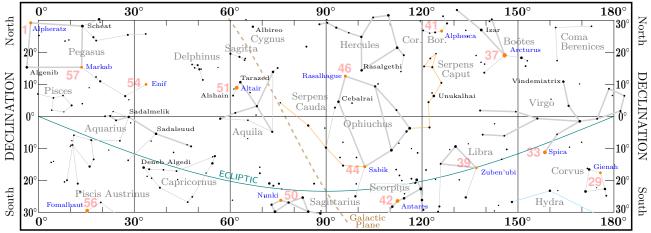
GENERATED USING SKYFIELD

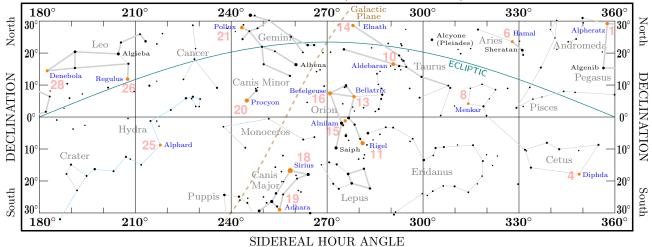
http://rhodesmill.org/skyfield/

EQUATORIAL STARS (SHA 0° to 180°)



SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



THE NAUTICAL ALMANAC

2024

Author: Andrew Bauer
Original concept from: Enno Rodegerdts

September 6, 2025

Disclaimer: These are computer generated tables - use them at your own risk. The accuracy has been randomly checked with JPL HORIZONS System, but cannot be guaranteed. The author claims no liability for any consequences arising from use of these tables. Besides, this publication only contains the 'daily pages' of the Nautical Almanac: an official version of the Nautical Almanac is indispensable.

Information in the data page footers

Information pertaining to the IERS EOP data has been added to the odd data page footers if using MiKTeX or TeX Live (2020 or later). The International Earth Rotation Service (IERS) provides accurate data (updated weekly) on the Earth Orientation Parameters (EOP).

Earth's speed of rotation is not constant, i.e. the day length fluctuates.¹ This is due to *internal torques* caused by relative movements and mass redistribution of Earth's core, mantle, oceans, atmosphere, and cryosphere. This has an immediate impact on the GHA values of all celestial objects.

The IERS monitors and measures several parameters taking the actual speed of Earth's rotation into account. Their measured data begins on 2nd Januaray 1973. Predictive data begins following the last day of (obtained) data and extends about 360 days into the future. (The IERS results are published with a delay of about 18-hours between the date of publication and the last available date with measured EOP.²) These Nautical Almanac daily pages take the (measured or predicted) UT1-UTC values into account providing highly accurate navigational data especially if the predictions are fairly recent.

As long as either measured or predicted data is available the footer will show:

IERS Earth Orientation data as of dd-mmm-yyyy

This indicates that IERS EOP data is in use - older dates are measured; newer dates are predictions.

If the final date of IERS prediction data is on the current data page, the footer shows:

IERS Earth Orientation predictions end dd-mmm-yyyy

Pages with dates beyond the final date of IERS prediction data have the following footer:

No IERS EOP prediction data available

Skyfield then defaults to using the ΔT and leap second files that ship with Skyfield internally.

The footers mentioned are only displayed as long as 'uselERS = True' is set in config.py to enable use of IERS EOP data.

Brief historical overview

The story begins with the XEphem astronomical library, which is declared 'end of life' by its author, Elwood Charles Downey, as no further updates are planned. He generously gave permission for use of XEphem code in Ephem (also known as Pyephem), an astronomical library authored by Brandon Rhodes. Enno Rodegerdts (https://sv-inua.net/) created the original Nautical Almanac 'daily pages' in Pyalmanac using Python 2 and LaTeX. After contacting him I obtained permission for its future enhancement and maintenance. Pyalmanac uses Ephem.

Meanwhile Brandon Rhodes was working on a far more sophisticated astronomical library, Skyfield. This was 'state of the art' and clearly surpassed the 'Jean Meeus'-based Pyephem/Ephem. Skyfield uses NASA's NAIF (Navigation and Ancillary Information Facility) SPICE algorithms. The results agree with those from the HORIZONS System (operated by NASA JPL (Jet Propulsion Laboratory) SSD (Solar System Dynamics) group, not by NAIF). This in turn implies that celestial positions calculated by Skyfield agree with those generated by the United States Naval Observatory and their Astronomical Almanac to within 0.0005 arcseconds (half a milliarcsecond).

Pyephem was then in 'maintenance mode'. Clearly Pyalmanac needed adaptation to use Skyfield, and thus SFalmanac was born. However its performance was poor regarding the calculation of 'events' such as: sunrise, sunset, moonrise, moonset, civil twilight start/end and nautical twilight start/end. An interim (faster) solution was required.

A hybrid application, originally named Skyalmanac, was developed using Ephem to calculate 'events' and Skyfield for the rest. This was indeed much faster at the cost of poorer 'event time' data. It took a while to find a better solution: multiprocessing, which was built into SFalmanac. This now could compare to the execution times in Pyalmanac but with improved data.

New functionality was added to SFalmanac, e.g. lunar phase as a graphic; Lunar Distance tables and charts. The original Skyalmanac is deprecated and has now been replaced with the latest SFalmanac code, so Skyalmanac and SFalmanac are now identical apart from the name. Since April 2019 http://thenauticalalmanac.com has been publishing Celestial Navigation related material with software provided here.

¹https://en.wikipedia.org/wiki/Day_length_fluctuations

²https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html

January 01, 02, 03 UT (Mon., Tue., Wed.)

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA [Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	100°9.07		°46.16	193°5.81	\$23°57.68	66°27.94	N12° 15.84	124°22.38	\$11°50.35			
1	115° 11.54	234°11.37	46.82	208° 6.25	57.75	81°30.41	15.85	139°24.63	50.26	Alpheratz	357°35.71	29°13.49
2	$130^{\circ}14.00$	249°10.70	47.47	223°6.68	57.81	96°32.87	15.87	154°26.89	50.18	Ankaa Schedar	353°8.00 349°32.02	-42°10.81 56°40.38
3	145° 16.47		48.13	238°7.12	• • 57.87	111°35.33	• • 15.88	169°29.14	• • 50.10	Diphda	349° 32.02	-17°51.46
4	160° 18.93	279°9.36	48.79	253°7.56	57.93	126°37.79	15.90	184°31.40	50.01	Achernar	335°20.64	-57°7.20
5	175°21.40	294°8.69	49.44	268°7.99	57.99	141°40.25	15.91	199°33.65	49.93	Hamal	327°52.02	23°34.63
6 7	190°23.86 205°26.32	309°8.02 \$18° 324°7.34	°50.10 50.75	283°8.43 298°8.86	\$23°58.05 58.11	156°42.70 171°45.16	N12° 15.93 15.94	214°35.90 229°38.16	\$11°49.85 49.76	Polaris	$314^{\circ}8.60$	$89^{\circ}22.18$
8	220° 28.79	339°6.67	51.41	313° 9.30	58.17	186°47.62	15.96	244° 40.41	49.68	Acamar	315°12.15	-40°12.70
9	235°31.25		52.06	328° 9.74	58.23	201°50.08	• • 15.97	259° 42.67	• • 49.60	Menkar	314°6.83	4°11.01
10	250°33.72	9°5.32	52.71	343°10.17	58.28	216°52.54	15.99	274°44.92	49.51	Mirfak Aldebaran	308°29.12 290°40.29	49°56.94 16°33.47
11	265°36.18	24°4.65	53.36	358°10.61	58.34	231°55.00	16.01	289°47.17	49.43	Rigel	281°4.36	-8° 10.46
12	280°38.64	39°3.97 S18°		13°11.04	\$23°58.40	246°57.45	N12°16.02	304°49.43	S11°49.35	Capella	280°22.68	46°1.38
13	295°41.11	54°3.30 69°2.62	54.66 55.31	28°11.48 43°11.91	58.46	261°59.91 277°2.37	16.04	319°51.68 334°53.93	49.26	Bellatrix	278°23.46	6°22.28
14 15	310° 43.57 325° 46.04	84°1.95 · ·		58°12.35	58.51 •• 58.57	292°4.82	16.05 •• 16.07	349°56.19	49.18 •• 49.09	Elnath	278°2.57	28°37.68
16	340°48.50	99°1.27	56.61	73°12.78	58.62	307°7.28	16.09	4°58.44	49.01	Alnilam	275°38.26	-1°11.20
17	355° 50.96	114°0.59	57.25	88°13.22	58.68	322°9.73	16.10	20°0.69	48.93	Betelgeuse	270°52.66	7°24.69
18	10°53.43	128°59.91 S 18°	°57.90	103°13.65	S23°58.73	337°12.19	N12° 16.12	35°2.94	S11°48.84	Canopus Sirius	263°52.21 258°26.63	-52°42.47 -16°44.93
19	25°55.89	143°59.23	58.54	118°14.09	58.79	352°14.64	16.14	50°5.20	48.76	Adhara	255°6.14	-29°0.24
20	40°58.36	158° 58.55	59.19	133°14.52	58.84	7°17.10	16.15	65°7.45	48.68	Procyon	244°51.39	5°9.80
21	56°0.82		°59.83	148°14.96	• • 58.89	22°19.55 37°22.00	· · 16.17	80°9.70	· · 48.59	Pollux	243°17.97	$27^{\circ}58.04$
22 23	71°3.29 86°5.75	188° 57.19 19 203° 56.51	9° 0.47 1.11	163°15.39 178°15.82	58.95 59.00	52°24.46	16.19 16.21	95°11.95 110°14.21	48.51 48.42	Avior	234°14.48	-59°34.99
		-					_	-		Suhail	222°46.57	-43°31.58
Mer.p	bass. 17:17	ν-0.7′ d0.7′ m	1-4.02	$\nu^{0.4'} d0.$.1′ m1.37	$\nu^{2.5'} d0.$.0′ m-2.59	$\nu 2.3' \ d-0$	0.1′ m0.95	Miaplacidus	221°37.70	-69°48.67
										Alphard Regulus	217°48.33 207°35.13	-8°45.70 11°50.95
Tue	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.74	61°37.04
0	101°8.21		9° 1.75	193°16.26	\$23°59.05	67°26.91	N12°16.22	125° 16.46	S11°48.34	Denebola	182°25.74	14°26.20
1	116° 10.68	233°55.15	2.39	208°16.69	59.10	82°29.36	16.24	140°18.71	48.26	Gienah	175°44.43	-17°40.40
2	131° 13.14 146° 15.61	248° 54.47 263° 53.79	3.03 · 3.67	223°17.13 238°17.56	59.15 •• 59.21	97°31.81 112°34.27	16.26 •• 16.28	155°20.96 170°23.21	48.17 • • 48.09	Acrux	$173^{\circ}1.04$	$-63^{\circ}13.60$
3 4	161° 18.07	278°53.10	4.30	250 17.50 253°17.99	59.26	112 34.27 127°36.72	16.29	170 23.21 185°25.47	48.00	Gacrux	171°52.59	-57° 14.55
5	176° 20.53	293°52.42	4.94	268°18.43	59.31	142°39.17	16.31	200°27.72	47.92	Alioth	166°13.74	55°49.50
6	191°23.00		9°5.58	283°18.86	S23°59.36	157°41.62	N12°16.33	215°29.97	S11°47.84	Spica Alkaid	158°23.27 152°52.82	-11°17.13 49°11.35
7	$206^{\circ}25.46$	323°51.05	6.21	$298^{\circ}19.29$	59.40	$172^{\circ}44.07$	16.35	230°32.22	47.75	Hadar	152 52.62 148°37.48	-60° 29.02
8	221°27.93	338°50.36	6.84	313°19.73	59.45	187°46.52	16.37	245°34.47	47.67	Menkent	147°58.79	-36°29.09
9	236° 30.39		• 7.48	328°20.16	• • 59.50	202°48.97	• • 16.39	260°36.72	• • 47.58	Arcturus	145°48.83	19°3.33
10 11	251°32.85 266°35.32	8°48.99 23°48.31	8.11 8.74	343°20.59 358°21.03	59.55 59.60	217°51.42 232°53.87	16.40 16.42	275°38.97 290°41.22	47.50 47.41	Rigil Kent.	$139^{\circ}41.82$	-60°55.79
12	281° 37.78		9°9.37	13°21.46	\$23°59.64	247°56.32	N12° 16.44	305°43.48	\$11°47.33	Kochab	137°20.42	74°3.09
13	296° 40.25	53°46.93	10.00	28°21.89	59.69	262°58.76	16.46	320°45.73	47.24	Zuben'ubi	136°57.15	-16°8.42
14	311°42.71	68°46.24	10.63	43°22.32	59.73	278°1.21	16.48	335°47.98	47.16	Alphecca Antares	126°4.72 112°17.20	26° 37.89 -26° 29.04
15	$326^{\circ}45.17$		11.25	58°22.76	• • 59.78	293°3.66	•• 16.50	350°50.23	• • 47.08	Atria	107°12.73	-69°4.07
16	341°47.64	98°44.86	11.88	73°23.19	59.83	308°6.11	16.52	5°52.48	46.99	Sabik	102°4.09	-15°45.27
17	356° 50.10	113°44.17	12.51	88°23.62	59.87	323°8.55	16.54	20°54.73	46.91	Shaula	96°11.93	-37°7.23
18 19	11°52.57 26°55.03	128° 43.48 S19° 143° 42.79	°13.13 13.76	103°24.05 118°24.48	\$23°59.91 23°59.96	338°11.00 353°13.45	N12° 16.56 16.58	35°56.98 50°59.23	\$11°46.82 46.74	Rasalhague	95°59.67	$12^{\circ}32.48$
20	41° 57.49	158° 42.10	14.38	133°24.92	0.00	8°15.89	16.60	66°1.48	46.65	Eltanin	90°43.12	51°29.01
21	56° 59.96		15.00	148°25.35	0.04	23°18.34	. 16.62	81°3.73	• • 46.57	Kaus Aust.	83°34.05 80°34.24	-34°22.40
22	72°2.42	188°40.72	15.62	163°25.78	0.09	38°20.78	16.64	96°5.98	46.48	Vega Nunki		38°48.27 -26°16.06
23	87°4.89	203°40.03	16.24	178°26.21	0.13	53°23.23	16.66	111°8.23	46.40	Altair	62°1.11	8°55.85
Mer.r	pass. 17:13	ν-0.7' d0.6' m	-4.01	$\nu 0.4' d0.$.1′ m1.37	$\nu^{2.5'} d0$.0′ m-2.58	$\nu 2.3' d-0$	0.1' m0.95	Peacock		-56°39.63
	7433. 17.113									Deneb	49°26.81	45°22.00
\A/ad	CHA	CHA E	٦	CHA	Dee	CHA	Dee	CHA	Dee	Enif	33°39.87	9°59.07
Wed 0	GHA 102°7.35	GHA E 218°39.33 S 19°	Dec °16.86	GHA 193°26.64	Dec \$24°0.17	GHA 68°25.67	Dec N12° 16.68	GHA 126°10.48	Dec \$11°46.31	Al Na'ir		-46°50.94
1	117°9.82	233°38.64	17.48	208°27.07	0.21	83°28.12	16.70	141°12.73	46.23	Fomalhaut Scheat	15°15.61 13°46.19	-29°29.92 28°12.86
2	132° 12.28	248°37.94	18.10	223°27.51	0.25	98°30.56	16.72	156°14.98	46.14	Markab	13° 30.89	26 12.60 15°20.08
3	147°14.74		18.72	238°27.94	• • 0.29	113°33.00	• • 16.74	171°17.22	• • 46.06			
4	162° 17.21	278° 36.55	19.34	253°28.37	0.33	128°35.45	16.76	186° 19.47	45.97	Jan 01 Mon	SHA	Mer.pass
5 6	177° 19.67 192° 22.14	293°35.86 308°35.16 S 19°	19.95 ° 20.57	268°28.80 283°29.23	0.37 \$24°0.41	143°37.89	16.78 N12° 16.80	201°21.72	45.89 \$11°45.80	Venus Mars	119°2.97 92°56.73	09:24 11:07
о 7	192°22.14 207°24.60	308°35.16 \$19°	21.18	283°29.23 298°29.66	\$24°0.41 0.45	158°40.33 173°42.77	16.82	216° 23.97 231° 26.22	45.72	Jupiter	92 50.75 326°18.87	19:31
8	207 24.00 222° 27.06	338°33.77	21.79	313°30.09	0.49	173 42.77 188°45.22	16.84	246°28.47	45.72	Saturn	24°13.30	15:40
9	237°29.53		22.40	328°30.52	• • 0.52	203°47.66	• • 16.87	261°30.72	• • 45.54	Ion 02 T		
10	252° 31.99	8°32.37	23.02	343°30.95	0.56	218°50.10	16.89	276° 32.97	45.46	Jan 02 Tue	SHA 117°47.62	Mer.pass 09:25
11	267°34.46	23°31.67	23.63	358°31.38	0.60	233°52.54	16.91	291°35.21	45.37	Mars	92°8.05	11:07
12	282°36.92	38°30.97 \$19°		13°31.81	\$24°0.63	248°54.98	N12° 16.93	306°37.46	\$11°45.29		326°18.70	19:27
13 14	297°39.38 312°41.85	53°30.27 68°29.57	24.84 25.45	28°32.24 43°32.67	0.67 0.70	263°57.42 278°59.86	16.95 16.97	321°39.71 336°41.96	45.20 45.12	Saturn	24°8.25	15:37
15	327° 44.31		26.06	58°33.10	• • 0.74	276 59.80 294°2.30	17.00	351°44.21	• • 45.03	Jan 03 Wed	SHA	Mer.pass
16	342°46.78	98°28.17	26.67	73°33.53	0.77	309°4.74	17.02	6°46.45	44.95		116°31.98	09:26
17	357°49.24	113°27.47	27.27	88°33.96	0.81	324°7.18	17.04	21°48.70	44.86	Mars	91°19.29	11:06
18	12°51.70	128°26.77 \$19°		103°34.39	S24°0.84	339°9.61	N12°17.06	36°50.95	S11°44.77	I	326°18.32	19:23
19	27°54.17	143°26.06	28.48	118°34.82	0.88	354°12.05	17.09	51°53.20	44.69	Saturn	24°3.13	15:33
20	42°56.63 57°59.10	158°25.36 173°24.66	29.08 29.68	133°35.25 148°35.68	0.91 •• 0.94	9°14.49 24°16.93	17.11 •• 17.13	66°55.44 81°57.69	44.60 •• 44.52	Horizon	ntal parallax	
21 22	73°1.56	173 24.00 · · · 188° 23.95	30.28	148 35.08 163°36.11	0.97	39°19.36	17.15	96°59.94	44.43		Venus:	0.1
23	88°4.03	203°23.25	30.88	178°36.54	1.00	54°21.80	17.18	112°2.19	44.34		Mars:	0.1
	pass. 17:09	ν-0.7' d0.6' m			.0′ m1.37		.0′ m-2.58		0.1' m0.96			<u> </u>
- Ivier.	,uss. 11.U9	ν-σ.ι ασ.σ Μ	7.01	νυ. 4 αυ.	.0 1111.31	ν2. 4 α0.	.0 111-2.30	ν Δ.Δ U-U	.1110.90			

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°13.82	S23°3.51	$301^{\circ}1.97$	16.1'	N12°37.65	-12.7'	54.1'
1	194°13.52	3.32	315°37.04	16.1'	12°24.92	-12.8'	54.1'
2	209°13.22 224°12.93	3.12 •• 2.93	330° 12.16 344° 47.34	16.2' 16.2'	12°12.14 11°59.32	-12.8' -12.9'	54.1' 54.1'
4	239°12.63	2.73	359° 22.56	16.3'	11°46.47	-12.9'	54.1'
5	254°12.34	2.54	13°57.83	16.3'	$11^{\circ}33.57$	-12.9'	54.1'
6	269°12.04	\$23°2.34	28° 33.15	16.4	N11°20.63	-13.0'	54.1'
7 8	284°11.74 299°11.45	2.15 1.95	43°8.51 57°43.92	16.4' 16.5'	11°7.65 10°54.63	-13.0' -13.1'	54.1' 54.1'
9	314°11.15	1.75	72° 19.37	16.5'	10° 41.57	-13.1'	54.1
10	329°10.86	1.55	86°54.86	16.5'	10°28.48	-13.1'	54.1'
11	344°10.56 359°10.27	1.35 \$23°1.15	101°30.40 116°5.98	16.6'	10° 15.35 N10° 2.19	-13.2'	54.1' 54.1'
12 13	359 10.27 14°9.97	0.95	110 5.98 130°41.59	16.6' 16.7'	09°48.99	-13.2' -13.2'	54.1'
14	29°9.68	0.74	145° 17.25	16.7'	09°35.76	-13.3'	54.1'
15	44°9.38	• • 0.54	159°52.94	16.7'	09°22.49	-13.3'	54.1'
16 17	59°9.09 74°8.79	0.34 23°0.13	174°28.67 189°4.44	16.8' 16.8'	09°9.19 08°55.86	-13.3' -13.4'	54.1' 54.1'
18	89°8.50	522° 59.92	203° 40.23	16.8'	N08° 42.50	-13.4'	54.1
19	104°8.20	59.72	218°16.07	16.9'	$08^{\circ}29.11$	-13.4'	54.1'
20	119°7.91	59.51	232°51.93	16.9'	08° 15.69	-13.5'	54.1'
21 22	134°7.61 149°7.32	· · 59.30 59.09	247°27.82 262°3.75	16.9' 17.0'	08°2.24 07°48.76	-13.5' -13.5'	54.1' 54.1'
23	149 7.32 164°7.03	59.09 58.88	202 3.75 276°39.70	17.0'	07 48.76 07°35.25	-13.5'	54.1'
-	SD = 16.3'	d = -0.2'			D = 14.8'		
		u — -0.2		ال			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°6.73 194°6.44	\$22°58.67 58.46	291° 15.68 305° 51.69	17.0' 17.0'	N07°21.72 07°8.16	-13.6' -13.6'	54.1' 54.1'
2	194 6.44 209 6.15	58.46 58.25	305°51.69 320°27.72	17.0° 17.1'	07°8.16 06°54.57	-13.6'	54.1'
3	224°5.85	• • 58.04	335°3.78	17.1'	06°40.96	-13.6'	54.1'
4	239°5.56	57.82	349°39.86	17.1'	06°27.32	-13.7'	54.1'
5 6	254°5.27 269°4.97	57.61 \$22°57.39	4° 15.96 18° 52.09	17.1' 17.1'	06°13.67 N05°59.98	-13.7' -13.7'	54.1' 54.1'
7	284°4.68	57.18	33°28.23	17.1	05°46.28	-13.7'	54.1
8	299°4.39	56.96	48°4.39	17.2'	05°32.55	-13.7'	54.1'
9	314°4.10	56.74	62°40.57	17.2'	05°18.81	-13.8'	54.1'
10 11	329°3.80 344°3.51	56.52 56.30	77°16.77 91°52.98	17.2' 17.2'	05°5.04 04°51.25	-13.8' -13.8'	54.1' 54.1'
12	359° 3.22	50.30 522°56.08	106° 29.20	17.2'	N04° 37.44	-13.8'	54.2'
13	14°2.93	55.86	$121^{\circ}5.44$	17.2'	$04^{\circ}23.62$	-13.8'	54.2'
14	29°2.64	55.64	135°41.69	17.3' 17.3'	04°9.78 03°55.92	-13.9'	54.2'
15 16	44°2.34 59°2.05	• • 55.42 55.20	150° 17.95 164° 54.22	17.3'	03°55.92 03°42.04	-13.9' -13.9'	54.2' 54.2'
17	74°1.76	54.97	179°30.49	17.3'	03°28.15	-13.9'	54.2'
18	89°1.47	\$22°54.75	194°6.78	17.3'	N03°14.24	-13.9'	54.2'
19 20	104°1.18 119°0.89	54.52 54.29	208°43.07 223°19.36	17.3' 17.3'	03°0.32 02°46.38	-13.9'	54.2' 54.2'
21	134°0.60	• • 54.07	237°55.66	17.3	02° 40.38	-13.9 -14.0'	54.2'
22	149°0.31	53.84	$252^{\circ}31.96$	17.3'	$02^{\circ}18.47$	-14.0'	54.2'
23	164°0.02	53.61	267°8.26	17.3'	02°4.50	-14.0'	54.2'
	SD = 16.3'	d = -0.2'		SI	D = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°59.73	\$22° 53.38	281°44.57	17.3'	N01°50.51	-14.0'	54.2'
1	193°59.43	53.15	296°20.87	17.3'	01°36.52	-14.0'	54.3'
2	208°59.14 223°58.86	52.92 •• 52.69	310°57.17 325°33.46	17.3' 17.3'	01°22.51 01°8.49	-14.0' -14.0'	54.3' 54.3'
4	238°58.57	52.45	340°9.75	17.3'	01 0.49 00°54.47	-14.0'	54.3'
5	253°58.28	52.22	354°46.04	17.3'	$00^{\circ}40.43$	-14.0'	54.3'
6	268°57.99 283°57.70	\$22°51.99	9°22.31 23°58.58	17.3'	N00°26.39 N00°12.35	-14.0'	54.3'
7 8	283°57.70 298°57.41	51.75 51.51	23°58.58 38°34.84	17.3' 17.2'	N00°12.35 S00°1.71	-14.1' 14.1'	54.3' 54.3'
9	313°57.12	51.28	53° 11.09	17.2'	00° 15.77	14.1	54.3'
10	328°56.83	51.04	67°47.33	17.2'	00°29.83	14.1'	54.4'
11 12	343°56.54 358°56.25	50.80 \$22°50.56	82°23.55 96°59.76	17.2' 17.2'	00°43.90 \$00°57.98	14.1' 14.1'	54.4' 54.4'
13	358°56.25 13°55.96	50.32	96°59.76 111°35.95	17.2'	01° 12.05	14.1'	54.4' 54.4'
14	28°55.68	50.08	$126^{\circ}12.13$	17.2'	$01^{\circ}26.13$	14.1'	54.4'
15	43°55.39	• • 49.84	140°48.29	17.1'	01°40.21	14.1'	54.4'
16 17	58°55.10 73°54.81	49.60 49.35	155°24.43 170°0.54	17.1' 17.1'	01°54.29 02°8.38	14.1' 14.1'	54.4' 54.4'
17	73°54.81 88°54.52	49.35 \$22°49.11	170°0.54 184°36.64	17.1	02°8.38 \$02°22.46	14.1	54.4
19	103°54.24	48.87	199°12.71	17.0'	02°36.54	14.1'	54.5'
20	118°53.95	48.62	213°48.76	17.0'	02°50.62	14.1'	54.5'
21 22	133°53.66 148°53.38	· · 48.37 48.13	228°24.79 243°0.79	17.0' 17.0'	03°4.70 03°18.77	14.1' 14.1'	54.5' 54.5'
23	148 53.38 163°53.09	48.13 47.88	243 0.79 257°36.76	17.0 16.9'	03 18.77 03°32.84	14.1'	54.5'
_	SD = 16.3'	d = -0.2'			D = 14.8'		

N 72° N 70° 68°	Naut. 08:23 08:05	Civil 10:41	Sunrise	Sunset	Civil	Naut.
N 70°	08:05	10:41				ivaut.
					13:27	15:45
600		09:49			14:19	16:03
	07:50	09:16			14:52	16:18
66°	07:37	08:53	10:27	13:41	15:15	16:31
64°	07:26	08:34	09:49	14:19	15:34	16:41
62°	07:17	08:18	09:23	14:45	15:49	16:51
60°	07:09	08:05	09:02	15:06	16:02	16:59
N 58°	07:02	07:54	08:45	15:23	16:14	17:06
56°	06:56	07:44	08:31	15:37	16:24	17:12
54°	06:50	07:35	08:19	15:49	16:32	17:18
52°	06:44	07:28	08:08	16:00	16:40	17:24
50°	06:39	07:20	07:58	16:09	16:47	17:29
45°	06:28	07:05	07:38	16:29	17:03	17:40
N 40°	06:18	06:52	07:22	16:46	17:16	17:50
35°	06:08	06:40	07:08	17:00	17:28	17:59
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:11	06:35	17:32	17:56	18:24
N 10°	05:28	05:54	06:17	17:50	18:13	18:39
0°	05:11	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:24	18:43	19:08	19:37
30°	04:02	04:35	05:03	19:05	19:32	20:05
35°	03:44	04:20	04:50	19:17	19:47	20:23
40°	03:21	04:03	04:35	19:32	20:05	20:46
45°	02:52	03:41	04:18	19:50	20:27	21:15
S 50°	02:08	03:12	03:56	20:11	20:55	21:59
52°	01:42	02:57	03:45	20:22	21:10	22:24
54°	01:02	02:40	03:33	20:34	21:27	23:03
56°	////	02:19	03:20	20:47	21:48	////
58°	////	01:51	03:03	21:04	22:15	////
S 60°	////	01:08	02:44	21:23	22:58	////

Lat.		Moonris	e		Moonset	į.
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	20:47	22:46		12:26	11:51	11:20
N 70°	21:00	22:49		12:11	11:45	11:21
68°	21:10	22:51		11:58	11:40	11:22
66°	21:18	22:53		11:48	11:35	11:23
64°	21:25	22:55	•• ••	11:40	11:32	11:23
62°	21:31	22:56		11:33	11:28	11:24
60°	21:36	22:58		11:26	11:26	11:25
N 58°	21:41	22:59		11:21	11:23	11:25
56°	21:45	23:00		11:16	11:21	11:26
54°	21:48	23:01		11:11	11:19	11:26
52°	21:51	23:01		11:07	11:17	11:26
50°	21:54	23:02	•• ••	11:03	11:15	11:27
45°	22:01	23:04		10:55	11:12	11:27
N 40°	22:06	23:05		10:48	11:08	11:28
35°	22:11	23:06		10:42	11:06	11:28
30°	22:15	23:07		10:37	11:03	11:29
20°	22:21	23:09	23:57	10:28	10:59	11:30
N 10°	22:27	23:11	23:54	10:20	10:55	11:30
0°	22:33	23:12	23:51	10:12	10:52	11:31
S 10°	22:39	23:14	23:49	10:05	10:48	11:31
20°	22:45	23:15	23:46	09:56	10:45	11:32
30°	22:51	23:17	23:43	09:47	10:40	11:33
35°	22:55	23:18	23:41	09:41	10:38	11:33
40°	22:59	23:19	23:39	09:35	10:35	11:34
45°	23:05	23:20	23:36	09:28	10:31	11:34
S 50°	23:11	23:22	23:33	09:19	10:27	11:35
52°	23:13	23:23	23:32	09:15	10:25	11:35
54°	23:16	23:24	23:31	09:10	10:23	11:36
56°	23:20	23:24	23:29	09:05	10:21	11:36
58°	23:23	23:25	23:28	09:00	10:18	11:36
S 60°	23:27	23:27	23:26	08:53	10:16	11:37

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	78-61%	
01	03:05	03:19	12:03	04:03	16:23		
02	03:33	03:47	12:04	04:42	17:02		
03	04:01	04:15	12:04	05:21	17:41		

January 04, 05, 06 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	103°6.49	218°22.54 \$19°31.48	193°36.97 \$24°1.03	69°24.24 N12°17.20	127° 4.43 S11° 44.26	
1	118°8.95	233°21.84 32.08	208°37.39 1.06	84°26.67 17.22	142°6.68 44.17	Alpheratz 357°35.72 29°13.48
2	133°11.42	248°21.13 32.68	223°37.82 1.09	99°29.11 17.25	157°8.93 44.09	Ankaa 353°8.02 -42°10.81
3	148°13.88	263°20.42 · · 33.27	238°38.25 · · 1.12	114°31.54 · · 17.27	172°11.17 · · 44.00	Schedar 349° 32.05 56° 40.38 Diphda 348° 48.15 -17° 51.46
4	163° 16.35	278° 19.72 33.87	253°38.68 1.15	129°33.98 17.29	187°13.42 43.91	Achernar 335°20.67 -57°7.21
5	178° 18.81	293°19.01 34.46	268°39.11 1.18	144°36.41 17.32	202°15.67 43.83	Hamal 327°52.03 23°34.63
6	193°21.27	308°18.30 \$19°35.06	283°39.54 \$24°1.21	159°38.85 N12°17.34	217°17.91 S11°43.74	Polaris 314°9.79 89°22.19
7 8	208°23.74 223°26.20	323°17.59 35.65 338°16.88 36.24	298°39.96 1.24 313°40.39 1.27	174°41.28 17.37 189°43.71 17.39	232°20.16 43.66 247°22.40 43.57	Acamar 315°12.17 -40°12.71
9	238°28.67	353°16.17 · · 36.83	328°40.82 · · 1.29	204° 46.15 · · 17.41	262°24.65 · · 43.48	Menkar 314°6.84 4°11.01
10	253°31.13	8°15.46 37.42	343°41.25 1.32	219° 48.58 17.44	277°26.90 43.40	Mirfak 308°29.14 49°56.94
11	268° 33.59	23°14.75 38.01	358°41.68 1.35	234°51.01 17.46	292°29.14 43.31	Aldebaran 290°40.29 16°33.47
12	283°36.06	38°14.04 \$19°38.60	13°42.10 S 24°1.37	249°53.44 N12°17.49	307°31.39 \$11°43.22	Rigel 281°4.36 -8°10.47 Capella 280°22.69 46°1.39
13	298°38.52	53°13.33 39.19	28°42.53 1.40	264°55.87 17.51	322°33.63 43.14	Bellatrix 278°23.46 6°22.28
14	313° 40.99	68°12.62 39.78	43°42.96 1.42	279°58.31 17.54	337°35.88 43.05	Elnath 278°2.57 28°37.68
15	328° 43.45	83°11.91 · · 40.36 98°11.19 40.95	58°43.39 · · 1.45	295°0.74 · · 17.56	352°38.12 · · 42.96 7°40.37 42.88	Alnilam 275°38.26 -1°11.21
16 17	343° 45.91 358° 48.38	98°11.19 40.95 113°10.48 41.53	73°43.81 1.47 88°44.24 1.49	310°3.17 17.59 325°5.60 17.61	7°40.37 42.88 22°42.61 42.79	Betelgeuse 270°52.66 7°24.69
18	13° 50.84	128°9.77 \$19°42.11	103°44.67 S24°1.52	340°8.03 N12°17.64	37°44.86 S11°42.70	Canopus 263°52.21 -52°42.49
19	28°53.31	143°9.05 42.70	118°45.09 1.54	355°10.46 17.66	52°47.10 42.62	Sirius 258°26.63 -16°44.94
20	43°55.77	158°8.34 43.28	133°45.52 1.56	10°12.89 17.69	67°49.35 42.53	Adhara 255°6.14 -29°0.25
21	58°58.24	173°7.62 · · 43.86	148°45.95 · · 1.58	25°15.31 · · 17.71	82°51.59 · · 42.44	Procyon 244°51.38 5°9.80 Pollux 243°17.96 27°58.04
22	74°0.70	188°6.90 44.44	163°46.37 1.60	40° 17.74 17.74	97°53.84 42.36	Avior 234°14.47 -59°35.01
23	89°3.16	203°6.19 45.02	178°46.80 1.63	55°20.17 17.76	112°56.08 42.27	Suhail 222°46.55 -43°31.60
Mer.ı	pass. 17:05	ν-0.7' d0.6' m-4.00	ν0.4' d0.0' m1.37	ν 2.4′ d0.0′ m-2.57	ν2.2' d-0.1' m0.96	Miaplacidus 221°37.67 -69°48.69
	<u>'</u>					Alphard 217°48.32 -8°45.71
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.11 11°50.95
0	104°5.63	218°5.47 \$19°45.59	193°47.23 \$24°1.65	70°22.60 N12°17.79	127°58.33 \$11°42.18	Dubhe 193°41.70 61°37.04
1	119°8.09	233°4.75 46.17	208°47.65 1.67	85°25.03 17.82	143° 0.57 42.10	Denebola 182°25.72 14°26.19
2	134° 10.56	248°4.04 46.75	223°48.08 1.68	100°27.45 17.84	158°2.82 42.01	Gienah 175°44.41 -17°40.41 Acrux 173°1.00 -63°13.60
3	$149^{\circ}13.02$	263°3.32 · · 47.32	238°48.51 · · 1.70	115°29.88 · · 17.87	173°5.06 · · 41.92	Gacrux 171°52.56 -57°14.55
4	164° 15.48	278°2.60 47.89	253°48.93 1.72	130°32.31 17.90	188°7.30 41.83	Alioth 166°13.70 55°49.49
5	179° 17.95	293°1.88 48.47	268°49.36 1.74	145°34.73 17.92	203°9.55 41.75	Spica 158°23.25 -11°17.14
6	194° 20.41	308°1.16 \$19°49.04	283°49.79 \$24°1.76	160°37.16 N12°17.95	218°11.79 S11°41.66 233°14.03 41.57	Alkaid 152°52.79 49°11.34
7 8	209°22.88 224°25.34	323°0.44 49.61 337°59.72 50.18	298°50.21 1.78 313°50.64 1.79	175°39.58 17.98 190°42.01 18.00	233°14.03 41.57 248°16.28 41.49	Hadar 148°37.45 -60°29.02
9	239° 27.80	352°59.00 · · 50.75	328°51.06 · · 1.81	205°44.43 · · 18.03	263°18.52 · · 41.49	Menkent 147°58.76 -36°29.09
10	254°30.27	7°58.28 51.32	343°51.49 1.83	220° 46.86 18.06	278°20.77 41.31	Arcturus 145°48.81 19°3.32
11	269°32.73	22°57.55 51.89	358°51.91 1.84	235°49.28 18.08	293°23.01 41.22	Rigil Kent. 139°41.79 -60°55.79 Kochab 137°20.37 74°3.08
12	284°35.20	37°56.83 \$19°52.46	13°52.34 S 24°1.86	250°51.70 N12°18.11	308°25.25 \$11°41.14	Zuben'ubi 136°57.13 -16°8.42
13	299° 37.66	52°56.11 53.02	28°52.76 1.87	265°54.13 18.14	323°27.49 41.05	Alphecca 126°4.71 26°37.87
14	314°40.12	67°55.39 53.59	43°53.19 1.88	280°56.55 18.17	338°29.74 40.96	Antares 112°17.19 -26°29.05
15	329° 42.59	82°54.66 · · 54.15	58°53.61 · · 1.90	295°58.97 · · 18.19	353°31.98 · · 40.87	Atria 107°12.69 -69°4.06
16 17	344° 45.05 359° 47.52	97°53.94 54.71 112°53.21 55.28	73°54.04 1.91 88°54.46 1.92	311°1.40 18.22 326°3.82 18.25	8°34.22 40.79 23°36.47 40.70	Sabik 102°4.07 -15°45.27
18	14° 49.98	127°52.49 \$19°55.84	103°54.89 S24°1.94	341°6.24 N12°18.28	38°38.71 S11°40.61	Shaula 96°11.92 -37°7.22
19	29°52.45	142°51.76 56.40	118°55.31 1.95	356°8.66 18.31	53°40.95 40.52	Rasalhague 95°59.66 12°32.47
20	44°54.91	157°51.03 56.96	133°55.74 1.96	11°11.08 18.33	68°43.19 40.43	Eltanin 90°43.11 51°29.00 Kaus Aust. 83°34.04 -34°22.40
21	59° 57.37	172°50.31 · · 57.52	148°56.16 · · 1.97	26°13.50 · · 18.36	83°45.44 · · 40.35	Vega 80°34.23 38°48.26
22	74°59.84	187°49.58 58.07	163°56.59 1.98	41°15.92 18.39	98°47.68 40.26	Nunki 75°49.18 -26°16.06
23	90°2.30	202°48.85 58.63	178°57.01 1.99	56°18.34 18.42	113°49.92 40.17	Altair 62°1.11 8°55.84
Mer.	pass. 17:01	ν -0.7' $d0.6'$ m-4.00	ν 0.4′ d 0.0′ m 1.36	ν 2.4′ d 0.0′ m-2.56	$\nu 2.2' \ d$ -0.1' m0.96	Peacock 53°7.61 -56°39.62
						Deneb 49°26.82 45°21.99
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.88 9°59.07
0	105°4.77	217°48.12 \$19°59.19	193°57.44 \$24°2.00	71°20.76 N12°18.45	128°52.16 \$11°40.08	Al Na'ir 27°34.28 -46°50.93
1	120°7.23	232°47.40 19°59.74	208°57.86 2.01	86°23.18 18.48	143°54.40 40.00	Fomalhaut 15°15.63 -29°29.92 Scheat 13°46.20 28°12.85
2	135°9.69	247°46.67 20°0.30	223°58.28 2.02	101°25.60 18.51	158°56.64 39.91	Markab 13°30.90 15°20.07
3	150° 12.16	262°45.94 · · 0.85	238°58.71 · · 2.03	116°28.02 · · 18.54	173°58.89 · · 39.82	
4	165°14.62	277°45.21 1.40	253°59.13 2.04	131°30.44 18.57	189°1.13 39.73	Jan 04 Thu SHA Mer.pass
5	180° 17.09	292°44.48 1.95	268°59.56 2.04	146°32.85 18.60	204°3.37 39.64	Venus 115°16.05 09:27 Mars 90°30.48 11:05
6	195° 19.55	307°43.74 \$20°2.50	283°59.98	161°35.27 N12°18.62	219°5.61 \$11°39.55	Mars 90°30.48 11:05 Jupiter 326°17.75 19:19
7 8	210°22.01 225°24.48	322°43.01 3.05 337°42.28 3.60	299° 0.40 2.06 314° 0.83 2.06	176°37.69 18.65 191°40.10 18.68	234°7.85 39.47 249°10.09 39.38	Saturn 23°57.94 15:29
9	240°26.94	352°41.55 · · 4.15	329°1.25 · · 2.07	206° 42.52 · · 18.71	264°12.33 · · 39.29	
10	255°29.41	7°40.82 4.69	344°1.67 2.08	221°44.94 18.74	279°14.57 39.20	Jan 05 Fri SHA Mer.pass
11	270°31.87	22°40.08 5.24	359°2.10 2.08	236°47.35 18.77	294°16.82 39.11	Venus 113°59.84 09:28
12	285° 34.34	37°39.35 S 20°5.79	14°2.52 S 24°2.08	251°49.77 N12°18.80	309°19.06 S 11°39.02	Mars 89°41.60 11:05 Jupiter 326°16.97 19:15
13	300°36.80	52°38.61 6.33	29°2.94 2.09	266°52.18 18.83	324°21.30 38.94	Saturn 23°52.70 15:26
14	315°39.26	67°37.88 6.87	44°3.37 2.09	281°54.60 18.87	339°23.54 38.85	
15 16	330°41.73 345°44.19	82°37.14 · · 7.41 97°36.41 7.96	59°3.79 · · 2.10 74°4.21 2.10	296°57.01 · · 18.90 311°59.43 18.93	354°25.78 · · 38.76 9°28.02 38.67	Jan 06 Sat SHA Mer.pass
10 17	0°46.66	97 36.41 7.96 112°35.67 8.50	89° 4.63 2.10	311 59.43 18.93 327°1.84 18.96	9 28.02 38.67 24°30.26 38.58	Venus 112°43.36 09:29 Mars 88°52.67 11:04
18	15° 49.12	127°34.94 \$20°9.04	104°5.06 S24°2.10	342°4.25 N12°18.99	39°32.50 S11°38.49	Mars 88° 52.67 11:04 Jupiter 326° 16.00 19:12
19	30°51.58	142°34.20 9.57	119°5.48 2.10	357°6.66 19.02	54°34.74 38.40	Saturn 23°47.39 15:22
20	45°54.05	157°33.46 10.11	134°5.90 2.10	12°9.08 19.05	69°36.98 38.32	
21	60°56.51	172°32.72 · · 10.65	149°6.32 · · 2.10	27°11.49 · · 19.08	84°39.22 · · 38.23	Horizontal parallax
22	75°58.98	187°31.98 11.18	164°6.75 2.10	42°13.90 19.11	99°41.46 38.14	Venus: 0.1
23	91°1.44	202°31.25 11.72	179°7.17 2.10	57°16.31 19.14	114°43.70 38.05	Mars: 0.1
Mer.	pass. 16:57	ν -0.7′ d 0.6′ m-4.00	$ u 0.4' \ d0.0' \ m1.36$	$\nu 2.4' \ d0.0' \ \text{m-}2.55$	$\nu 2.2' \ d\text{-}0.1' \ \text{m}0.96$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 52.80	5 22°47.63	272°12.70	16.9'	S03°46.91	14.1'	54.6'
1 2	193°52.52 208°52.23	47.38 47.13	286°48.61 301°24.48	16.9' 16.8'	04°0.97 04°15.03	14.1' 14.0'	54.6' 54.6'
3	206 52.25 223°51.94	• • 46.88	316° 0.33	16.8	04 15.05 04°29.08	14.0'	54.6'
4	238°51.66	46.63	330°36.14	16.8'	04°43.12	14.0'	54.6'
5	253°51.37	46.38	345°11.92	16.7'	04°57.15	14.0'	54.6'
6 7	268° 51.08 283° 50.80	\$22°46.12 45.87	359°47.66 14°23.36	16.7' 16.7'	\$05°11.18 05°25.20	14.0' 14.0'	54.7' 54.7'
8	298° 50.51	45.61	28°59.02	16.6'	05°39.21	14.0'	54.7'
9	313°50.23	• • 45.36	43°34.64	16.6'	$05^{\circ}53.20$	14.0'	54.7'
10 11	328° 49.94 343° 49.66	45.10 44.84	58°10.22 72°45.76	16.5' 16.5'	06°7.19 06°21.16	14.0' 14.0'	54.7' 54.8'
12	358° 49.37	\$22°44.59	87°21.25	16.4	S06°35.12	13.9'	54.8'
13	13°49.09	44.33	101°56.69	16.4'	06°49.07	13.9'	54.8'
14	28° 48.80	44.07	116°32.09	16.4'	07°3.00	13.9'	54.8'
15 16	43° 48.52 58° 48.24	· · 43.81 43.55	131°7.45 145°42.75	16.3' 16.3'	07°16.91 07°30.82	13.9' 13.9'	54.8' 54.9'
17	73° 47.95	43.28	160°18.00	16.2'	07°44.70	13.9'	54.9'
18	88° 47.67	5 22°43.02	174°53.20	16.1'	S07°58.56	13.8'	54.9'
19 20	103°47.39 118°47.10	42.76 42.49	189°28.35 204°3.44	16.1' 16.0'	08°12.41 08°26.24	13.8' 13.8'	54.9' 54.9'
21	133° 46.82	• • 42.23	204 3.44 218°38.47	16.0'	08°40.05	13.8	54.9 55.0'
22	148°46.54	41.96	233°13.45	15.9'	08°53.84	13.8'	55.0'
23	163°46.25	41.70	247°48.37	15.9'	09°7.60	13.7'	55.0'
	SD = 16.3'	d = -0.2'		SE	0 = 14.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 45.97	S22°41.43	262°23.24	15.8'	S09°21.34	13.7'	55.0'
1	193° 45.69	41.16	276°58.04	15.7'	09°35.06	13.7'	55.1'
2	208° 45.40 223° 45.12	40.89 • • 40.62	291°32.77 306°7.45	15.7' 15.6'	09°48.76 10°2.43	13.7' 13.6'	55.1' 55.1'
4	238° 44.84	40.35	320° 42.06	15.5'	10° 2.43	13.6'	55.1'
5	253° 44.56	40.08	335°16.60	15.5'	10°29.69	13.6'	55.2'
6	268° 44.28	S22°39.81	349°51.08	15.4'	\$10°43.28	13.6'	55.2'
7 8	283°44.00 298°43.71	39.53 39.26	4°25.49 18°59.82	15.3' 15.3'	10°56.84 11°10.37	13.5' 13.5'	55.2' 55.2'
9	313° 43.43	• • 38.99	33°34.09	15.2'	11°23.86	13.5'	55.3'
10	328° 43.15	38.71	48°8.28	15.1'	11°37.33	13.4'	55.3'
11 12	343° 42.87 358° 42.59	38.43 \$22°38.16	62°42.40 77°16.45	15.0' 15.0'	11°50.77 \$12°4.17	13.4' 13.4'	55.3' 55.3'
13	13° 42.31	37.88	91°50.42	14.9'	12°17.53	13.3'	55.4'
14	28° 42.03	37.60	106°24.31	14.8'	12°30.86	13.3'	55.4'
15 16	43°41.75 58°41.47	· · 37.32 37.04	120°58.12 135°31.86	14.7' 14.7'	12°44.16 12°57.41	13.3' 13.2'	55.4' 55.5'
17	73°41.19	36.76	150°5.51	14.6'	12 37.41 13°10.63	13.2'	55.5'
18	88°40.91	S22°36.48	164°39.08	14.5'	S13°23.80	13.1'	55.5'
19 20	103°40.63 118°40.35	36.20 35.91	179°12.56 193°45.96	14.4'	13°36.94 13°50.03	13.1' 13.1'	55.5' 55.6'
21	133° 40.07	35.63	208°19.28	14.3	13 50.03 14°3.09	13.1	55.6'
22	148°39.79	35.35	222°52.50	14.1'	14°16.09	13.0'	55.6'
23	163°39.51	35.06	237°25.64	14.0'	14°29.05	12.9'	55.7'
	SD = 16.3'	d = -0.3'		SE	0 = 15.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 39.24	5 22°34.77	251°58.69	14.0'	S14°41.97	12.9'	55.7'
1 2	193°38.96 208°38.68	34.49 34.20	266°31.64 281°4.51	13.9' 13.8'	14°54.84 15°7.65	12.8' 12.8'	55.7' 55.7'
3	200 38.00 223°38.40	33.91	295°37.28	13.7'	15°20.42	12.7'	55.8'
4	238°38.12	33.62	310° 9.95	13.6'	15°33.14	12.7'	55.8'
5 6	253° 37.85 268° 37.57	33.33 \$22°33.04	324°42.53 339°15.01	13.5' 13.4'	15°45.80 \$15°58.42	12.6' 12.6'	55.8' 55.9'
7	283°37.29	32.75	353°47.40	13.4	16°10.97	12.5'	55.9'
8	298°37.02	32.46	8°19.68	13.2'	$16^{\circ}23.47$	12.4'	55.9'
9	313°36.74 328°36.46	· · 32.16 31.87	22°51.87 37°23.95	13.1' 13.0'	16°35.92 16°48.30	12.4' 12.3'	56.0' 56.0'
10 11	328 36.46 343°36.19	31.87 31.57	51°55.93	13.0	16 48.30 17°0.62	12.3'	56.0'
12	358°35.91	S22°31.28	66°27.81	12.8'	S17°12.89	12.2'	56.1'
13	13°35.63	30.98	80°59.58	12.7'	17°25.09	12.1'	56.1'
14 15	28° 35.36 43° 35.08	30.69 •• 30.39	95°31.24 110°2.80	12.6' 12.4'	17°37.23 17°49.30	12.1' 12.0'	56.1' 56.2'
16	58°34.81	30.09	124°34.25	12.4	18° 1.30	11.9'	56.2
17	73°34.53	29.79	139° 5.59	12.2'	18°13.24	11.9'	56.2'
18 19	88°34.26 103°33.98	\$22°29.49 29.19	153°36.82 168°7.94	12.1' 12.0'	\$18°25.11 18°36.91	11.8' 11.7'	56.3' 56.3'
20	103° 33.98 118° 33.71	29.19 28.89	168° 7.94 182° 38.95	12.0 11.9'	18° 48.63	11.7'	56.3
21	133°33.43	• • 28.59	197° 9.84	11.8'	19°0.28	11.6'	56.4'
22 23	148°33.16 163°32.88	28.28 27.98	211°40.62 226°11.28	11.7' 11.5'	19°11.86 19°23.36	11.5' 11.4'	56.4' 56.4'
23	SD = 16.3'	d = -0.3'	220 11.28		0 = 15.2'	11.4	50.4
	3D = 10.3	u = -0.5) SL	<i>σ</i> = 13.2		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:20	10:31			13:39	15:51
N 70°	08:02	09:44			14:27	16:09
68°	07:47	09:13	11:33	12:38	14:58	16:23
66°	07:35	08:50	10:21	13:50	15:21	16:35
64°	07:25	08:32	09:45	14:25	15:39	16:46
62°	07:16	08:17	09:20	14:51	15:54	16:55
60°	07:08	08:04	09:00	15:11	16:07	17:02
N 58°	07:01	07:53	08:44	15:27	16:17	17:09
56°	06:55	07:43	08:30	15:41	16:27	17:16
54°	06:49	07:35	08:18	15:53	16:36	17:21
52°	06:44	07:27	08:07	16:03	16:43	17:27
50°	06:39	07:20	07:58	16:13	16:51	17:32
45°	06:28	07:05	07:38	16:32	17:06	17:43
N 40°	06:18	06:52	07:22	16:48	17:19	17:53
35°	06:09	06:41	07:08	17:02	17:30	18:01
30°	06:01	06:30	06:57	17:14	17:40	18:10
20°	05:45	06:12	06:36	17:34	17:58	18:25
N 10°	05:29	05:56	06:18	17:52	18:15	18:41
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	04:55	05:22	05:44	18:26	18:49	19:16
20°	04:33	05:02	05:26	18:44	19:08	19:37
30°	04:05	04:38	05:05	19:05	19:32	20:05
35°	03:47	04:23	04:52	19:18	19:47	20:23
40°	03:24	04:05	04:38	19:32	20:05	20:45
45°	02:55	03:44	04:21	19:49	20:26	21:14
S 50°	02:13	03:15	03:59	20:11	20:54	21:56
52°	01:48	03:01	03:49	20:21	21:08	22:21
54°	01:11	02:44	03:37	20:33	21:25	22:57
56°	////	02:24	03:24	20:46	21:45	////
58°	////	01:57	03:08	21:02	22:12	////
S 60°	////	01:17	02:49	21:20	22:50	////

Lat.		Moonris	e	Moonset			
Lat.	Thu	Fri	Sat	Thu	Fri	Sat	
N 72°	00:43	02:48	05:29	10:48	10:08	08:59	
N 70°	00:37	02:31	04:45	10:57	10:28	09:44	
68°	00:32	02:18	04:16	11:04	10:43	10:15	
66°	00:28	02:07	03:55	11:10	10:56	10:37	
64°	00:25	01:58	03:38	11:15	11:06	10:56	
62°	00:22	01:50	03:24	11:20	11:15	11:11	
60°	00:19	01:43	03:13	11:24	11:23	11:23	
N 58°	00:17	01:38	03:03	11:27	11:30	11:34	
56°	00:15	01:33	02:54	11:30	11:36	11:44	
54°	00:13	01:28	02:46	11:33	11:42	11:52	
52°	00:12	01:24	02:39	11:36	11:47	12:00	
50°	00:10	01:20	02:33	11:38	11:51	12:07	
45°	00:07	01:12	02:20	11:43	12:01	12:22	
N 40°	00:05	01:05	02:09	11:48	12:09	12:34	
35°	00:02	01:00	02:00	11:51	12:16	12:44	
30°	00:00	00:55	01:52	11:55	12:22	12:54	
20°	••••	00:46	01:38	12:01	12:33	13:10	
N 10°		00:39	01:26	12:06	12:43	13:24	
0°		00:32	01:15	12:10	12:52	13:37	
S 10°	•• ••	00:25	01:04	12:15	13:01	13:50	
20°	••••	00:18	00:52	12:20	13:11	14:04	
30°	••••	00:09	00:39	12:26	13:22	14:20	
35°		00:05	00:31	12:30	13:28	14:30	
40° 45°	23:59 23:53		00:22 00:12	12:34 12:38	13:36 13:44	14:41 14:54	
		•••••					
S 50°	23:46	•• ••	00:00	12:44	13:55	15:10	
52°	23:42	23:54		12:46	14:00	15:17	
54° 56°	23:39	23:48		12:49	14:05	15:25	
56°	23:35	23:41	23:51	12:52	14:11	15:35	
S 60°	23:30 23:25	23:34 23:25	23:39 23:26	12:55 12:59	14:18 14:25	15:45 15:58	
5 60°	23:25	23:25	23:26	12:59	14:25	15:58	

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	52-32%	
04	04:29	04:43	12:05	06:01	18:21		
05	04:56	05:10	12:05	06:42	19:03		
06	05:23	05:36	12:06	07:26	19:49		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$106^{\circ}3.91$	217°30.51 \$20°12.25	194°7.59 S 24°2.10	72°18.72 N12°19.18	129°45.94 S 11°37.96	Alpheratz 357°35.73 29°13.47
1	121°6.37	232°29.77 12.78	209°8.01 2.10	87°21.13 19.21	144°48.18 37.87	Ankaa 353°8.03 -42°10.81
2	136°8.83	247°29.03 13.32	224°8.44 2.10	102°23.55 19.24	159°50.41 37.78	Schedar 349°32.07 56°40.37
3	151°11.30	262°28.29 · · 13.85	239°8.86 · · 2.10	117°25.96 · · 19.27	174°52.65 · · 37.69	Diphda 348°48.16 -17°51.46
4 5	166° 13.76 181° 16.23	277°27.54 14.38 292°26.80 14.91	254°9.28 2.10 269°9.70 2.09	132°28.37 19.30 147°30.77 19.34	189°54.89 37.60 204°57.13 37.52	Achernar 335°20.70 -57°7.21
6	196° 18.69	307°26.06 S20°15.43	284°10.12 S 24°2.09	162°33.18 N12°19.37	219°59.37 S11°37.43	Hamal 327°52.04 23°34.63
7	211°21.15	322°25.32 15.96	299°10.54 2.09	177°35.59 19.40	235°1.61 37.34	Polaris 314°10.79 89°22.20
8	226°23.62	337°24.58 16.49	314°10.97 2.08	192°38.00 19.43	250° 3.85 37.25	Acamar 315°12.18 -40°12.72 Menkar 314°6.85 4°11.00
9	241°26.08	352°23.83 · · 17.01	329°11.39 · · 2.08	207°40.41 · · 19.47	265°6.09 · · 37.16	Mirfak 308°29.15 49°56.95
10	256°28.55	7°23.09 17.54	344°11.81 2.07	222°42.82 19.50	280° 8.32 37.07	Aldebaran 290°40.29 16°33.47
11	271°31.01	22°22.34 18.06	359°12.23 2.06	237°45.22 19.53	295°10.56 36.98	Rigel 281°4.36 -8°10.48
12 13	286°33.48 301°35.94	37°21.60 \$20°18.58 52°20.85 19.10	14°12.65 \$24°2.06 29°13.07 2.05	252°47.63 N12°19.57 267°50.04 19.60	310°12.80 S11°36.89 325°15.04 36.80	Capella 280°22.69 46°1.39
14	316°38.40	67°20.11 19.62	44°13.49 2.04	282°52.44 19.63	340°17.28 36.71	Bellatrix 278°23.46 6°22.27
15	331° 40.87	82°19.36 · · 20.14	59°13.91 · · 2.04	297°54.85 · · 19.66	355°19.52 · · 36.62	Elnath 278°2.57 28°37.68
16	346°43.33	97°18.61 20.66	74°14.34 2.03	312°57.26 19.70	10°21.75 36.53	Alnilam 275°38.26 -1°11.22 Betelgeuse 270°52.66 7°24.68
17	1°45.80	112° 17.87 21.18	89°14.76 2.02	327°59.66 19.73	25°23.99 36.44	Betelgeuse 270°52.66 7°24.68 Canopus 263°52.21 -52°42.51
18	16° 48.26	127°17.12 \$20°21.70	104°15.18	343°2.07 N12°19.77	40°26.23 \$11°36.35	Sirius 258°26.62 -16°44.96
19	31°50.72	142°16.37 22.21	119°15.60 2.00	358°4.47 19.80	55°28.47 36.26	Adhara 255°6.13 -29°0.27
20 21	46°53.19 61°55.65	157°15.62 22.73 172°14.88 •• 23.24	134°16.02 1.99 149°16.44 · · 1.98	13°6.87 19.83 28°9.28 · · 19.87	70°30.70 36.17 85°32.94 · · 36.08	Procyon 244°51.37 5°9.79
22	76°58.12	187°14.13 23.75	164°16.86 1.97	43°11.68 19.90	100°35.18 36.00	Pollux 243°17.95 27°58.04
23	92°0.58	202°13.38 24.27	179°17.28 1.96	58°14.08 19.94	115°37.41 35.91	Avior 234°14.46 -59°35.03
			ν0.4' d-0.0' m1.36	ν2.4' d0.0' m-2.54		Suhail 222°46.53 -43°31.62
ivier.p	pass. 16:53	ν-0.7' d0.5' m-3.99	νυ.4 <i>a</i> -υ.υ m1.30	ν2.4 αυ.υ m-2.54	ν2.2' d-0.1' m0.96	Miaplacidus 221°37.64 -69°48.71 Alphard 217°48.30 -8°45.73
						Regulus 207°35.09 11°50.94
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.66 61°37.04
0	107°3.05	217°12.63 \$20°24.78	194°17.70 S24°1.95	73°16.49 N12°19.97	130°39.65 \$11°35.82	Denebola 182°25.69 14°26.18
1 2	122°5.51 137°7.97	232°11.88 25.29 247°11.12 25.80	209°18.12 1.94 224°18.54 1.92	88° 18.89 20.01 103° 21.29 20.04	145°41.89 35.73 160°44.13 35.64	Gienah 175°44.38 -17°40.42
3	152° 10.44	262°10.37 · · 26.30	239°18.96 · · 1.91	118°23.69 · · 20.08	175°46.36 · · 35.55	Acrux 173°0.95 -63°13.61
4	167° 12.90	277°9.62 26.81	254°19.38 1.90	133°26.10 20.11	190°48.60 35.46	Gacrux 171°52.51 -57°14.56
5	$182^{\circ}15.37$	292°8.87 27.32	269°19.80 1.88	148°28.50 20.15	205°50.84 35.37	Alioth 166°13.67 55°49.48 Spica 158°23.22 -11°17.15
6	197° 17.83	307°8.12 S 20°27.82	284°20.22 S 24°1.87	163°30.90 N12°20.18	220°53.07 S 11°35.28	Alkaid 152°52.76 49°11.33
7	212°20.30	322°7.36 28.33	299°20.64 1.86	178° 33.30 20.22	235°55.31 35.19	Hadar 148°37.40 -60°29.03
8	227° 22.76	337°6.61 28.83	314°21.06 1.84	193°35.70 20.25	250°57.54 35.10	Menkent 147°58.73 -36°29.10
9 10	242°25.22 257°27.69	352°5.86 · · 29.33 7°5.10 29.83	329°21.48 · · 1.83 344°21.90 1.81	208° 38.10 · · 20.29 223° 40.50 20.32	265°59.78 · · 35.01 281°2.02 34.91	Arcturus 145°48.79 19°3.31
11	272°30.15	22°4.35 30.33	359°22.32 1.79	238° 42.90 20.36	296° 4.25 34.82	Rigil Kent. 139°41.74 -60°55.79
12	287° 32.62	37°3.59 \$20°30.83	14°22.74 S24°1.78	253°45.29 N12°20.39	311°6.49 S11°34.73	Kochab 137°20.32 74°3.07
13	302°35.08	52°2.83 31.33	29°23.16 1.76	268°47.69 20.43	326° 8.72 34.64	Zuben'ubi 136°57.11 -16°8.43 Alphecca 126°4.68 26°37.86
14	317° 37.54	67°2.08 31.83	44°23.58 1.74	283°50.09 20.47	341°10.96 34.55	Antares 112° 17.16 -26° 29.05
15	332°40.01	82°1.32 · · 32.33	59°23.99 · · 1.72	298°52.49 · · 20.50	356°13.20 · · 34.46	Atria 107°12.65 -69°4.05
16	347° 42.47	97°0.56 32.82	74°24.41 1.70	313°54.89 20.54	11°15.43 34.37	Sabik 102°4.06 -15°45.27
17 18	2°44.94 17°47.40	111°59.81 33.32 126°59.05 \$20°33.81	89°24.83 1.68 104°25.25 \$24°1.67	328°57.28 20.57 343°59.68 N12°20.61	26°17.67 34.28 41°19.90 \$11°34.19	Shaula 96°11.90 -37°7.22
19	32° 49.87	141°58.29 34.30	119°25.67 1.65	359°2.08 20.65	56°22.14 34.10	Rasalhague 95°59.65 12°32.46
20	47°52.33	156° 57.53 34.79	134°26.09 1.62	14°4.47 20.69	71°24.37 34.01	Eltanin 90°43.10 51°28.98 Kaus Aust. 83°34.03 -34°22.39
21	62°54.79	171°56.77 · · 35.29	149°26.51 · · 1.60	29°6.87 · · 20.72	86°26.61 · · 33.92	Kaus Aust. 83°34.03 -34°22.39 Vega 80°34.22 38°48.24
22	77° 57.26	186°56.01 35.78	164°26.93 1.58	44°9.26 20.76	101°28.84 33.83	Nunki 75°49.17 -26°16.05
23	92°59.72	201°55.25 36.26	179°27.34 1.56	59°11.66 20.80	116°31.08 33.74	Altair 62°1.11 8°55.84
Mer.	pass. 16:49	ν -0.8' d 0.5' m-3.99	ν0.4' d-0.0' m1.36	ν 2.4′ d 0.0′ m -2.53	$\nu 2.2' \ d$ -0.1' m0.97	Peacock 53°7.61 -56°39.61
						Deneb 49°26.82 45°21.98
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.88 9°59.06
0	108°2.19	216°54.49 \$20°36.75	194°27.76 \$24°1.54	74°14.05 N12°20.83	131°33.31 \$11°33.65	Al Na'ir 27°34.29 -46°50.92 Fomalhaut 15°15.63 -29°29.92
1	123°4.65	231°53.73 37.24	209°28.18 1.52	89°16.45 20.87	146°35.55 33.56	Scheat 13°46.21 28°12.85
2	138°7.12	246°52.97 37.73	224°28.60 1.49	104°18.84 20.91	161°37.78 33.47	Markab 13°30.91 15°20.07
3	153°9.58	261°52.21 · · 38.21	239°29.02 · · 1.47	119°21.23 · · 20.95	176°40.01 · · 33.38	Lev 07 Com CHA May year
4	168° 12.04 183° 14.51	276°51.45 38.69 291°50.68 39.18	254°29.44 1.44 269°29.85 1.42	134°23.63 20.98 149°26.02 21.02	191°42.25 33.28 206°44.48 33.19	Jan 07 Sun SHA Mer.pass Venus 111° 26.60 09:30
5 6	183 14.51 198° 16.97	291°50.68 39.18 306°49.92 \$20°39.66	269°29.85 1.42 284°30.27 \$24°1.40	149°26.02 21.02 164°28.41 N12°21.06	206°44.48 33.19 221°46.72 \$11°33.10	Mars 88°3.69 11:03
7	213° 19.44	321°49.16 40.14	299°30.69 1.37	179°30.80 21.10	236°48.95 33.01	Jupiter 326°14.82 19:08
8	228°21.90	336°48.39 40.62	314°31.11 1.34	194°33.20 21.14	251°51.18 32.92	Saturn 23°42.03 15:19
9	243°24.36	351°47.63 · · 41.10	329°31.53 · · 1.32	209°35.59 · · 21.17	266°53.42 · · 32.83	Jan 08 Mon SHA Mer.pass
10	258° 26.83	6°46.86 41.58	344°31.94 1.29	224° 37.98 21.21	281°55.65 32.74	Venus 110°9.58 09:32
11	273°29.29	21°46.10 42.05	359°32.36 1.26	239° 40.37 21.25	296°57.89 32.65	Mars 87°14.65 11:03
12 13	288°31.76 303°34.22	36°45.33 S 20°42.53 51°44.57 43.01	14°32.78	254° 42.76 N12° 21.29 269° 45.15 21.33	312°0.12 \$11°32.56 327°2.35 32.46	Jupiter 326°13.44 19:04
14	318° 36.69	66°43.80 43.48	44°33.61 1.18	284° 47.54 21.37	342°4.59 32.37	Saturn 23°36.61 15:15
15	333°39.15	81°43.03 · · 43.95	59°34.03 · · 1.15	299°49.93 · · 21.41	357°6.82 · · 32.28	Jan 09 Tue SHA Mer.pass
16	348°41.61	96°42.27 44.43	74°34.45 1.12	314°52.32 21.45	12°9.05 32.19	Venus 108°52.31 09:33
17	3°44.08	111°41.50 44.90	89°34.87 1.09	329°54.71 21.49	27°11.29 32.10	Mars 86°25.58 11:02
18	18° 46.54	126°40.73	104°35.28 \$24°1.06	344°57.10 N12°21.52	42°13.52 \$11°32.01	Jupiter 326°11.87 19:00
19	33°49.01	141°39.96 45.84	119°35.70 1.03	359°59.48 21.56	57°15.75 31.92	Saturn 23°31.12 15:12
20 21	48°51.47 63°53.94	156°39.19 46.30 171°38.42 •• 46.77	134°36.12 1.00 149°36.54 · · 0.97	15°1.87 21.60 30°4.26 · · 21.64	72°17.98 31.83 87°20.22 · · 31.73	Horizontal parallax
22	78° 56.40	186°37.65 47.24	164°36.95 0.94	45°6.65 21.68	102°22.45 31.64	Venus: 0.1
23	93°58.86	201°36.88 47.70	179°37.37 0.90	60°9.03 21.72	117°24.68 31.55	Mars: 0.1
Merr	pass. 16:45	ν-0.8' d0.5' m-3.98	ν0.4' d-0.0' m1.36	ν2.4' d0.0' m-2.53	ν2.2' d-0.1' m0.97	
		- 0.0 do.5 iii-5.90	- 5.1 d 5.5 HII.50		- 2.2 G 0.1 III0.91	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.61	\$22°27.67	240°41.83	11.4'	S19°34.78	11.3'	56.5'
1	193°32.34	27.37	$255^{\circ}12.26$	11.3'	$19^{\circ}46.13$	11.3'	56.5'
2	208°32.06	27.06	269°42.58	11.2'	19°57.39	11.2'	56.5'
3	223°31.79	• • 26.75	284°12.78	11.1'	20°8.57	11.1'	56.6'
4 5	238°31.52 253°31.24	26.45 26.14	298° 42.85 313° 12.81	11.0' 10.8'	20° 19.66 20° 30.67	11.0' 10.9'	56.6' 56.6'
6	268°30.97	522°25.83	327°42.65	10.6	S20°41.60	10.9	56.7'
7	283°30.70	25.52	342° 12.36	10.6'	20°52.43	10.7	56.7'
8	298°30.42	25.21	356° 41.96	10.5'	21°3.17	10.7'	56.7'
9	313°30.15	• • 24.90	11°11.43	10.3'	21°13.83	10.6'	56.8'
10	328°29.88	24.58	25°40.78	10.2'	21°24.38	10.5'	56.8'
11	343°29.61 358°29.34	24.27	40°10.00	10.1'	21°34.85	10.4'	56.8'
12 13	13°29.34	\$22°23.96 23.64	54°39.10 69°8.07	10.0' 9.8'	\$21°45.22 21°55.48	10.3' 10.2'	56.9' 56.9'
14	28°28.79	23.33	83°36.92	9.7'	21 55.46 22°5.65	10.2	56.9'
15	43°28.52	• • 23.01	98°5.65	9.6'	22° 15.72	10.0'	57.0'
16	58°28.25	22.69	112°34.24	9.5'	$22^{\circ}25.68$	9.9'	57.0'
17	73°27.98	22.37	127°2.71	9.3'	$22^{\circ}35.54$	9.8'	57.1'
18	88°27.71	\$22°22.06	141°31.06	9.2'	S22°45.29	9.6'	57.1'
19	103°27.44	21.74	155°59.27	9.1'	22°54.93	9.5'	57.1'
20 21	118°27.17 133°26.90	21.42 •• 21.10	170°27.36 184°55.32	9.0' 8.8'	23°4.47 23°13.89	9.4' 9.3'	57.2' 57.2'
22	148°26.63	20.77	199°23.16	8.7'	23°23.20	9.3 9.2'	57.2'
23	163°26.36	20.45	213°50.86	8.6'	23°32.39	9.1'	57.3'
	SD = 16.3'	d = -0.3'			0 = 15.4'		
		<u>u — -0.5</u>		JL	. — 13.4		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°26.09 193°25.83	\$22°20.13 19.80	228° 18.44 242° 45.89	8.4' 8.3'	\$23°41.46 23°50.42	9.0' 8.8'	57.3' 57.3'
2	208°25.56	19.48	257° 13.21	8.2'	23°59.26	8.7'	57.4'
3	223°25.29	• • 19.15	271°40.40	8.1'	24°7.97	8.6'	57.4'
4	238°25.02	18.83	286°7.47	7.9'	$24^{\circ}16.56$	8.5'	57.5'
5	253°24.75	18.50	300°34.41	7.8'	24°25.02	8.3'	57.5'
6	268°24.48 283°24.22	\$22°18.17	315°1.22	7.7'	\$24°33.36 24°41.56	8.2'	57.5'
7 8	283°24.22 298°23.95	17.84 17.52	329°27.90 343°54.46	7.6' 7.4'	24°41.56 24°49.64	8.1' 7.9'	57.6' 57.6'
9	313°23.68	17.19	358° 20.89	7.3'	24°57.58	7.8'	57.6'
10	328°23.42	16.85	12°47.19	7.2'	25°5.39	7.7'	57.7'
11	343°23.15	16.52	$27^{\circ}13.37$	7.1'	$25^{\circ}13.06$	7.5'	57.7'
12	358°22.88	\$22°16.19	41°39.43	6.9'	S25°20.59	7.4'	57.7'
13 14	13°22.62 28°22.35	15.86 15.52	56°5.35 70°31.16	6.8' 6.7'	25°27.99 25°35.24	7.3' 7.1'	57.8' 57.8'
15	43°22.08	. 15.19	84°56.84	6.6'	25°42.35	7.1	57.8 57.9'
16	58°21.82	14.85	99°22.40	6.4	25°49.31	6.8'	57.9'
17	73°21.55	14.52	113°47.84	6.3'	$25^{\circ}56.12$	6.7'	57.9'
18	88°21.29	S22°14.18	128° 13.16	6.2'	\$26°2.79	6.5'	58.0'
19	103°21.02	13.84	142°38.36	6.1'	26°9.31	6.4'	58.0'
20 21	118°20.76 133°20.49	13.50 •• 13.16	157°3.45 171°28.41	6.0' 5.8'	26° 15.67 26° 21.88	6.2' 6.1'	58.0' 58.1'
22	148°20.23	12.82	185°53.26	5.7'	26°27.94	5.9'	58.1'
23	163°19.96	12.48	200° 17.99	5.6'	26°33.83	5.7'	58.1'
	SD = 16.3'	d = -0.3'		SE	0 = 15.6'		
Tue	GHA	Doe			Dee		HP
Tue 0	178° 19.70	Dec \$22° 12.14	GHA 214° 42.61	u 5.5'	Dec \$26° 39.57	<i>d</i> 5.6'	58.2'
1	193°19.44	11.80	229°7.12	5.4'	26°45.15	5.4	58.2'
2	208°19.17	11.46	243°31.51	5.3'	$26^{\circ}50.57$	5.3'	58.3'
3	223°18.91	• • 11.11	257°55.80	5.2'	26°55.82	5.1'	58.3'
4	238°18.65	10.77	272°19.98	5.1'	27°0.91	4.9'	58.3'
5 6	253°18.38 268°18.12	10.42 \$22°10.08	286°44.05 301°8.02	5.0' 4.9'	27°5.83 \$27°10.58	4.8' 4.6'	58.4' 58.4'
7	283°17.86	9.73	301 8.02 315°31.88	4.9 4.8'	27° 15.16	4.0 4.4'	58.4'
8	298°17.60	9.38	329°55.64	4.7'	27° 19.57	4.2'	58.5'
9	313°17.34	• • 9.04	344°19.31	4.6'	$27^{\circ}23.80$	4.1'	58.5'
10	328°17.07	8.69	358° 42.87	4.5'	27°27.87	3.9'	58.5'
11	343°16.81	8.34	13°6.34	4.4'	27°31.75	3.7'	58.6'
12 13	358°16.55 13°16.29	\$22°7.99 7.63	27°29.72 41°53.01	4.3' 4.2'	\$27°35.46 27°38.99	3.5' 3.3'	58.6' 58.6'
13 14	28°16.03	7.03 7.28	56° 16.20	4.2 4.1'	27°42.34	3.3 3.2'	58.7'
15	43°15.77	. 6.93	70°39.31	4.0'	27°45.51	3.0'	58.7'
16	58°15.51	6.58	85°2.33	3.9'	27°48.49	2.8'	58.7'
17	73°15.25	6.22	99°25.27	3.9'	27°51.29	2.6'	58.8'
18	88°14.99	S22°5.87	113°48.13	3.8'	\$27°53.91	2.4'	58.8'
19 20	103°14.73 118°14.47	5.51 5.15	128° 10.92 142° 33.62	3.7' 3.6'	27°56.34 27°58.58	2.2' 2.1'	58.8' 58.9'
21	118 14.47 133°14.21	• • 4.80	142 33.02 156° 56.25	3.6'	27 58.58 28°0.63	2.1 1.9'	58.9'
22	148°13.95	4.44	171° 18.82	3.5'	28°2.50	1.7'	58.9'
23	163°13.69	4.08	185°41.31	3.4'	28°4.17	1.5'	59.0'
	SD = 16.3'	d = -0.3'		SE	0 = 15.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	08:16	10:21		_	13:53	15:58
N 70°	07:58	09:37			14:36	16:15
68°	07:44	09:08	11:12	13:01	15:05	16:29
66°	07:33	08:46	10:14	14:00	15:27	16:41
64°	07:23	08:29	09:41	14:33	15:44	16:50
62°	07:14	08:15	09:16	14:57	15:59	16:59
60°	07:07	08:02	08:57	15:16	16:11	17:06
N 58°	07:00	07:52	08:42	15:32	16:22	17:13
56°	06:54	07:42	08:28	15:45	16:31	17:19
54°	06:48	07:34	08:16	15:57	16:39	17:25
52°	06:43	07:26	08:06	16:07	16:47	17:30
50°	06:38	07:19	07:57	16:16	16:54	17:35
45°	06:28	07:04	07:38	16:36	17:09	17:46
N 40°	06:18	06:52	07:22	16:51	17:21	17:55
35°	06:09	06:41	07:09	17:05	17:32	18:04
30°	06:01	06:31	06:57	17:16	17:42	18:12
20°	05:46	06:13	06:37	17:36	18:00	18:27
N 10°	05:31	05:57	06:19	17:54	18:16	18:42
0°	05:14	05:40	06:03	18:10	18:33	18:59
S 10°	04:56	05:23	05:46	18:27	18:50	19:16
20°	04:35	05:04	05:28	18:45	19:09	19:38
30°	04:07	04:40	05:07	19:05	19:33	20:05
35°	03:50	04:26	04:55	19:18	19:47	20:23
40°	03:28	04:08	04:41	19:32	20:04	20:45
45°	02:59	03:47	04:24	19:49	20:25	21:13
S 50°	02:18	03:20	04:03	20:10	20:53	21:54
52°	01:55	03:06	03:53	20:20	21:06	22:17
54°	01:21	02:49	03:41	20:31	21:22	22:50
56°	////	02:30	03:28	20:44	21:42	////
58°	////	02:04	03:13	20:59	22:07	////
S 60°	////	01:28	02:55	21:17	22:42	////

Lat.		Moonris	е		Moonset	;
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°	06:58			09:13		
66°	06:04			10:08		
64°	05:32	07:54		10:41	10:09	
62°	05:08	07:04	09:19	11:05	10:59	10:46
60°	04:49	06:33	08:18	11:25	11:31	11:47
N 58°	04:34	06:10	07:45	11:41	11:54	12:21
56°	04:21	05:51	07:20	11:55	12:14	12:46
54°	04:09	05:36	07:00	12:07	12:30	13:06
52°	03:59	05:22	06:43	12:18	12:44	13:23
50°	03:50	05:10	06:29	12:27	12:56	13:38
45°	03:32	04:46	06:00	12:47	13:21	14:07
N 40°	03:16	04:26	05:37	13:04	13:42	14:31
35°	03:03	04:10	05:19	13:18	13:59	14:50
30°	02:52	03:56	05:03	13:30	14:13	15:06
20°	02:33	03:33	04:36	13:51	14:38	15:34
N 10°	02:17	03:12	04:12	14:09	15:00	15:58
0°	02:02	02:54	03:51	14:26	15:20	16:20
S 10°	01:47	02:35	03:29	14:43	15:41	16:42
20°	01:30	02:15	03:07	15:01	16:03	17:06
30°	01:12	01:52	02:40	15:23	16:28	17:34
35°	01:02	01:39	02:25	15:35	16:43	17:51
40°	00:49	01:23	02:06	15:50	17:00	18:10
45°	00:35	01:05	01:45	16:07	17:21	18:33
S 50°	00:18	00:42	01:18	16:28	17:48	19:03
52°	00:10	00:32	01:04	16:38	18:01	19:18
54°	00:01	00:20	00:49	16:50	18:16	19:35
56°		00:06	00:31	17:03	18:33	19:55
58°	23:50		00:09	17:19	18:54	20:21
S 60°	23:30	23:42		17:37	19:22	20:57

		Sun		Moon			
Day	Eqn.o	f Time	Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	23-8%	
07	05:50	06:03	12:06	08:14	20:40		
08	06:16	06:28	12:06	09:07	21:35		
09	06:41	06:54	12:07	10:05	22:36		

January 10, 11, 12 UT (Wed., Thu., Fri.)

h	Aries	Ve	nus	M	ars	Juj	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	109°1.33		S20°48.17	194°37.79	S24°0.87	75°11.42	N12°21.76	132°26.91	S11°31.46			
1	124°3.79	231°35.34	48.63	209°38.20	0.84	90°13.80	21.80	$147^{\circ}29.15$	31.37	Alpheratz	357°35.74	29°13.47 -42°10.81
2	$139^{\circ}6.26$	246°34.57	49.09	224°38.62	0.80	105°16.19	21.84	162°31.38	31.28	Ankaa Schedar	353°8.04 349°32.08	-42 10.81 56°40.37
3	154°8.72	261°33.80	• • 49.56	239°39.04	• • 0.77	120°18.58	• • 21.88	177°33.61	• • 31.18	Diphda	348°48.16	-17°51.46
4	169°11.19	276°33.03	50.02	254°39.45	0.73	135°20.96	21.93	192°35.84	31.09	Achernar	335°20.72	$-57^{\circ}7.21$
5 6	184° 13.65 199° 16.11	291°32.25 306°31.48	50.48 \$20°50.93	269°39.87 284°40.29	0.70 \$24°0.66	150°23.35 165°25.73	21.97 N12°22.01	207°38.07 222°40.31	31.00 \$11°30.91	Hamal	$327^{\circ}52.04$	$23^{\circ}34.63$
7	214° 18.58	321°30.71	51.39	299°40.70	0.63	180°28.11	22.05	237°42.54	30.82	Polaris	314°11.75	89°22.21
8	229°21.04	336° 29.93	51.85	314°41.12	0.59	195°30.50	22.09	252°44.77	30.72	Acamar	315°12.19	-40°12.73
9	244°23.51	351°29.16	• • 52.30	329°41.54	• • 0.55	210°32.88	• • 22.13	267°47.00	• • 30.63	Menkar Mirfak	314°6.85 308°29.15	4°11.00 49°56.95
10	259° 25.97	6°28.38	52.76	344°41.95	0.52	225°35.26	22.17	282°49.23	30.54	Aldebaran	290°40.29	49 50.95 16°33.47
11	274°28.44	21°27.61	53.21	359°42.37	0.48	240°37.65	22.21	297°51.46	30.45	Rigel	281°4.36	-8°10.48
12	289°30.90	36°26.83	\$20°53.66	14°42.79	\$24°0.44	255°40.03	N12°22.25	312°53.69	\$11°30.36	Capella	280°22.68	46°1.40
13 14	304°33.36 319°35.83	51°26.06 66°25.28	54.11 54.57	29°43.20 44°43.62	0.40 0.36	270°42.41 285°44.79	22.30 22.34	327°55.93 342°58.16	30.26 30.17	Bellatrix	278°23.46	6°22.27
15	334° 38.29	81°24.50	55.01	59°44.03	0.32	300°47.17	• • 22.38	358°0.39	30.08	Elnath	278°2.56	28°37.69
16	349°40.76	96°23.73	55.46	74°44.45	0.28	315°49.55	22.42	13°2.62	29.99	Alnilam	275°38.25	-1°11.23
17	4°43.22	111°22.95	55.91	89°44.87	0.24	330°51.93	22.46	28°4.85	29.90	Betelgeuse Canopus	270°52.65 263°52.21	7°24.67 -52°42.53
18	19° 45.68	126° 22.17	\$20°56.36	104°45.28	S 24°0.20	345°54.31	N12°22.50	43°7.08	S 11°29.80	Sirius	258° 26.61	-32 42.33 -16°44.97
19	34°48.15	141°21.39	56.80	119°45.70	0.16	0°56.69	22.55	58°9.31	29.71	Adhara	255°6.12	-29°0.29
20	49°50.61	156°20.61	57.25	134°46.11	0.12	15°59.07	22.59	73°11.54	29.62	Procyon	244°51.36	5°9.78
21 22	64°53.08 79°55.54	171°19.84 186°19.06	· · 57.69 58.13	149°46.53 164°46.94	· · 0.08 0.03	31°1.45 46°3.83	· · 22.63 22.67	88° 13.77 103° 16.00	· · 29.53 29.43	Pollux	243°17.93	$27^{\circ}58.04$
23	94°58.01	201° 18.28	58.57	179°47.36	59.99	61°6.21	22.72	118° 18.23	29.43	Avior	234° 14.44	-59°35.05
		-					_			Suhail	222°46.51	-43°31.64
Mer.p	pass. 16:41	ν -0.8′ $d0$.5′ m-3.98	ν 0.4′ d-0	0.0′ m1.36	ν2.4′ d0	.0′ m-2.52	ν 2.2' d-0	.1′ m0.97	Miaplacidus Alphard	221°37.61 217°48.28	-69°48.73 -8°45.74
										Regulus	217 46.26 207°35.07	-6 45.74 11°50.93
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.62	61°37.04
0	110°0.47	216° 17.50	\$20°59.02	194°47.77	\$23°59.95	76°8.59	N12°22.76	133°20.46	\$11°29.25	Denebola	$182^{\circ}25.66$	$14^{\circ}26.17$
1 2	125°2.93 140°5.40	231°16.72 246°15.93	59.45 20°59.89	209°48.19 224°48.61	59.90	91°10.97 106°13.34	22.80	148°22.69 163°24.92	29.16	Gienah	$175^{\circ}44.35$	-17°40.43
3	140 5.40 155°7.86	240 15.95 261°15.15	20 59.89 21°0.33	239°49.02	59.86 •• 59.81	100 15.34 121°15.72	22.85 •• 22.89	103 24.92 178°27.15	29.06 •• 28.97	Acrux	173°0.89	-63°13.62
4	170° 10.33	276°14.37	0.77	254°49.44	59.77	136°18.10	22.93	193°29.38	28.88	Gacrux	171°52.47	-57°14.57
5	185° 12.79	291°13.59	1.20	269°49.85	59.72	151°20.47	22.98	208°31.61	28.79	Alioth Spica	166° 13.63 158° 23.19	55°49.48 -11°17.16
6	200°15.26	306°12.81	S21°1.64	284°50.27	\$23°59.67	166°22.85	N12°23.02	223°33.84	S11°28.69	Alkaid	150 23.19 152°52.72	49°11.32
7	215° 17.72	321°12.02	2.07	299°50.68	59.63	181°25.23	23.06	238°36.07	28.60	Hadar	148° 37.35	-60°29.03
8	230°20.18	336°11.24	2.50	314°51.10	59.58	196°27.60	23.11	253°38.30	28.51	Menkent	147°58.70	-36°29.10
9 10	245°22.65 260°25.11	351°10.46 6°9.67	· · 2.93 3.36	329°51.51 344°51.93	•• 59.53 59.48	211°29.98 226°32.35	· · 23.15 23.20	268° 40.53 283° 42.76	· · 28.41 28.32	Arcturus	$145^{\circ}48.76$	$19^{\circ}3.29$
11	200 25.11 275°27.58	21°8.89	3.79	359°52.34	59.46 59.44	241°34.72	23.24	203 42.70 298°44.99	28.23	Rigil Kent.	139°41.69	-60°55.79
12	290°30.04	36°8.10	S21°4.22	14°52.76	\$23°59.39	256°37.10	N12°23.28	313°47.21	S11°28.14	Kochab	137°20.26	74°3.05
13	$305^{\circ}32.51$	51°7.32	4.65	29°53.17	59.34	271°39.47	23.33	328°49.44	28.04	Zuben'ubi Alphecca	136°57.08 126°4.66	-16° 8.44 26° 37.85
14	$320^{\circ}34.97$	66°6.53	5.08	44°53.59	59.29	286°41.85	23.37	343°51.67	27.95	Antares	112° 17.13	-26°29.05
15	335°37.43	81°5.75	• • 5.50	59°54.00	• • 59.24	301°44.22	• • 23.42	358°53.90	• • 27.86	Atria	107° 12.59	-69° 4.04
16	350°39.90	96°4.96	5.93	74°54.42	59.19	316°46.59	23.46	13°56.13	27.76	Sabik	$102^{\circ}4.03$	-15°45.28
17 18	5° 42.36 20° 44.83	111°4.17 126°3.38	6.35 \$21°6.77	89°54.83 104°55.24	59.13 \$23°59.08	331°48.96 346°51.34	23.51 N12°23.55	28°58.36 44°0.59	27.67 \$11°27.58	Shaula	96°11.87	-37°7.21
19	35° 47.29	141°2.60	7.19	119°55.66	59.03	1°53.71	23.60	59°2.81	27.48	Rasalhague	95°59.63	12°32.45
20	50°49.76	156°1.81	7.61	134°56.07	58.98	16°56.08	23.64	74°5.04	27.39	Eltanin	90°43.08	51°28.96
21	65°52.22	171°1.02	• • 8.03	149°56.49	• • 58.93	31°58.45	• • 23.69	89°7.27	• • 27.30	Kaus Aust. Vega	83 34.01 80°34.21	-34°22.39 38°48.23
22	80°54.68	186°0.23	8.45	164°56.90	58.87	47°0.82	23.73	104°9.50	27.20	Nunki	75°49.15	-26°16.05
23	95°57.15	200°59.44	8.87	179°57.32	58.82	62°3.19	23.78	119°11.73	27.11	Altair	62°1.10	8°55.83
Mer.	pass. 16:37	ν -0.8' d0.	.4′ m-3.98	ν 0.4′ d-0	.0′ m1.36	ν 2.4′ d0	.0′ m-2.51	ν 2.2′ d-0	.1' m0.97	Peacock	53°7.60	-56°39.59
										Deneb	49°26.82	45°21.96
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.88	9°59.06
0	110°59.61	215°58.65	S21°9.28	194°57.73	\$23°58.76	77°5.56	N12°23.82	134°13.95	\$11°27.02	Al Na'ir Fomalhaut	27°34.29 15°15.64	-46°50.91 -29°29.91
1	126°2.08	230°57.86	9.70	209°58.15	58.71	92°7.93	23.87	$149^{\circ}16.18$	26.92	Scheat	13°46.21	28°12.84
2	141°4.54	245°57.07	10.11	224°58.56	58.65	107°10.30	23.92	164°18.41	26.83	Markab	13°30.91	15°20.06
3	156°7.00	260°56.28	10.53	239°58.97	58.60	122°12.67	• • 23.96	179°20.64	• • 26.74	Jan 10 Wed	SHA	Mer.pass
4 5	171°9.47 186°11.93	275°55.49 290°54.70	10.94 11.35	254°59.39 269°59.80	58.54 58.48	137°15.04 152°17.40	24.01 24.05	194°22.87 209°25.09	26.64 26.55		3HA 107°34.78	09:34
6	201° 14.40		\$21°11.76		58.48 \$23°58.43	152 17.40 167°19.77	N12° 24.10	209 25.09 224°27.32	20.55 \$11°26.46	Mars	85°36.46	11:01
7	216° 16.86	320°53.12	12.17	300° 0.63	58.37	182°22.14	24.15	239°29.55	26.36	Jupiter	326° 10.09	18:56
8	231°19.33	$335^{\circ}52.32$	12.58	315°1.04	58.31	197°24.51	24.19	254°31.77	26.27	Saturn	23°25.59	15:08
9	246°21.79	350°51.53	• • 12.98	330°1.46	• • 58.25	212°26.87	• • 24.24	269°34.00	• • 26.18	Jan 11 Thu	SHA	Mer.pass
10	261°24.25	5°50.74	13.39	345°1.87	58.19	227°29.24	24.29	284°36.23	26.08		106° 17.03	09:35
11 12	276°26.72 291°29.18	20°49.94 35°49.15	13.79 \$21°14.20	0°2.29 15°2.70	58.14 \$23°58.08	242°31.61 257°33.97	24.33 N12°24.38	299°38.46 314°40.68	25.99 \$11°25.89	Mars	84°47.30	11:01
13	306°31.65	50°48.36	14.60	30°3.11	58.02	272°36.34	24.43	329°42.91	25.80	Jupiter	326°8.12	18:52
14	321°34.11	65° 47.56	15.00	45° 3.53	57.95	287°38.70	24.47	344°45.14	25.71	Saturn	23°19.99	15:04
15	336°36.58	80°46.77	• • 15.40	60°3.94	• • 57.89	$302^{\circ}41.07$	• • 24.52	359°47.36	• • 25.61	Jan 12 Fri	SHA	Mer.pass
16	351°39.04	95°45.97	15.80	75°4.35	57.83	317°43.43	24.57	14°49.59	25.52	Venus	$104^{\circ}59.04$	09:37
17	6°41.50	110°45.18	16.20	90°4.77	57.77	332°45.80	24.62	29°51.81	25.43	Mars	83°58.12	11:00
18 19	21°43.97 36°46.43	125°44.38 140°43.58	\$21°16.60 17.00	105°5.18 120°5.59	\$23°57.71 57.64	347°48.16 2°50.52	N12°24.66 24.71	44°54.04 59°56.27	\$11°25.33 25.24	Jupiter	326°5.95	18:49
20	36° 46.43 51° 48.90	140° 43.58 155° 42.79	17.00 17.39	120° 5.59 135° 6.01	57.64 57.58	17°52.89	24.71 24.76	74°58.49	25.24 25.14	Saturn	23°14.34	15:01
21	66°51.36	170°41.99	17.79	150°6.42	• • 57.52	32°55.25	24.81	90°0.72	• • 25.05	Horizoi	ntal parallax	
22	81°53.82	185°41.19	18.18	165° 6.83	57.45	47°57.61	24.86	105°2.94	24.96		Venus:	0.1
23	96°56.29	200°40.39	18.57	180°7.25	57.39	62°59.97	24.90	$120^{\circ}5.17$	24.86		Mars:	0.1
Mer.	pass. 16:33	ν -0.8' d0.	.4′ m-3.97	ν 0.4' d-0	.1′ m1.36	ν 2.4′ d0	.0′ m-2.50	ν 2.2' d-0	.1′ m0.97			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°13.43	S22°3.72	200°3.74	3.4'	\$28°5.65	1.3'	59.0'
1	193°13.18	3.36	214°26.11	3.3'	28°6.94	1.1'	59.0'
2	208°12.92 223°12.66	3.00 · · 2.64	228°48.41 243°10.66	3.2' 3.2'	28°8.03 28°8.93	0.9' 0.7'	59.1' 59.1'
3 4	223 12.00 238°12.40	2.28	243 10.00 257°32.85	3.1'	28 8.93 28°9.63	0.7	59.1'
5	253°12.15	1.91	271°54.99	3.1'	28° 10.14	0.3'	59.2'
6	268°11.89	\$22°1.55	286°17.09	3.0'	S28°10.45	0.1'	59.2'
7	283°11.63	1.18	300°39.13	3.0'	28° 10.56	-0.1'	59.2'
8	298°11.38	0.82	315°1.14	3.0'	28° 10.48	-0.3	59.3'
9 10	313°11.12 328°10.86	· · 0.45 22°0.08	329°23.10 343°45.03	2.9' 2.9'	28° 10.19 28° 9.70	-0.5' -0.7'	59.3' 59.3'
11	343°10.61	21°59.72	358° 6.92	2.9'	28° 9.02	-0.7	59.3
12	358°10.35	S21°59.35	12°28.78	2.8'	\$28°8.13	-1.1'	59.4'
13	13°10.10	58.98	26°50.61	2.8'	28°7.05	-1.3'	59.4'
14	28° 9.84 43° 9.59	58.61	41°12.41 55°34.19	2.8'	28°5.76 28°4.27	-1.5'	59.4'
15 16	43° 9.59 58° 9.33	· · 58.24 57.87	55° 34.19 69° 55.96	2.8' 2.7'	28° 4.27 28° 2.58	-1.7' -1.9'	59.5' 59.5'
17	73° 9.08	57.49	84°17.71	2.7'	28°0.68	-2.1'	59.5'
18	88°8.82	S21°57.12	98°39.44	2.7'	S27°58.59	-2.3'	59.5'
19	103°8.57	56.75	113°1.16	2.7'	27°56.29	-2.5'	59.6'
20	118°8.32	56.37	127°22.88	2.7'	27°53.79	-2.7'	59.6'
21 22	133° 8.06 148° 7.81	· · 56.00 55.62	141°44.59 156°6.30	2.7' 2.7'	27°51.08 27°48.17	-2.9' -3.1'	59.6' 59.6'
23	163°7.56	55.02	170°28.01	2.7'	27°45.17	-3.1 -3.3'	59.0 59.7'
	SD = 16.3'	d = -0.4'			D = 16.1'		
	<u> </u>	u — -0.4			U — 10.1		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178° 7.30 193° 7.05	\$21°54.87 54.49	184°49.73 199°11.45	2.7' 2.7'	\$27°41.75 27°38.24	-3.5' -3.7'	59.7' 59.7'
2	208° 6.80	54.11	213°33.18	2.7'	27°34.52	-3.9'	59.7'
3	223°6.55	• • 53.73	227°54.93	2.8'	$27^{\circ}30.61$	-4.1'	59.8'
4	238° 6.29	53.35	242°16.70	2.8'	27°26.49	-4.3'	59.8'
5	253° 6.04 268° 5.79	52.97 \$21°52.59	256°38.48 271°0.29	2.8'	27°22.17 \$27°17.65	-4.5' -4.7'	59.8' 59.8'
6 7	283° 5.54	52.1 52.59	271 0.29 285°22.12	2.8	27°12.93	-4.7 -4.9'	59.8 59.9'
8	298° 5.29	51.82	299°43.98	2.9'	27°8.01	-5.1'	59.9'
9	313°5.04	• • 51.44	$314^{\circ}5.87$	2.9'	27°2.89	-5.3'	59.9'
10	328° 4.79	51.05	328°27.79	3.0'	26°57.58	-5.5'	59.9'
11	343° 4.54 358° 4.29	50.67 \$21°50.28	342°49.75 357°11.74	3.0' 3.0'	26°52.06 \$26°46.35	-5.7'	59.9'
12 13	13° 4.29	49.89	11°33.78	3.1'	26°40.45	-5.9' -6.1'	60.0' 60.0'
14	28° 3.79	49.50	25°55.87	3.1'	26°34.35	-6.3	60.0'
15	43°3.54	• • 49.12	40°18.00	3.2'	$26^{\circ}28.05$	-6.5'	60.0'
16	58° 3.29	48.73	54°40.17	3.2'	26°21.57	-6.7'	60.0'
17 18	73°3.05 88°2.80	48.34 \$21°47.95	69°2.40 83°24.69	3.3' 3.3'	26°14.89 \$26°8.02	-6.9' -7.1'	60.1' 60.1'
19	103° 2.55	47.55	97°47.03	3.4'	26°0.95	-7.1 -7.2'	60.1
20	118°2.30	47.16	112°9.43	3.5'	25°53.70	-7.4	60.1
21	133°2.05	• • 46.77	$126^{\circ}31.89$	3.5'	$25^{\circ}46.27$	-7.6'	60.1'
22	148° 1.81	46.38	140°54.41	3.6'	25°38.64	-7.8'	60.2'
23	163°1.56	45.98	155°16.99	3.7'	25°30.83	-8.0'	60.2'
	SD = 16.3'	d = -0.4'		S	D = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 1.31	S21°45.59	169°39.65	3.7'	\$25°22.84	-8.2'	60.2'
1 2	193° 1.07 208° 0.82	45.19 44.79	184°2.37 198°25.17	3.8' 3.9'	25°14.66 25°6.31	-8.4' -8.5'	60.2' 60.2'
3	208° 0.82 223° 0.58	44.79 •• 44.40	198°25.17 212°48.03	3.9'	25° 6.31 24° 57.77	-8.5° -8.7'	60.2'
4	238° 0.33	44.00	227°10.97	4.0'	24°49.05	-8.9'	60.2
5	253°0.08	43.60	241°33.99	4.1'	24°40.16	-9.1'	60.3'
6	267°59.84	\$21°43.20	255°57.09	4.2'	\$24°31.09	-9.2'	60.3'
7 8	282°59.59 297°59.35	42.80 42.40	270°20.27 284°43.53	4.3' 4.3'	24°21.85 24°12.43	-9.4' -9.6'	60.3' 60.3'
9	312°59.11	• • 42.00	299°6.87	4.3 4.4'	24 12.43 24°2.85	-9.0 -9.8'	60.3
10	327°58.86	41.59	$313^{\circ}30.29$	4.5'	23°53.09	-9.9'	60.3'
11	342°58.62	41.19	327°53.80	4.6'	23°43.17	-10.1'	60.3'
12	357°58.37	S21°40.79	342°17.40	4.7'	\$23°33.08	-10.3'	60.3'
13 14	12°58.13 27°57.89	40.38 39.98	356°41.09 11°4.87	4.8' 4.9'	23°22.83 23°12.41	-10.4' -10.6'	60.3' 60.4'
15	42°57.65	39.57	25°28.74	5.0'	23°1.84	-10.0	60.4
16	57°57.40	39.16	39°52.70	5.1'	22°51.10	-10.9'	60.4'
17	72°57.16	38.75	54°16.75	5.1'	22°40.21	-11.0'	60.4'
18	87°56.92	\$21°38.35	68°40.89 83°5.14	5.2'	\$22°29.16 22°17.96	-11.2'	60.4'
19 20	102°56.68 117°56.44	37.94 37.53	83°5.14 97°29.47	5.3' 5.4'	22°17.96 22°6.61	-11.4' -11.5'	60.4' 60.4'
21	132°56.20	• • 37.12	111°53.91	5.5'	22°55.11	-11.6'	60.4
22	147°55.95	36.71	126°18.44	5.6'	21°43.46	-11.8'	60.4'
23	162°55.71	36.29	140°43.07	5.7'	21°31.67	-11.9'	60.4'
	SD = 16.3'	d = -0.4'	_	S	D = 16.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
	Naut.	Civil	Jamise	Junioce	Civil	Naut.
N 72°	08:10	10:09			14:07	16:06
N 70°	07:54	09:30			14:46	16:22
68°	07:41	09:03	10:55	13:21	15:13	16:35
66°	07:30	08:42	10:06	14:10	15:34	16:46
64°	07:20	08:25	09:35	14:41	15:50	16:56
62°	07:12	08:12	09:12	15:04	16:04	17:04
60°	07:05	08:00	08:54	15:22	16:16	17:11
N 58°	06:58	07:49	08:39	15:37	16:26	17:18
56°	06:53	07:40	08:26	15:50	16:35	17:23
54°	06:47	07:32	08:15	16:01	16:44	17:29
52°	06:42	07:25	08:05	16:11	16:51	17:34
50°	06:37	07:18	07:56	16:20	16:58	17:38
45°	06:27	07:04	07:37	16:39	17:12	17:49
N 40°	06:18	06:51	07:21	16:54	17:24	17:58
35°	06:09	06:41	07:08	17:07	17:35	18:06
30°	06:01	06:31	06:57	17:19	17:45	18:14
20°	05:46	06:14	06:37	17:38	18:02	18:29
N 10°	05:32	05:58	06:20	17:55	18:18	18:44
0°	05:16	05:42	06:04	18:11	18:34	19:00
S 10°	04:58	05:25	05:48	18:28	18:50	19:17
20°	04:37	05:06	05:30	18:45	19:09	19:38
30°	04:10	04:43	05:10	19:05	19:32	20:05
35°	03:53	04:29	04:58	19:17	19:46	20:22
40°	03:31	04:12	04:44	19:31	20:03	20:43
45°	03:04	03:51	04:27	19:48	20:24	21:11
S 50°	02:24	03:24	04:07	20:08	20:50	21:50
52°	02:02	03:11	03:57	20:18	21:04	22:12
54°	01:31	02:55	03:46	20:29	21:19	22:42
56°	00:25	02:36	03:33	20:41	21:38	23:39
58°	////	02:12	03:18	20:56	22:01	////
S 60°	////	01:39	03:01	21:13	22:34	////
	Na					

Lat.		Moonris	e		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°			12:29			14:14
64°			11:29			15:14
62°		11:03	10:54		13:28	15:47
60°	09:40	10:16	10:29	12:37	14:14	16:12
N 58°	09:01	09:46	10:08	13:16	14:44	16:31
56°	08:34	09:23	09:52	13:43	15:07	16:47
54°	08:12	09:04	09:37	14:04	15:26	17:01
52°	07:54	08:48	09:25	14:22	15:41	17:13
50°	07:39	08:34	09:14	14:37	15:55	17:24
45°	07:08	08:06	08:50	15:08	16:23	17:46
N 40°	06:45	07:43	08:32	15:32	16:44	18:03
35°	06:25	07:25	08:16	15:51	17:02	18:18
30°	06:08	07:09	08:02	16:08	17:18	18:31
20°	05:40	06:42	07:39	16:36	17:44	18:52
N 10°	05:15	06:18	07:18	17:01	18:06	19:11
0°	04:53	05:57	06:59	17:23	18:27	19:28
S 10°	04:30	05:35	06:40	17:46	18:47	19:45
20°	04:06	05:11	06:20	18:10	19:09	20:03
30°	03:38	04:44	05:56	18:37	19:35	20:24
35°	03:21	04:28	05:42	18:54	19:50	20:36
40°	03:02	04:09	05:25	19:13	20:07	20:50
45°	02:38	03:46	05:06	19:36	20:27	21:06
S 50°	02:08	03:17	04:41	20:06	20:53	21:26
52°	01:53	03:03	04:29	20:20	21:05	21:36
54°	01:36	02:46	04:16	20:37	21:19	21:46
56°	01:15	02:26	04:00	20:57	21:36	21:58
58°	00:49	02:01	03:41	21:22	21:55	22:12
S 60°	00:13	01:28	03:18	21:56	22:19	22:27
				1		

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	29-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-1%	
10	07:06	07:19	12:07	11:08	23:40		
11	07:31	07:43	12:08	12:12	-:-		
12	07:55	08:07	12:08	13:14	00:43		

January 13, 14, 15 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	111°58.75	215°39.59 \$21°18.96	195°7.66	78°2.34 N12°24.95	135°7.40 \$11°24.77	
1	127°1.22	230°38.80 19.35	210°8.07 57.26	93°4.70 25.00	150°9.62 24.67	Alpheratz 357°35.75 29°13.47 Ankaa 353°8.05 -42°10.80
2	142°3.68	245°38.00 19.74	225°8.49 57.19	108°7.06 25.05	165°11.85 24.58	Schedar 349°32.10 56°40.37
3	157°6.15	260°37.20 · · 20.13	240°8.90 · · 57.12	123°9.42 · · 25.10	180°14.07 · · 24.48	Diphda 348°48.17 -17°51.46
4 5	172°8.61 187°11.07	275°36.40 20.52 290°35.60 20.91	255°9.31 57.06 270°9.73 56.99	138°11.78 25.15 153°14.14 25.20	195°16.30 24.39 210°18.52 24.30	Achernar 335°20.74 -57°7.21
6	202° 13.54	305°34.80 S21°21.29	285°10.14 S23°56.92	168°16.50 N12°25.25	225°20.75 \$11°24.20	Hamal 327°52.05 23°34.63
7	217° 16.00	320°34.00 21.67	300°10.55 56.85	183°18.86 25.29	240°22.97 24.11	Polaris 314°13.06 89°22.22 Acamar 315°12.20 -40°12.73
8	232° 18.47	335°33.20 22.06	315°10.96 56.79	198°21.22 25.34	255°25.20 24.01	Menkar 314°6.86 4°11.00
9	247° 20.93	350°32.39 · · 22.44	330°11.38 · · 56.72	213°23.58 · · 25.39	270°27.42 · · 23.92	Mirfak 308°29.16 49°56.96
10 11	262°23.39 277°25.86	5°31.59 22.82 20°30.79 23.20	345°11.79 56.65 0°12.20 56.58	228°25.94 25.44 243°28.29 25.49	285°29.65 23.82 300°31.87 23.73	Aldebaran 290°40.29 16°33.47
12	292° 28.32	35°29.99 S21°23.58	15°12.62 S23°56.51	258°30.65 N12°25.54	315°34.10 \$11°23.63	Rigel 281°4.36 -8°10.49
13	307° 30.79	50°29.18 23.96	30°13.03 56.43	273°33.01 25.59	330°36.32 23.54	Capella 280°22.67 46°1.41 Bellatrix 278°23.45 6°22.27
14	322° 33.25	65°28.38 24.33	45°13.44 56.36	288°35.37 25.64	345°38.55 23.45	Elnath 278°2.56 28°37.69
15	337°35.72	80°27.58 · · 24.71	60°13.85 · · 56.29	303°37.72 · · 25.69	0°40.77 · · 23.35	Alnilam 275°38.25 -1°11.23
16 17	352°38.18 7°40.64	95°26.77 25.09 110°25.97 25.46	75°14.27 56.22 90°14.68 56.15	318°40.08 25.74 333°42.44 25.79	15° 42.99 23.26 30° 45.22 23.16	Betelgeuse 270°52.65 7°24.67
18	22°43.11	125°25.17	105°15.09 \$23°56.07	348°44.79 N12°25.84	45°47.44 \$11°23.07	Canopus 263°52.22 -52°42.54
19	37° 45.57	140°24.36 26.20	120°15.50 56.00	3°47.15 25.89	60°49.67 22.97	Sirius 258°26.61 -16°44.98 Adhara 255°6.12 -29°0.30
20	52°48.04	155°23.56 26.57	135°15.92 55.93	18°49.50 25.94	75°51.89 22.88	Adhara 255°6.12 -29°0.30 Procyon 244°51.34 5°9.77
21	67°50.50	170°22.75 · · 26.94	150°16.33 · · 55.85	33°51.86 · · 25.99	90°54.11 · · 22.78	Pollux 243°17.92 27°58.04
22 23	82°52.96 97°55.43	185°21.94 27.31 200°21.14 27.68	165°16.74 55.78 180°17.15 55.70	48°54.21 26.04 63°56.56 26.10	105° 56.34 22.69 120° 58.56 22.59	Avior 234°14.43 -59°35.07
			-	the state of the s		Suhail 222°46.50 -43°31.65
Mer.p	bass. 16:29	ν-0.8' d0.4' m-3.97	ν0.4' d-0.1' m1.36	ν2.4' d0.0' m-2.49	ν2.2' d-0.1' m0.97	Miaplacidus 221°37.60 -69°48.75
						Alphard 217°48.26 -8°45.75 Regulus 207°35.04 11°50.92
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.57 61°37.04
0	112°57.89	215°20.33 S21°28.05	195°17.57 \$23°55.62	78°58.92 N12°26.15	136°0.79 \$11°22.50	Denebola 182°25.63 14°26.16
1 2	128°0.36 143°2.82	230° 19.52 28.41 245° 18.72 28.78	210°17.98 55.55 225°18.39 55.47	94°1.27 26.20 109°3.62 26.25	151°3.01 22.40 166°5.23 22.31	Gienah 175°44.32 -17°40.45
3	143 2.62 158°5.28	260°17.91 · · 29.14	240°18.80 · · 55.39	124°5.98 · · 26.30	181°7.46 · · 22.21	Acrux 173°0.85 -63°13.64
4	173°7.75	275°17.10 29.50	255°19.22 55.32	139°8.33 26.35	196°9.68 22.12	Gacrux 171°52.43 -57°14.59 Alioth 166°13.58 55°49.47
5	$188^{\circ}10.21$	290°16.29 29.86	270°19.63 55.24	154°10.68 26.40	211°11.90 22.02	Spica 158°23.16 -11°17.17
6	203°12.68	305°15.48 \$21°30.22	285°20.04 \$23°55.16	169°13.03 N12°26.45	226°14.13	Alkaid 152°52.68 49°11.31
7 8	218° 15.14 233° 17.61	320°14.67 30.58 335°13.87 30.94	300°20.45 55.08 315°20.86 55.00	184°15.38 26.51 199°17.74 26.56	241°16.35 21.83 256°18.57 21.74	Hadar 148°37.30 -60°29.04
9	248° 20.07	350°13.06 · · 31.30	330°21.28 · · 54.92	214°20.09 · · 26.61	271°20.79 · · 21.64	Menkent 147°58.66 -36°29.11
10	263°22.53	5°12.25 31.65	345°21.69 54.84	229°22.44 26.66	286°23.02 21.55	Arcturus 145°48.73 19°3.28 Rigil Kent. 139°41.64 -60°55.79
11	278°25.00	20°11.44 32.01	0°22.10 54.76	244°24.79 26.71	301°25.24 21.45	Kochab 137°20.19 74°3.04
12	293°27.46	35°10.63	15°22.51	259°27.14 N12°26.77	316°27.46 \$11°21.35	Zuben'ubi 136°57.05 -16°8.45
13	308° 29.93 323° 32.39	50°9.81 32.71 65°9.00 33.07	30°22.92 54.60 45°23.34 54.51	274°29.49 26.82 289°31.83 26.87	331°29.68 21.26 346°31.91 21.16	Alphecca 126°4.63 26°37.83
14 15	338° 34.85	80°8.19 · · 33.42	45°23.34 54.51 60°23.75 •• 54.43	304°34.18 · · 26.92	346°31.91 21.16 1°34.13 · · 21.07	Antares 112°17.11 -26°29.05
16	353°37.32	95°7.38 33.77	75°24.16 54.35	319°36.53 26.98	16°36.35 20.97	Atria 107°12.54 -69°4.03 Sabik 102°4.01 -15°45.28
17	8°39.78	110°6.57 34.12	90°24.57 54.26	334°38.88 27.03	31°38.57 20.88	Shaula 96°11.85 -37°7.22
18	23° 42.25	125°5.75	105°24.98 \$23°54.18	349°41.23 N12°27.08	46°40.79 \$11°20.78	Rasalhague 95°59.61 12°32.44
19 20	38° 44.71 53° 47.17	140°4.94 34.81 155°4.13 35.15	120°25.40 54.10 135°25.81 54.01	4°43.57 27.14 19°45.92 27.19	61°43.02 20.69 76°45.24 20.59	Eltanin 90°43.06 51°28.94
21	68° 49.64	170°3.31 · · 35.50	150°26.22 · · 53.93	34°48.27 · · 27.24	91°47.46 · · 20.50	Kaus Aust. 83°33.98 -34°22.39
22	83°52.10	185°2.50 35.84	165°26.63 53.84	49°50.61 27.30	106°49.68 20.40	Vega 80°34.20 38°48.21 Nunki 75°49.14 -26°16.05
23	98°54.57	200°1.69 36.18	180°27.04 53.75	64°52.96 27.35	121°51.90 20.30	Altair 62°1.09 8°55.82
Mer.p	pass. 16:25	ν-0.8' d0.4' m-3.97	ν0.4' d-0.1' m1.35	ν2.4' d0.1' m-2.49	ν2.2' d-0.1' m0.97	Peacock 53°7.58 -56°39.58
						Deneb 49°26.82 45°21.95
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.88 9°59.05
0	113°57.03	215°0.87 S21°36.53	195°27.45 \$23°53.67	79°55.31 N12°27.40	136°54.13 \$11°20.21	Al Na'ir 27°34.29 -46°50.91 Fomalhaut 15°15.64 -29°29.91
1	$128^{\circ}59.50$	230°0.06 36.87	210°27.87 53.58	94°57.65 27.46	151°56.35 20.11	Scheat 13°46.22 28°12.84
2	144°1.96	244°59.24 37.20	225°28.28 53.49	110°0.00 27.51	166°58.57 20.02	Markab 13°30.91 15°20.06
3 4	159°4.42 174°6.89	259°58.43 · · 37.54 274°57.61 37.88	240°28.69 · · 53.40 255°29.10 53.32	125°2.34 · · 27.57 140°4.69 27.62	182°0.79 · · 19.92 197°3.01 19.82	Jan 13 Sat SHA Mer.pass
5	174 0.89 189° 9.35	289°56.79 38.22	270°29.51 53.23	155°7.03 27.67	212° 5.23 19.73	Venus 103°40.84 09:38
6	204° 11.82	304°55.98 S 21°38.55	285°29.92 S 23°53.14	170°9.37 N12°27.73	227°7.45 \$11°19.63	Mars 83°8.91 10:59
7	219° 14.28	319°55.16 38.88	300°30.33 53.05	185°11.72 27.78	242°9.67 19.54	Jupiter 326°3.58 18:45
8	234° 16.74	334°54.34 39.22	315°30.75 52.96	200°14.06 27.84	257°11.89 19.44	Saturn 23°8.64 14:57
9 10	249° 19.21 264° 21.67	349°53.53 · · 39.55 4°52.71 39.88	330°31.16 · · 52.87 345°31.57 52.77	215°16.40 · · 27.89 230°18.74 27.95	272°14.11 · · 19.34 287°16.34 19.25	Jan 14 Sun SHA Mer.pass
11	279° 24.14	19°51.89 40.21	0°31.98 52.68	245°21.09 28.00	302°18.56 19.15	Venus 102°22.44 09:39
12	294° 26.60	34°51.07 S 21°40.54	15°32.39	260°23.43 N12°28.06	317°20.78 \$11°19.06	Mars 82°19.67 10:59
13	309°29.06	49°50.25 40.86	30°32.80 52.50	275°25.77 28.11	332°23.00 18.96	Jupiter 326°1.03 18:41 Saturn 23°2.89 14:54
14	324°31.53	64°49.44 41.19	45°33.21 52.41	290°28.11 28.17	347°25.22 18.86	
15 16	339°33.99 354°36.46	79°48.62 · · 41.51 94°47.80 41.84	60°33.63 · · 52.31 75°34.04 52.22	305°30.45 · · 28.22 320°32.79 28.28	2°27.44 · · 18.77 17°29.66 18.67	Jan 15 Mon SHA Mer.pass
17	9° 38.92	109°46.98 42.16	90°34.45 52.12	335°35.13 28.33	32°31.88 18.57	Venus 101°3.84 09:40 Mars 81°30.42 10:58
18	24°41.38	124°46.16 S 21°42.48	105°34.86	350°37.47 N12°28.39	47°34.10 \$11°18.48	Jupiter 325°58.27 18:37
19	39°43.85	139°45.34 42.80	120°35.27 51.93	5°39.81 28.44	62°36.32 18.38	Saturn 22°57.09 14:50
20	54°46.31	154°44.52 43.12 169°43.69 · · 43.44	135°35.68 51.84 150°36.09 · · 51.74	20°42.15 28.50 35°44.49 •• 28.56	77°38.54 18.29 92°40.76 •• 18.19	Horizontal parallax
21 22	69° 48.78 84° 51.24	184°42.87 43.76	165°36.50 51.64	50°46.83 28.61	107°42.98 18.09	Venus: 0.1
23	99°53.70	199° 42.05 44.08	180°36.91 51.55	65°49.16 28.67	122°45.20 18.00	Mars: 0.1
	pass. 16:22	ν-0.8' d0.3' m-3.96	ν0.4' d-0.1' m1.35	ν2.3' d0.1' m-2.48	ν2.2' d-0.1' m0.98	
14101.	10.22	- 0.5 do.5 iii-5.90	ν σ. τ σ σ. τ ππ.σσ			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°55.47	S21°35.88	$155^{\circ}7.79$	5.8'	S21°19.73	-12.1'	60.4'
1	192°55.23	35.47	169°32.62	5.9'	21°7.65	-12.2'	60.4
2 3	207°54.99 222°54.76	35.05 •• 34.64	183°57.54 198°22.57	6.0' 6.1'	20°55.43 20°43.08	-12.4' -12.5'	60.4' 60.4'
4	237°54.52	34.22	212° 47.70	6.2'	20°30.58	-12.6'	60.4
5	252°54.28	33.81	$227^{\circ}12.92$	6.3'	$20^{\circ}17.96$	-12.8'	60.4'
6	267°54.04 282°53.80	S21°33.39	241°38.25	6.4'	\$20°5.20 19°52.31	-12.9'	60.4
7 8	282°53.80 297°53.56	32.97 32.55	256°3.67 270°29.20	6.5' 6.6'	19°52.31 19°39.30	-13.0' -13.1'	60.4' 60.4'
9	312°53.32	· · 32.13	284°54.83	6.7'	19°26.16	-13.3'	60.4
10	327°53.09	31.71	299° 20.56	6.8'	19° 12.89	-13.4'	60.4'
11	342°52.85 357°52.61	31.29 \$21°30.87	313°46.39 328°12.33	6.9' 7.0'	18°59.51 \$18°46.00	-13.5' -13.6'	60.4'
12 13	12°52.38	30.45	342°38.36	7.0 7.1'	18°32.38	-13.0 -13.7'	60.4' 60.4'
14	27°52.14	30.03	357°4.50	7.2'	18° 18.65	-13.8'	60.4
15	42°51.90	• • 29.60	11°30.73	7.3'	18°4.80	-14.0'	60.4'
16 17	57°51.67 72°51.43	29.18 28.75	25°57.07 40°23.50	7.4' 7.5'	17°50.83 17°36.76	-14.1' -14.2'	60.4' 60.4'
18	87°51.20	521°28.33	54° 50.04	7.6'	\$17°22.59	-14.2	60.4
19	102°50.96	27.90	$69^{\circ}16.67$	7.7'	$17^{\circ}8.31$	-14.4'	60.4'
20	117°50.73	27.47	83°43.40	7.8'	16°53.92	-14.5'	60.4
21 22	132°50.49 147°50.26	· · 27.05 26.62	98°10.24 112°37.17	7.9' 8.0'	16°39.44 16°24.86	-14.6' -14.7'	60.4' 60.4'
23	162°50.02	26.19	127°4.19	8.1'	16° 10.18	-14.7	60.4
	SD = 16.3'	d = -0.4'		SI	0 = 16.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177°49.79 192°49.56	\$21°25.76 25.33	141°31.32 155°58.54	8.2' 8.3'	\$15°55.40 15°40.54	-14.9' -15.0'	60.4' 60.4'
2	207°49.32	24.90	170°25.85	8.4'	15° 25.58	-15.0'	60.4
3	222°49.09	• • 24.46	184°53.26	8.5'	$15^{\circ}10.54$	-15.1'	60.4'
4	237°48.86	24.03	199°20.77	8.6'	14°55.41	-15.2'	60.4'
5 6	252°48.63 267°48.40	23.60 \$21°23.16	213°48.36 228°16.05	8.7' 8.8'	14°40.20 \$14°24.90	-15.3' -15.4'	60.4' 60.4'
7	282°48.16	22.73	242°43.83	8.9'	14°9.53	-15.5'	60.4
8	297°47.93	22.29	$257^{\circ}11.71$	9.0'	$13^{\circ}54.08$	-15.5'	60.4'
9	312°47.70	• • 21.85	271°39.67	9.1'	13°38.55 13°22.95	-15.6'	60.3'
10 11	327°47.47 342°47.24	21.42 20.98	286°7.72 300°35.86	9.1' 9.2'	13° 22.95 13° 7.28	-15.7' -15.7'	60.3' 60.3'
12	357°47.01	S21°20.54	315°4.09	9.3'	S12°51.53	-15.8'	60.3
13	12°46.78	20.10	329°32.40	9.4'	12°35.73	-15.9'	60.3'
14 15	27°46.55 42°46.32	19.66 •• 19.22	344°0.80 358°29.28	9.5' 9.6'	12°19.85 12°3.91	-15.9' -16.0'	60.3' 60.3'
16	57°46.09	18.78	12° 57.85	9.6'	12 3.91 11°47.91	-16.0 -16.1'	60.3
17	72°45.86	18.34	27°26.49	9.7'	11°31.85	-16.1'	60.3'
18	87°45.64	S21°17.89	41°55.22	9.8'	\$11°15.73 10°59.56	-16.2'	60.2'
19 20	102°45.41 117°45.18	17.45 17.01	56°24.03 70°52.92	9.9' 10.0'	10° 59.56 10° 43.34	-16.2'	60.2' 60.2'
21	132°44.95	. 16.56	85°21.88	10.0'	10° 27.06	-16.3'	60.2
22	147°44.72	16.11	$99^{\circ}50.92$	10.1'	$10^{\circ}10.73$	-16.4'	60.2'
23	162°44.50	15.67	114°20.04	10.2'	09°54.35	-16.4'	60.2'
	SD = 16.3'	d = -0.4'		SI	O = 16.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°44.27	S21°15.22	128°49.23	10.3'	S 09°37.93	-16.5'	60.2'
1	192°44.04	14.77	143°18.49	10.3'	09°21.47	-16.5'	60.1
2 3	207°43.82 222°43.59	14.32 •• 13.88	157° 47.82 172° 17.23	10.4' 10.5'	09°4.96 08°48.41	-16.5' -16.6'	60.1' 60.1'
4	237°43.37	13.42	172 17.23 186°46.70	10.5'	08°31.82	-16.6'	60.1
5	252°43.14	12.97	201°16.24	10.6'	08° 15.20	-16.7'	60.1'
6 7	267°42.92 282°42.69	\$21°12.52 12.07	215° 45.85 230° 15.52	10.7' 10.7'	\$07°58.54 07°41.85	-16.7' -16.7'	60.1'
7 8	282°42.69 297°42.47	12.07	230° 15.52 244° 45.26	10.7	07°41.85 07°25.13	-16.7° -16.8'	60.1' 60.0'
9	312°42.24	•• 11.16	$259^{\circ}15.06$	10.9'	07°8.37	-16.8'	60.0'
10	327°42.02	10.71	273°44.92	10.9'	06°51.59	-16.8'	60.0'
11 12	342°41.80 357°41.57	10.25 \$21°9.80	288° 14.84 302° 44.81	11.0' 11.0'	06° 34.79 \$06° 17.96	-16.8' -16.9'	60.0' 60.0'
13	12°41.35	9.34	317° 14.85	11.1'	06°1.11	-16.9'	59.9'
14	27°41.13	8.89	331°44.94	11.1'	$05^{\circ}44.24$	-16.9'	59.9'
15	42°40.91	• 8.43	346° 15.09	11.2'	05°27.34	-16.9'	59.9'
16 17	57°40.68 72°40.46	7.97 7.51	0°45.29 15°15.54	11.3' 11.3'	05° 10.44 04° 53.51	-16.9' -16.9'	59.9' 59.9'
18	87°40.24	521°7.05	29° 45.84	11.4'	504° 36.58	-16.9'	59.8'
19	102°40.02	6.59	44°16.19	11.4'	$04^{\circ}19.63$	-17.0'	59.8'
20	117°39.80	6.13	58° 46.59	11.4'	04°2.67	-17.0'	59.8'
21 22	132°39.58 147°39.36	· · 5.67 5.20	73°17.03 87°47.52	11.5' 11.5'	03°45.70 03°28.73	-17.0' -17.0'	59.8' 59.8'
23	162°39.14	4.74	102° 18.05	11.6'	03°28.73	-17.0'	59.7'
	SD = 16.3'	d = -0.4'			0 = 16.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:04	09:58			14:21	16:15
N 70°	07:49	09:22			14:56	16:30
68°	07:36	08:57	10:40	13:38	15:22	16:42
66°	07:26	08:37	09:57	14:21	15:41	16:52
64°	07:17	08:21	09:29	14:49	15:57	17:01
62°	07:09	80:80	09:07	15:11	16:10	17:09
60°	07:02	07:57	08:50	15:28	16:22	17:16
N 58°	06:56	07:47	08:35	15:43	16:31	17:22
56°	06:51	07:38	08:23	15:55	16:40	17:28
54°	06:45	07:30	08:12	16:06	16:48	17:33
52°	06:41	07:23	08:02	16:16	16:55	17:38
50°	06:36	07:17	07:54	16:24	17:01	17:42
45°	06:26	07:03	07:36	16:43	17:15	17:52
N 40°	06:17	06:51	07:21	16:57	17:27	18:01
35°	06:09	06:40	07:08	17:10	17:38	18:09
30°	06:02	06:31	06:57	17:21	17:47	18:16
20°	05:47	06:14	06:38	17:40	18:04	18:31
N 10°	05:32	05:58	06:21	17:57	18:19	18:45
0°	05:17	05:43	06:05	18:13	18:35	19:01
S 10°	05:00	05:27	05:49	18:28	18:51	19:18
20°	04:39	05:08	05:32	18:45	19:10	19:38
30°	04:13	04:45	05:12	19:05	19:32	20:04
35°	03:56	04:32	05:01	19:17	19:46	20:21
40°	03:35	04:15	04:47	19:30	20:02	20:42
45°	03:09	03:55	04:31	19:46	20:22	21:08
S 50°	02:30	03:29	04:11	20:06	20:48	21:46
52°	02:09	03:16	04:02	20:15	21:01	22:07
54°	01:41	03:01	03:51	20:26	21:15	22:34
56°	00:53	02:43	03:39	20:38	21:33	23:18
58°	////	02:20	03:25	20:52	21:55	////
S 60°	////	01:50	03:08	21:09	22:25	////

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°		12:01	11:12		18:43	21:20
N 70°	12:45	11:38	11:03	16:03	19:03	21:26
68°	12:00	11:20	10:55	16:47	19:19	21:30
66°	11:29	11:06	10:49	17:16	19:32	21:34
64°	11:07	10:54	10:43	17:37	19:42	21:37
62°	10:48	10:43	10:39	17:54	19:51	21:40
60°	10:33	10:34	10:34	18:08	19:58	21:42
N 58°	10:20	10:26	10:31	18:20	20:05	21:44
56°	10:09	10:20	10:27	18:31	20:11	21:46
54°	09:59	10:13	10:24	18:40	20:16	21:48
52°	09:50	10:08	10:22	18:48	20:20	21:49
50°	09:42	10:02	10:19	18:55	20:25	21:51
45°	09:25	09:51	10:14	19:11	20:34	21:54
N 40°	09:10	09:42	10:09	19:23	20:41	21:56
35°	08:58	09:34	10:05	19:34	20:47	21:58
30°	08:48	09:27	10:02	19:43	20:53	22:00
20°	08:30	09:15	09:56	19:59	21:03	22:03
N 10°	08:14	09:04	09:50	20:13	21:11	22:06
0°	07:59	08:54	09:45	20:25	21:19	22:08
S 10°	07:44	08:44	09:40	20:38	21:26	22:11
20°	07:27	08:33	09:35	20:51	21:34	22:14
30°	07:09	08:20	09:28	21:06	21:43	22:17
35°	06:58	08:13	09:25	21:15	21:48	22:18
40°	06:45	08:04	09:21	21:25	21:54	22:20
45°	06:30	07:55	09:16	21:37	22:01	22:22
S 50°	06:12	07:43	09:10	21:50	22:09	22:25
52°	06:03	07:37	09:08	21:57	22:13	22:26
54°	05:54	07:31	09:05	22:04	22:17	22:27
56°	05:42	07:24	09:01	22:12	22:21	22:29
58°	05:30	07:16	08:58	22:21	22:26	22:30
S 60°	05:15	07:07	08:54	22:31	22:32	22:32

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-17%	
13	08:18	08:30	12:08	14:12	01:44		
14	08:41	08:52	12:09	15:06	02:40		
15	09:03	09:14	12:09	15:57	03:32		

January 16, 17, 18 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	114°56.17	214°41.23 S 21°44.39	195°37.33	80°51.50 N12°28.73	137°47.42 S 11°17.90	
1	129°58.63	229° 40.41 44.71	210°37.74 51.35	95°53.84 28.78	152°49.64 17.80	Alpheratz 357°35.76 29°13.46 Ankaa 353°8.06 -42°10.80
2	145°1.10	244°39.58 45.02	225°38.15 51.25	110°56.18 28.84	167°51.85 17.71	Schedar 349°32.13 56°40.37
3	160°3.56	259°38.76 · · 45.33	240°38.56 · · 51.15	125°58.51 · · 28.89	182°54.07 · · 17.61	Diphda 348°48.18 -17°51.47
4 5	175°6.03 190°8.49	274° 37.94 45.64 289° 37.11 45.95	255°38.97 51.06 270°39.38 50.96	141°0.85 28.95 156°3.18 29.01	197° 56.29 17.51 212° 58.51 17.42	Achernar 335°20.76 -57°7.21
6	205° 10.95	304°36.29 \$21°46.26	285°39.79 \$23°50.86	171°5.52 N12°29.07	212°58.51 17.42 228°0.73 \$11°17.32	Hamal 327°52.06 23°34.63
7	220° 13.42	319°35.47 46.57	300°40.20 50.75	186°7.86 29.12	243°2.95 17.22	Polaris 314°14.55 89°22.23
8	235° 15.88	334°34.64 46.88	315°40.61 50.65	201°10.19 29.18	258°5.17 17.13	Acamar 315°12.22 -40°12.74 Menkar 314°6.87 4°11.00
9	250° 18.35	349°33.82 · · 47.18	330°41.03 · · 50.55	216°12.53 · · 29.24	273°7.39 · · 17.03	Mirfak 308°29.18 49°56.96
10	265°20.81	4°32.99 47.49	345°41.44 50.45	231°14.86 29.29	288°9.61 16.93	Aldebaran 290°40.30 16°33.47
11 12	280°23.27 295°25.74	19°32.17 47.79 34°31.34 \$21°48.09	0°41.85 50.35 15°42.26 \$23°50.24	246°17.19 29.35 261°19.53 N12°29.41	303°11.82 16.84 318°14.04 \$11°16.74	Rigel 281°4.36 -8°10.49
13	310°28.20	49°30.52 48.39	30°42.67 50.14	276°21.86 29.47	333°16.26 16.64	Capella 280°22.68 46°1.42
14	325°30.67	64°29.69 48.69	45°43.08 50.04	291°24.19 29.52	348° 18.48 16.54	Bellatrix 278°23.46 6°22.26
15	$340^{\circ}33.13$	79°28.86 · · 48.99	60°43.49 · · 49.93	306°26.53 · · 29.58	3°20.70 · · 16.45	Elnath 278°2.56 28°37.70 Alnilam 275°38.25 -1°11.23
16	355°35.59	94°28.04 49.29	75°43.90 49.83	321°28.86 29.64	18°22.92 16.35	Betelgeuse 270°52.65 7°24.67
17	10°38.06	109°27.21 49.59	90°44.31 49.72	336°31.19 29.70	33°25.13 16.25	Canopus 263°52.22 -52°42.56
18 19	25° 40.52 40° 42.99	124°26.38 S21°49.89 139°25.56 50.18	105°44.72 S23°49.62 120°45.13 49.51	351°33.52 N12°29.76 6°35.85 29.82	48°27.35 \$11°16.16 63°29.57 16.06	Sirius 258°26.61 -16°44.99
20	55° 45.45	154°24.73 50.47	135°45.54 49.40	21°38.18 29.87	78° 31.79 15.96	Adhara 255°6.12 -29°0.31
21	$70^{\circ}47.91$	169°23.90 · · 50.77	150°45.96 · · 49.30	36°40.52 · · 29.93	93°34.01 · · 15.87	Procyon 244°51.34 5°9.77 Pollux 243°17.91 27°58.05
22	85°50.38	184°23.07 51.06	165°46.37 49.19	51°42.85 29.99	108° 36.22 15.77	Avior 234°14.43 -59°35.09
23	100°52.84	199°22.24 51.35	180°46.78 49.08	66°45.18 30.05	123°38.44 15.67	Suhail 222°46.49 -43°31.67
Mer.p	bass. 16:18	ν-0.8' d0.3' m-3.96	ν0.4' d-0.1' m1.35	ν2.3' d0.1' m-2.47	ν2.2' d-0.1' m0.98	Miaplacidus 221°37.58 -69°48.76
<u>.</u>						Alphard 217°48.25 -8°45.76
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.03 11°50.92
0	115°55.31	214°21.41 S 21°51.64	195°47.19 S 23°48.97	81°47.51 N12°30.11	138°40.66 S 11°15.57	Dubhe 193°41.53 61°37.05 Denebola 182°25.61 14°26.16
1	$130^{\circ}57.77$	229°20.58 51.93	210°47.60 48.87	96°49.83 30.17	153°42.88 15.48	Gienah 175°44.30 -17°40.46
2	146°0.23	244°19.76 52.21	225°48.01 48.76	111°52.16 30.23	168°45.09 15.38	Acrux 173°0.82 -63°13.65
3 4	161°2.70 176°5.16	259° 18.93 · · 52.50 274° 18.10 52.79	240°48.42 · · 48.65 255°48.83 48.54	126°54.49 · · 30.29 141°56.82 30.35	183°47.31 · · 15.28 198°49.53 15.18	Gacrux 171°52.40 -57°14.60
5	170 5.10 191°7.63	289°17.26 53.07	270°49.24 48.43	156°59.15 30.40	213°51.75 15.09	Alioth 166°13.55 55°49.47
6	206° 10.09	304°16.43 S21°53.35	285°49.65 \$23°48.32	172°1.48 N12°30.46	228°53.96 \$11°14.99	Spica 158°23.14 -11°17.18
7	$221^{\circ}12.56$	319° 15.60 53.63	300°50.06 48.20	187°3.80 30.52	243°56.18 14.89	Alkaid 152°52.65 49°11.30 Hadar 148°37.26 -60°29.04
8	236° 15.02	334°14.77 53.92	315°50.47 48.09	202°6.13 30.58	258° 58.40 14.79	Menkent 147°58.64 -36°29.12
9	251°17.48	349°13.94 · · 54.20	330°50.88 · · 47.98	217°8.46 · · · 30.64	274°0.61 · · 14.70	Arcturus 145°48.71 19°3.27
10 11	266° 19.95 281° 22.41	4°13.11 54.47 19°12.28 54.75	345°51.29 47.87 0°51.70 47.75	232°10.78 30.70 247°13.11 30.76	289°2.83 14.60 304°5.05 14.50	Rigil Kent. 139°41.60 -60°55.80
12	296°24.88	34°11.44 \$21°55.03	15°52.11 \$23°47.64	262°15.44 N12°30.82	319°7.26 \$11°14.40	Kochab 137°20.13 74°3.03
13	311°27.34	49°10.61 55.30	30°52.53 47.53	277°17.76 30.88	334°9.48 14.31	Zuben'ubi 136°57.03 -16°8.46 Alphecca 126°4.61 26°37.82
14	$326^{\circ}29.80$	64°9.78 55.58	45°52.94 47.41	292°20.09 30.94	349°11.70 14.21	Antares 112° 17.09 -26° 29.06
15	341°32.27	79°8.95 · · 55.85	60°53.35 · · 47.30	307°22.41 · · 31.01	4°13.91 · · 14.11	Atria 107°12.50 -69°4.03
16 17	356°34.73 11°37.20	94°8.11 56.12 109°7.28 56.39	75°53.76 47.18 90°54.17 47.06	322°24.74 31.07 337°27.06 31.13	19°16.13 14.01 34°18.34 13.91	Sabik 102°3.99 -15°45.29
18	26°39.66	124°6.45 \$21°56.66	105°54.58 \$23°46.95	352°29.38 N12°31.19	49°20.56 \$11°13.82	Shaula 96°11.83 -37°7.21
19	41°42.12	139°5.61 56.93	120°54.99 46.83	7°31.71 31.25	64°22.78 13.72	Rasalhague 95°59.60 12°32.42 Eltanin 90°43.05 51°28.93
20	56° 44.59	154°4.78 57.20	135°55.40 46.71	22°34.03 31.31	79°24.99 13.62	Eltanin 90°43.05 51°28.93 Kaus Aust. 83°33.97 -34°22.39
21	71°47.05	169°3.94 · · 57.47	150°55.81 · · 46.60	37°36.35 · · 31.37	94°27.21 · · 13.52	Vega 80°34.19 38°48.19
22	86° 49.52 101° 51.98	184°3.11 57.73 199°2.27 58.00	165°56.22 46.48 180°56.63 46.36	52°38.68 31.43 67°41.00 31.49	109°29.42 13.42 124°31.64 13.33	Nunki 75°49.13 -26°16.05
23						Altair 62°1.08 8°55.81
Mer.p	pass. 16:14	ν-0.8' d0.3' m-3.96	ν0.4' d-0.1' m1.35	ν2.3' d0.1' m-2.46	ν2.2' d-0.1' m0.98	Peacock 53°7.58 -56°39.57 Deneb 49°26.82 45°21.93
						Enif 33°39.88 9°59.04
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°34.30 -46°50.90
0	116°54.44	214°1.44 \$21°58.26	195°57.04 \$23°46.24	82°43.32 N12°31.55	139°33.86 \$11°13.23	Fomalhaut 15°15.64 -29°29.91
1 2	131°56.91 146°59.37	229°0.60 58.52 243°59.76 58.78	210°57.45 46.12 225°57.86 46.00	97°45.64 31.62 112°47.96 31.68	154°36.07 13.13 169°38.29 13.03	Scheat 13°46.23 28°12.83
3	162°1.84	258°58.93 · · 59.04	240°58.27 · · 45.88	127°50.28 · · 31.74	184°40.50 · · 12.93	Markab 13°30.92 15°20.05
4	177°4.30	273°58.09 59.30	255°58.68 45.76	142°52.60 31.80	199° 42.72 12.84	Jan 16 Tue SHA Mer.pass
5	192°6.77	288° 57.26 59.56	270°59.09 45.64	157°54.92 31.86	214°44.93 12.74	Venus 99°45.06 09:42
6	207°9.23	303°56.42 \$21°59.82	285°59.50 \$23°45.52	172°57.24 N12°31.93	229° 47.15 S11° 12.64	Mars 80°41.16 10:57
7 8	222°11.69 237°14.16	318°55.58 22°0.07 333°54.74 0.33	300°59.91 45.39 316°0.32 45.27	187°59.56 31.99 203°1.88 32.05	244° 49.36 12.54 259° 51.58 12.44	Jupiter 325°55.33 18:34 Saturn 22°51.25 14:47
9	252° 16.62	348°53.91 · · 0.58	331° 0.73 · · 45.15	218° 4.20 · · 32.11	274°53.79 · · 12.34	
10	267° 19.09	3°53.07 0.83	346°1.14 45.02	233°6.52 32.18	289° 56.01 12.25	Jan 17 Wed SHA Mer.pass
11	$282^{\circ}21.55$	18°52.23 1.08	1°1.56 44.90	248°8.84 32.24	304°58.22 12.15	Venus 98°26.11 09:43 Mars 79°51.88 10:57
12	297°24.01	33°51.39 S22°1.33	16°1.97 S23°44.78	263°11.16 N12°32.30	320°0.44 \$11°12.05	Jupiter 325°52.20 18:30
13 14	312°26.48 327°28.94	48°50.55 1.58 63°49.71 1.83	31°2.38 44.65 46°2.79 44.53	278°13.47 32.36 293°15.79 32.43	335°2.65 11.95 350°4.87 11.85	Saturn 22°45.35 14:43
14 15	342°31.41	78°48.87 · · 2.08	61°3.20 · · 44.40	308°18.11 · · 32.49	5°7.08 · · 11.75	Jan 18 Thu SHA Mer.pass
16	357° 33.87	93°48.03 2.32	76° 3.61 44.27	323°20.43 32.55	20°9.30 11.65	Venus 97°6.99 09:44
17	12°36.33	108°47.19 2.57	91°4.02 44.15	338°22.74 32.62	35°11.51 11.56	Mars 79°2.60 10:56
18	27°38.80	123°46.35	106°4.43	353°25.06 N12°32.68	50°13.72 S11°11.46	Jupiter 325°48.88 18:26
19 20	42°41.26 57°43.73	138° 45.51 3.05 153° 44.67 3.29	121° 4.84 43.89 136° 5.25 43.76	8°27.37 32.74 23°29.69 32.81	65° 15.94 11.36 80° 18.15 11.26	Saturn 22°39.41 14:40
20	72° 46.19	168° 43.83 · · 3.53	151° 5.66 · · 43.64	38°32.00 · · 32.87	80° 18.15 11.26 95° 20.37 · · 11.16	Horizontal parallax
22	87° 48.66	183°42.99 3.77	166° 6.07 43.51	53°34.32 32.93	110°22.58 11.06	Venus: 0.1
23	$102^{\circ}51.12$	198°42.15 4.01	181°6.48 43.38	68°36.63 33.00	125°24.79 10.96	Mars: 0.1
Mer.r	pass. 16:10	ν-0.8' d0.3' m-3.95	ν0.4' d-0.1' m1.35	ν2.3' d0.1' m-2.45	ν2.2' d-0.1' m0.98	

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°38.92	S21°4.28	$116^{\circ}48.63$	11.6'	S02°54.76	-17.0'	59.7'
1	192°38.70	3.81	131°19.24	11.7'	02°37.77	-17.0'	59.7'
2 3	207°38.48 222°38.26	3.35 • • 2.88	145°49.90 160°20.59	11.7' 11.7'	02°20.79 02°3.80	-17.0' -17.0'	59.7' 59.7'
4	237°38.04	2.41	174°51.32	11.8'	01°46.82	-17.0'	59.6'
5	252°37.83	1.94	$189^{\circ}22.08$	11.8'	$01^{\circ}29.84$	-17.0'	59.6'
6	267°37.61	S21°1.48	203°52.88	11.8'	S01°12.87	-17.0'	59.6'
7 8	282°37.39 297°37.17	1.01 0.54	218°23.71 232°54.57	11.9' 11.9'	00°55.90 00°38.95	-17.0' -16.9'	59.6' 59.6'
9	312°36.96	21°0.07	247°25.46	11.9'	00°22.00	-16.9'	59.5'
10	327°36.74	20°59.60	261°56.38	11.9'	S00°5.06	-16.9'	59.5'
11	342°36.52 357°36.31	59.12 \$20°58.65	276°27.32 290°58.29	12.0' 12.0'	N00°11.86 N00°28.76	16.9'	59.5'
12 13	12°36.09	58.18	290 58.29 305°29.28	12.0'	00°45.65	16.9' 16.9'	59.5' 59.4'
14	27°35.88	57.70	320°0.30	12.0'	01°2.53	16.9'	59.4'
15	42°35.66	• • 57.23	334°31.34	12.1'	01°19.38	16.8'	59.4'
16 17	57°35.45 72°35.23	56.75 56.28	349°2.39 3°33.47	12.1' 12.1'	01°36.21 01°53.02	16.8' 16.8'	59.4' 59.3'
18	87°35.02	\$20°55.80	18°4.56	12.1'	N02°9.81	16.8	59.3'
19	102°34.81	55.32	32°35.67	12.1'	02°26.57	16.7'	59.3'
20	117°34.59	54.85	47°6.79	12.1'	02°43.30	16.7'	59.3'
21 22	132°34.38 147°34.17	· · 54.37 53.89	61°37.92 76°9.07	12.1' 12.2'	03°0.01 03°16.68	16.7' 16.6'	59.2' 59.2'
23	147 34.17 162°33.95	53.89	90°40.23	12.2'	03 16.68 03°33.33	16.6'	59.2'
	SD = 16.3'	d = -0.5'			D = 16.3'		
Wed	GHA 177°33.74	Dec \$20°52.93	GHA 105°11.39	u 12.2'	Dec N03°49.94	d 16.6'	HP
0 1	177°33.74 192°33.53	520°52.93 52.45	105°11.39 119°42.56	12.2'	04°6.52	16.6' 16.5'	59.2' 59.1'
2	207°33.32	51.96	134°13.74	12.2'	04°23.07	16.5	59.1'
3	222°33.11	• • 51.48	148°44.92	12.2'	04°39.58	16.5'	59.1'
4	237°32.90 252°32.69	51.00 50.51	163°16.11 177°47.30	12.2' 12.2'	04°56.05 05°12.48	16.4' 16.4'	59.1' 59.0'
5 6	267°32.47	50.51 \$20°50.03	177 47.30 192°18.49	12.2'	N05°28.88	16.4	59.0'
7	282°32.26	49.54	206°49.68	12.2'	05°45.23	16.3'	59.0'
8	297°32.06	49.06	221°20.86	12.2'	06°1.54	16.3'	59.0'
9 10	312°31.85 327°31.64	•• 48.57 48.08	235°52.05 250°23.23	12.2' 12.2'	06°17.80 06°34.02	16.2' 16.2'	58.9' 58.9'
11	342°31.43	47.59	264°54.40	12.2'	06°50.19	16.2 16.1'	58.9'
12	357°31.22	\$20°47.10	279°25.57	12.2'	N07°6.31	16.1'	58.9'
13	12°31.01	46.61	293°56.73	12.1'	07°22.38	16.0'	58.8'
14 15	27°30.80 42°30.60	46.12 •• 45.63	308°27.88 322°59.01	12.1' 12.1'	07°38.41 07°54.38	16.0' 15.9'	58.8' 58.8'
16	57°30.39	45.14	337°30.14	12.1'	07° 34.36 08° 10.30	15.9'	58.8'
17	72°30.18	44.65	$352^{\circ}1.25$	12.1'	$08^{\circ}26.16$	15.8'	58.7'
18	87°29.98	\$20°44.16	6°32.35	12.1'	N08°41.97	15.7'	58.7'
19 20	102°29.77 117°29.56	43.66 43.17	21°3.44 35°34.50	12.1'	08°57.72 09°13.41	15.7' 15.6'	58.7' 58.7'
21	132°29.36	• • 42.67	50°5.55	12.0'	09°29.04	15.6'	58.6'
22	147°29.15	42.18	$64^{\circ}36.58$	12.0'	$09^{\circ}44.61$	15.5'	58.6'
23	162°28.95	41.68	79°7.59	12.0'	10°0.12	15.4'	58.6'
	SD = 16.3'	d = -0.5'		SI	O = 16.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°28.74	\$20°41.18	93°38.58	12.0'	N10°15.56 10°30.94	15.4'	58.5'
1 2	192°28.54 207°28.33	40.68 40.19	108°9.55 122°40.49	11.9' 11.9'	10°30.94 10°46.26	15.3' 15.2'	58.5' 58.5'
3	222°28.13	• • 39.69	$137^{\circ}11.41$	11.9'	$11^{\circ}1.51$	15.2'	58.5'
4	237°27.93	39.19	151°42.30	11.9'	11°16.69	15.1'	58.4'
5 6	252°27.72 267°27.52	38.69 \$20°38.18	166°13.17 180°44.00	11.8' 11.8'	11°31.80 N11°46.84	15.0' 15.0'	58.4' 58.4'
7	282°27.32	37.68	195°14.81	11.8'	12°1.81	14.9'	58.4'
8	297°27.12	37.18	209°45.59	11.7'	$12^{\circ}16.70$	14.8'	58.3'
9	312°26.91	• • 36.68	224°16.34	11.7'	12°31.52	14.7'	58.3'
10 11	327°26.71 342°26.51	36.17 35.67	238°47.06 253°17.74	11.7' 11.6'	12°46.27 13°0.94	14.7' 14.6'	58.3' 58.3'
12	357°26.31	\$20°35.16	267°48.39	11.6'	N13°15.53	14.5	58.2'
13	12°26.11	34.66	282°19.00	11.6'	13°30.04	14.4'	58.2'
14	27°25.91	34.15	296°49.58	11.5'	13°44.47	14.4'	58.2'
15 16	42°25.71 57°25.51	· · 33.64 33.13	311°20.12 325°50.63	11.5' 11.5'	13°58.82 14°13.09	14.3' 14.2'	58.1' 58.1'
17	72°25.31	32.62	340°21.09	11.5	14 13.09 14°27.27	14.2	58.1
18	87°25.11	\$20°32.11	354°51.52	11.4'	N14°41.37	14.0'	58.1'
19	102°24.91	31.60	9°21.91	11.3'	14°55.39	13.9'	58.0'
20 21	117°24.72 132°24.52	31.09 · · 30.58	23°52.25 38°22.56	11.3' 11.3'	15°9.32 15°23.15	13.8' 13.7'	58.0' 58.0'
22	132 24.32 147°24.32	30.07	52°52.82	11.2'	15° 36.90	13.7'	58.0'
23	162°24.12	29.56	67°23.03	11.2'	15°50.56	13.6'	57.9'
	SD = 16.3'	d = -0.5'	_	SI	O = 16.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	07:57	09:45			14:35	16:24
N 70°	07:43	09:13	11:54	12:27	15:07	16:38
68°	07:31	08:50	10:26	13:55	15:31	16:49
66°	07:21	08:31	09:48	14:32	15:49	16:59
64°	07:13	08:16	09:22	14:58	16:04	17:07
62°	07:06	08:04	09:02	15:19	16:17	17:15
60°	06:59	07:53	08:45	15:35	16:27	17:21
N 58°	06:53	07:44	08:31	15:49	16:37	17:27
56°	06:48	07:35	08:19	16:01	16:45	17:32
54°	06:43	07:28	08:09	16:11	16:53	17:37
52°	06:39	07:21	08:00	16:21	16:59	17:42
50°	06:35	07:15	07:51	16:29	17:06	17:46
45°	06:25	07:01	07:34	16:46	17:19	17:55
N 40°	06:16	06:50	07:19	17:01	17:30	18:04
35°	06:09	06:40	07:07	17:13	17:40	18:11
30°	06:01	06:31	06:56	17:24	17:49	18:19
20° N 10°	05:47 05:33	06:14 05:59	06:38 06:22	17:42 17:58	18:06 18:21	18:33 18:47
0°	05:33	05:59	06:22	18:14	18:36	19:01
S 10°	ł					
20°	05:02 04:42	05:28 05:10	05:51 05:34	18:29 18:46	18:52 19:09	19:18 19:38
30°	04:42	03.10	05:34	19:05	19:31	20:03
35°	04:00	04:35	05:03	19:16	19:45	20:20
40°	03:39	04:19	04:50	19:29	20:00	20:40
45°	03:14	03:59	04:35	19:44	20:20	21:05
S 50°	02:37	03:34	04:16	20:03	20:45	21:41
52°	02:17	03:22	04:06	20:12	20:57	22:01
54°	01:51	03:07	03:56	20:23	21:11	22:26
56°	01:12	02:50	03:44	20:34	21:28	23:03
58°	////	02:29	03:31	20:48	21:49	////
S 60°	////	02:01	03:15	21:03	22:16	////

Lat.		Moonris	e		Moonset	i i
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	10:34	09:58	09:12	23:43		02:11
N 70°	10:34	10:06	09:34	23:38		01:53
68°	10:34	10:14	09:50	23:34		01:38
66°	10:34	10:20	10:04	23:30		01:26
64°	10:34	10:25	10:15	23:27	•• ••	01:17
62°	10:34	10:30	10:25	23:25	•• ••	01:08
60°	10:34	10:34	10:34	23:22		01:01
N 58°	10:34	10:37	10:41	23:20		00:55
56°	10:34	10:40	10:48	23:18		00:50
54°	10:34	10:43	10:54	23:17	•• ••	00:45
52°	10:34	10:46	10:59	23:15		00:40
50°	10:34	10:48	11:04	23:14		00:36
45°	10:34	10:54	11:14	23:11		00:28
N 40°	10:34	10:58	11:23	23:09		00:21
35°	10:34	11:02	11:31	23:07	•• ••	00:14
30°	10:34	11:05	11:38	23:05	•• ••	00:09
20°	10:34	11:11	11:49	23:02		00:00
N 10°	10:34	11:17	12:00	22:59	23:52	
0°	10:34	11:22	12:10	22:57	23:44	•• ••
S 10°	10:34	11:27	12:20	22:54	23:37	
20°	10:34	11:32	12:30	22:51	23:29	
30°	10:34	11:39	12:43	22:48	23:20	23:53
35°	10:34	11:42	12:50	22:46	23:15	23:45
40°	10:34	11:46	12:58	22:44	23:09	23:35
45°	10:35	11:51	13:08	22:42	23:02	23:24
S 50°	10:35	11:57	13:19	22:39	22:54	23:11
52°	10:35	12:00	13:25	22:38	22:50	23:04
54°	10:35	12:03	13:31	22:37	22:46	22:57
56°	10:35	12:06	13:37	22:35	22:42	22:50
58°	10:35	12:10	13:45	22:33	22:37	22:41
S 60°	10:35	12:14	13:54	22:31	22:31	22:31

١			Sun		Moon			
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	24,	00 ^h	12 ^h	Pass	Upper Lower		5-7	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	26-48%	
	16	09:24	09:35	12:10	16:45	04:21		
١	17	09:45	09:55	12:10	17:33	05:09		
	18	10:05	10:15	12:10	18:21	05:57		

January 19, 20, 21 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec	
0	117°53.58	213°41.31			140°27.01 \$11°10.87		
1	$132^{\circ}56.05$		43.12 1.48 211°7.30		155°29.22 10.77	Alpheratz 357°35.77 29°13 Ankaa 353°8.08 -42°10	
2	$147^{\circ}58.51$	243°39.63 4	1.72 226°7.71 42.99	113°43.57 33.19	170°31.43 10.67	Ankaa 353°8.08 -42°10 Schedar 349°32.15 56°40	
3	163°0.98	258°38.78 · · 4			185°33.65 · · 10.57	Diphda 348°48.19 -17°51	
4	178°3.44		5.18 256°8.53 42.72		200°35.86 10.47	Achernar 335°20.79 -57°7	
5 6	193°5.90 208°8.37	288°37.10 5 303°36.26 \$22°5	5.42 271°8.94 42.59 5.65 286°9.35 \$23°42.46		215°38.07 10.37 230°40.29 \$11°10.27	Hamal 327°52.07 23°34	
7	223° 10.83		5.87 301°9.76 42.33		245° 42.50 10.17	Polaris 314°15.79 89°22	
8	238° 13.30		5.10 316°10.17 42.19		260°44.71 10.07	Acamar 315°12.24 -40°12 Menkar 314°6.88 4°10	
9	253° 15.76	348°33.73 · · 6			275°46.93 · · 9.97	Mirfak 308°29.19 49°56	
10	268° 18.22		5.56 346°10.99 41.92		290°49.14 9.88	Aldebaran 290°40.30 16°33	
11 12	283°20.69 298°23.15	18°32.04 6 33°31.19 S 22°7	5.78 1°11.40 41.79 7.00 16°11.81 \$23°41.65		305°51.35 9.78 320°53.57 \$11°9.68	Rigel 281°4.37 -8°10	
13	313° 25.62		7.23 31°12.22 41.52		335°55.78 9.58	Capella 280°22.69 46°1	
14	328° 28.08		7.45 46°12.63 41.38		350°57.99 9.48	Bellatrix 278°23.46 6°22	
15	$343^{\circ}30.55$	78°28.66 · · 7	7.67 61°13.04 · · 41.25	309°13.62 · · 34.04	6°0.20 · · 9.38	Elnath 278°2.57 28°37 Alnilam 275°38.26 -1°11	
16	358° 33.01		7.89 76°13.45 41.11		21°2.42 9.28	Betelgeuse 270°52.65 7°24	
17	13° 35.47		3.10 91°13.87 40.97		36°4.63 9.18	Canopus 263°52.23 -52°42	
18 19	28° 37.94 43° 40.40	123°26.12	3.32 106°14.28 \$23°40.83 3.54 121°14.69 40.69		51°6.84 S11°9.08 66°9.05 8.98	Sirius 258°26.61 -16°45	
20	58° 42.87		3.75 136°15.10 40.56	_	81°11.27 8.88	Adhara 255°6.12 -29°0	
21	73°45.33	168°23.58 · · 8			96°13.48 · · 8.78	1	9.76
22	88°47.79		0.18 166°15.92 40.28		111°15.69 8.68	Pollux 243°17.90 27°58 Avior 234°14.42 -59°35	
23	103°50.26	198°21.89 9	9.39 181°16.33 40.14	69°32.08 34.56	126° 17.90 8.58	Suhail 222°46.48 -43°31	
Mer.	pass. 16:06	ν -0.8′ d 0.2′ m -3.	95 ν0.4' d-0.1' m1.35	$\nu 2.3' \ d0.1' \ \text{m-}2.45$	$\nu 2.2' \ d$ -0.1' m0.98	Miaplacidus 221°37.56 -69°48	3.78
	<u> </u>		 -			Alphard 217° 48.24 -8° 45	
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.01 11°50	
0	$118^{\circ}52.72$	213°21.04 S 22°9			141°20.11 \$11°8.48	Dubhe 193°41.50 61°37 Denebola 182°25.59 14°26	
1	$133^{\circ}55.19$		0.81 211°17.15 39.85		156°22.33 8.39	Gienah 175°44.28 -17°40	
2	148°57.65		0.02 226°17.56 39.71		171°24.54 8.29	Acrux 173°0.77 -63°13	
3 4	164°0.12 179°2.58	258°18.50 · · 10 273°17.65	0.22 241°17.97 · · 39.57 0.43 256°18.38 39.43		186°26.75 · · 8.19 201°28.96 8.09	Gacrux 171°52.36 -57°14	
5	179 2.56 194° 5.04		0.63 271°18.79 39.29		201 28.90 8.09 216°31.17 7.99	Alioth 166°13.51 55°49	
6	209°7.51	303°15.96 S22°10			231°33.38 S11°7.89	Spica 158°23.12 -11°17	
7	224°9.97	318° 15.11 11	04 301°19.61 39.00	189°50.52 35.10	246°35.60 7.79	Alkaid 152°52.62 49°11 Hadar 148°37.22 -60°29	
8	239° 12.44		24 316°20.02 38.85		261°37.81 7.69	Menkent 147°58.61 -36°29	
9	254° 14.90	348°13.41 · · 11			276°40.02 · · 7.59	Arcturus 145°48.69 19°3	
10 11	269° 17.36 284° 19.83		64 346°20.84 38.57 84 1°21.25 38.42		291° 42.23 7.49 306° 44.44 7.39	Rigil Kent. 139°41.56 -60°55	
12	299° 22.29	33°10.86 \$22°12			321°46.65 \$11°7.29	Kochab 137°20.07 74°3	
13	$314^{\circ}24.76$		2.23 31°22.07 38.13		336°48.86 7.19	Zuben'ubi 136°57.00 -16°8 Alphecca 126°4.59 26°37	
14	$329^{\circ}27.22$		2.42 46°22.48 37.98		351°51.07 7.09	Antares 112° 17.07 -26° 29	
15	344° 29.69	78°8.31 · · 12			6°53.29 · · 6.99	Atria 107°12.45 -69°4	
16 17	359° 32.15 14° 34.61		2.81 76°23.30 37.69 3.00 91°23.71 37.54		21°55.50 6.89 36°57.71 6.79	Sabik 102°3.97 -15°45	
18	29° 37.08	123°5.76 S22°13			51°59.92 S11°6.69	Shaula 96°11.81 -37°7	
19	44°39.54		3.38 121°24.54 37.24		67°2.13 6.59	Rasalhague 95°59.58 12°32 Eltanin 90°43.03 51°28	
20	59°42.01		3.57 136°24.95 37.09		82°4.34 6.49	Eltanin 90°43.03 51°28 Kaus Aust. 83°33.96 -34°22	
21	74° 44.47	168°3.21 · · 13			97°6.55 · · 6.39	Vega 80°34.18 38°48	
22 23	89° 46.93 104° 49.40		3.94 166°25.77 36.79 3.12 181°26.18 36.64		112°8.76 6.29 127°10.97 6.19	Nunki 75°49.12 -26°16	
						Altair 62°1.08 8°55	
Mer.	pass. 16:02	ν-0.8′ d0.2′ m-3.	95 ν 0.4′ d -0.1′ m1.35	$\nu 2.3' \ d0.1' \ \text{m-}2.44$	$\nu 2.2' \ d$ -0.1' m0.98	Peacock 53°7.58 -56°39 Deneb 49°26.82 45°21	
						Deneb 49°26.82 45°21 Enif 33°39.88 9°59	
Sun	GHA	GHA Dec		GHA Dec	GHA Dec	Al Na'ir 27°34.31 -46°50	
0	119°51.86	213°0.65 \$22°14			142°13.18 \$11°6.09	Fomalhaut 15°15.65 -29°29	
1	134° 54.33		1.49 211°27.00 36.34		157°15.39 5.99	Scheat 13°46.24 28°12	
2 3	149° 56.79 164° 59.26	242°58.95 14 257°58.09 •• 14	4.67 226°27.41 36.18 4.85 241°27.82 · · 36.03		172°17.60 5.89 187°19.81 • 5.79	Markab 13°30.93 15°20).05
4	180°1.72		5.03 256°28.23 35.88		202°22.02 5.69	Jan 19 Fri SHA Mer.p	ass
5	195°4.18		5.21 271°28.64 35.72		217°24.23 5.59		9:46
6	$210^{\circ}6.65$	302°55.53 \$22°15	5.38 286°29.05 S 23°35.57	175°43.43 N12°36.68	232°26.44 S 11°5.49	l .	0:55
7	225°9.11		5.56 301°29.46 35.42		247°28.65 5.38		3:23
8 9	240° 11.58 255° 14.04	332°53.83 15 347°52.97 · · 15	5.73 316°29.87 35.26 5.91 331°30.28 · · 35.11	_	262°30.86 5.28 277°33.07 · · 5.18		1:36
10	270° 16.50		5.08 346°30.69 34.95		292°35.28 5.08	Jan 20 Sat SHA Mer.p	
11	285° 18.97		5.25 1°31.10 34.79		307°37.49 4.98		9:47
12	300°21.43	32°50.41 \$22°16	5.42 16°31.51 \$23°34.64	265°57.20 N12°37.10	322°39.70 S 11°4.88	l .	0:55 3:19
13	315°23.90		5.59 31°31.93 34.48		337°41.91 4.78		1:33
14 15	330° 26.36 345° 28.83	62°48.70 16 77°47.85 · · 16	5.75 46°32.34 34.32 5.92 61°32.75 · · 34.16		352°44.11 4.68 7°46.32 · · 4.58		
15 16	0°31.29		5.92 61°32.75 · · 34.16 7.09 76°33.16 34.01		7°46.32 · · 4.58 22°48.53 4.48	Jan 21 Sun SHA Mer.p Venus 93°8.79 09	oass 9:49
17	15° 33.75		7.25 91°33.57 33.85		37°50.74 4.38):54
18	30°36.22	122°45.28 S 22°17	7.41 106°33.98 \$23°33.69	356°10.96 N12°37.52	52°52.95 S 11°4.28	Jupiter 325°37.78 18	3:15
19	45° 38.68		7.58 121°34.39 33.53		67°55.16 4.18	Saturn 22°21.32 14	1:29
20 21	60°41.15 75°43.61	152°43.57 17 167°42.71 · · 17	7.74 136°34.80 33.37 7.90 151°35.21 · · 33.21		82°57.37 4.08 97°59.58 · · 3.98	Horizontal parallax	
21	75 43.61 90°46.08		3.05 166°35.62 33.05	_	113°1.79 3.87	Venus: 0.1	
23	105° 48.54		3.21 181°36.03 32.88		128°3.99 3.77	Mars: 0.1	
Mer	pass. 15:58	ν-0.9' d0.2' m-3.	94 \[\nu 0.4' \ d-0.2' \ m1.34 \]	ν2.3' d0.1' m-2.43	ν2.2' d-0.1' m0.98		
14161.	F433. 13.30	∠ 0.5 do.∠ III-5.			U U.I IIIU.30		

h	Su	n	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	177°23.93	S20°29.04	81°53.21	11.1'	$N16^{\circ}4.13$	13.5'	57.9'	
1	192°23.73	28.53	96°23.34	11.1'	16°17.60	13.4'	57.9'	
2	207°23.53 222°23.34	28.01 •• 27.50	110°53.42 125°23.46	11.0' 11.0'	16°30.98 16°44.27	13.3' 13.2'	57.9' 57.8'	
4	237°23.14	26.98	139°53.45	10.9'	16°57.46	13.1'	57.8'	
5	252°22.95	26.47	154°23.39	10.9'	17° 10.55	13.0'	57.8'	
6	267°22.75	\$20°25.95	168°53.28	10.8'	$N17^{\circ}23.55$	12.9'	57.8'	
7	282°22.56	25.43	183°23.13	10.8'	17°36.44	12.8'	57.7'	
8 9	297°22.36 312°22.17	24.91 •• 24.39	197°52.93 212°22.67	10.7' 10.7'	17°49.23 18°1.93	12.7' 12.6'	57.7' 57.7'	
10	312 22.17 327°21.97	23.87	212 22.07 226°52.37	10.7	16 1.93 18°14.52	12.5'	57.7'	
11	342°21.78	23.35	241°22.02	10.6'	18°27.00	12.4'	57.6'	
12	357°21.59	S20°22.83	255°51.61	10.5'	N18°39.38	12.3'	57.6'	
13	12°21.39	22.31	270°21.15	10.5'	18°51.66	12.2'	57.6'	
14 15	27°21.20 42°21.01	21.78	284°50.64 299°20.08	10.4' 10.4'	19°3.82 19°15.88	12.1' 12.0'	57.5' 57.5'	
16	57°20.82	20.74	313°49.47	10.4	19° 27.83	11.8'	57.5'	
17	72°20.63	20.21	328°18.80	10.3'	19°39.67	11.7'	57.5'	
18	87°20.44	\$20°19.69	342°48.08	10.2'	N19°51.40	11.6'	57.4'	
19	102°20.24	19.16	357°17.30	10.2'	20°3.02 20°14.52	11.5'	57.4	
20 21	117°20.05 132°19.86	18.63 •• 18.11	11°46.47 26°15.59	10.1' 10.1'	20°14.52 20°25.91	11.4' 11.3'	57.4' 57.4'	
22	147°19.67	17.58	40°44.65	10.0'	20°37.18	11.2'	57.3	
23	162°19.48	17.05	55°13.65	10.0'	20°48.34	11.0'	57.3'	
	SD = 16.2'	d = -0.5'		SE	0 = 15.8'			
Sat	GHA 177°19.30	Dec \$20°16.52	GHA 69° 42.61	u 9.9'	Dec N20°59.37	<i>d</i> 10.9'	HP 57.3'	
0 1	177° 19.30 192° 19.11	15.99	84°11.50	9.9 9.8'	21°10.29	10.9	57.3'	
2	207°18.92	15.46	98°40.35	9.8'	21°21.10	10.7'	57.2'	
3	222°18.73	•• 14.93	113°9.13	9.7'	21°31.77	10.6'	57.2'	
4	237°18.54	14.40	127°37.87	9.7'	21°42.33	10.4	57.2'	
5 6	252°18.35 267°18.17	13.86 \$20°13.33	142°6.54 156°35.16	9.6' 9.6'	21°52.77 N22°3.08	10.3' 10.2'	57.2' 57.1'	
7	282°17.98	12.80	171°3.73	9.0 9.5'	22°13.27	10.2	57.1'	
8	297°17.79	12.26	185°32.24	9.5'	22°23.33	9.9'	57.1'	
9	$312^{\circ}17.61$	• 11.73	200°0.70	9.4'	22°33.27	9.8'	57.1'	
10	327°17.42	11.19	214°29.11	9.3'	22°43.08	9.7'	57.0'	
11 12	342°17.24 357°17.05	10.65 \$20°10.12	228°57.46 243°25.75	9.3' 9.2'	22°52.76 N23°2.31	9.6' 9.4'	57.0' 57.0'	
13	12°16.87	9.58	257°53.99	9.2'	23°11.73	9.4	57.0'	
14	27°16.68	9.04	272°22.18	9.1'	23°21.02	9.2'	56.9'	
15	42°16.50	• • 8.50	286°50.32	9.1'	23°30.18	9.0'	56.9'	
16	57°16.31	7.96	301°18.40	9.0'	23°39.20	8.9'	56.9'	
17 18	72°16.13 87°15.95	7.42 \$20°6.88	315°46.43 330°14.41	9.0' 8.9'	23°48.09 N23°56.85	8.8' 8.6'	56.9' 56.9'	
19	102°15.76	6.34	344°42.33	8.9'	24°5.47	8.5'	56.8'	
20	$117^{\circ}15.58$	5.79	359°10.21	8.8'	24°13.96	8.3'	56.8'	
21	132°15.40	• 5.25	13°38.04	8.8'	24°22.31	8.2'	56.8'	
22 23	147°15.22 162°15.04	4.71 4.16	28°5.81 42°33.54	8.7' 8.7'	24°30.52 24°38.59	8.1' 7.9'	56.8' 56.7'	
23	SD = 16.2'	d = -0.5'			0 = 15.6'	1.5	30.1	
	JD = 10.2	<u>u = -0.5</u>		JL	7 — 15.0			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0 1	177°14.85 192°14.67	\$20°3.62 3.07	57°1.22 71°28.85	8.6' 8.6'	N24°46.52 24°54.31	7.8' 7.7'	56.7' 56.7'	
2	192°14.67 207°14.49	3.07 2.52	71°28.85 85°56.44	8.5	24°54.31 25°1.96	7.7° 7.5'	56.7'	
3	222°14.31	. 1.98	100°23.97	8.5'	25°9.47	7.4	56.6'	
4	237°14.13	1.43	114°51.47	8.4'	25°16.84	7.2'	56.6'	
5	252°13.95	0.88 \$20°0.33	129°18.91	8.4'	25°24.07	7.1'	56.6'	
6 7	267°13.77 282°13.59	520°0.33 19°59.78	143°46.32 158°13.68	8.4' 8.3'	N25°31.15 25°38.08	6.9' 6.8'	56.6' 56.6'	
8	297°13.42	59.23	172°41.00	8.3'	25°44.87	6.6'	56.5	
9	312°13.24	• • 58.68	187°8.27	8.2'	25°51.52	6.5'	56.5'	
10	327°13.06	58.13	201°35.51	8.2'	25°58.01	6.4'	56.5'	
11 12	342°12.88 357°12.70	57.58 \$19°57.02	216°2.71 230°29.87	8.2' 8.1'	26°4.37 N26°10.57	6.2' 6.1'	56.5' 56.4'	
13	12°12.53	56.47	230 29.87 244°56.99	8.1'	26°16.62	5.9'	56.4'	
14	27°12.35	55.92	259°24.08	8.1'	26°22.53	5.8'	56.4	
15	42°12.17	• • 55.36	273°51.13	8.0'	26°28.29	5.6'	56.4'	
16	57°12.00	54.80	288°18.15	8.0'	26°33.89 26°39.35	5.5'	56.4'	
17 18	72°11.82 87°11.65	54.25 \$19°53.69	302°45.14 317°12.09	8.0' 7.9'	26°39.35 N26°44.65	5.3' 5.2'	56.3' 56.3'	
19	102°11.47	53.13	331°39.02	7.9'	26°49.81	5.0'	56.3	
20	117°11.30	52.58	$346^{\circ}5.91$	7.9'	26°54.81	4.8'	56.3'	
21	132°11.12	• • 52.02	0°32.78	7.8'	26°59.66	4.7'	56.2	
22 23	147°10.95 162°10.78	51.46 50.90	14°59.62 29°26.44	7.8' 7.8'	27°4.36 27°8.90	4.5' 4.4'	56.2' 56.2'	
23			29 20.44			4.4	JU.2	
	SD = 16.2'	d = -0.5'		SL	D = 15.5'			

	Twilight		Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.	
N 72°	07:49	09:33			14:50	16:34	
N 70°	07:36	09:04	11:10	13:13	15:19	16:47	
68°	07:25	08:42	10:12	14:10	15:40	16:57	
66°	07:16	08:25	09:39	14:44	15:58	17:06	
64°	07:09	08:11	09:15	15:08	16:12	17:14	
62°	07:02	07:59	08:56	15:27	16:23	17:21	
60°	06:56	07:49	08:40	15:42	16:34	17:27	
N 58°	06:50	07:40	08:27	15:55	16:42	17:32	
56°	06:45	07:32	08:16	16:07	16:50	17:37	
54°	06:41	07:25	08:06	16:17	16:57	17:42	
52°	06:36	07:18	07:57	16:25	17:04	17:46	
50°	06:32	07:12	07:49	16:33	17:10	17:50	
45°	06:23	06:59	07:32	16:50	17:23	17:59	
N 40°	06:15	06:48	07:18	17:04	17:34	18:07	
35°	06:08	06:39	07:06	17:16	17:43	18:14	
30°	06:01	06:30	06:56	17:26	17:52	18:21	
20°	05:47	06:14	06:38	17:44	18:08	18:34	
N 10°	05:34	06:00	06:22	18:00	18:22	18:48	
0°	05:20	05:45	06:07	18:14	18:36	19:02	
S 10°	05:03	05:30	05:52	18:29	18:52	19:18	
20°	04:44	05:12	05:36	18:45	19:09	19:38	
30°	04:19	04:51	05:17	19:04	19:30	20:02	
35°	04:03	04:38	05:06	19:15	19:43	20:18	
40°	03:44	04:23	04:54	19:27	19:59	20:37	
45°	03:19	04:04	04:39	19:42	20:17	21:02	
S 50°	02:44	03:40	04:20	20:01	20:41	21:36	
52°	02:25	03:28	04:12	20:09	20:53	21:54	
54°	02:02	03:14	04:02	20:19	21:06	22:17	
56°	01:28	02:58	03:51	20:30	21:22	22:50	
58°	////	02:38	03:38	20:43	21:42	////	
S 60°	////	02:13	03:23	20:57	22:06	////	

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	07:37			05:31		
N 70°	08:41			04:28		
68°	09:18			03:54		
66°	09:44	09:08		03:29	05:52	
64°	10:04	09:48	09:06	03:10	05:12	07:46
62°	10:21	10:16	10:11	02:54	04:45	06:41
60°	10:35	10:38	10:46	02:41	04:24	06:07
N 58°	10:47	10:56	11:11	02:30	04:07	05:42
56°	10:57	11:11	11:32	02:21	03:52	05:22
54°	11:06	11:24	11:49	02:12	03:40	05:05
52°	11:15	11:35	12:03	02:05	03:29	04:51
50°	11:22	11:45	12:16	01:58	03:20	04:39
45°	11:38	12:07	12:42	01:44	02:59	04:13
N 40°	11:51	12:24	13:03	01:32	02:43	03:53
35°	12:03	12:39	13:21	01:22	02:29	03:36
30°	12:13	12:52	13:36	01:13	02:18	03:22
20°	12:30	13:14	14:01	00:58	01:57	02:57
N 10°	12:45	13:33	14:24	00:45	01:40	02:36
0°	12:59	13:51	14:45	00:33	01:23	02:16
S 10°	13:13	14:09	15:05	00:21	01:07	01:57
20°	13:29	14:28	15:28	00:08	00:50	01:36
30°	13:47	14:51	15:54		00:30	01:12
35°	13:57	15:04	16:10		00:19	00:57
40°	14:09	15:20	16:28		00:05	00:41
45°	14:23	15:38	16:50	23:50		00:22
S 50°	14:41	16:02	17:18	23:31	23:57	
52°	14:49	16:13	17:32	23:22	23:46	•• ••
54°	14:59	16:26	17:47	23:12	23:33	
56°	15:09	16:40	18:06	23:01	23:17	23:44
58°	15:21	16:58	18:29	22:48	22:59	23:20
S 60°	15:35	17:19	19:00	22:33	22:37	22:49

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	59-79%	
19	10:24	10:34	12:11	19:11	06:46		
20	10:43	10:52	12:11	20:03	07:37		
21	11:01	11:09	12:11	20:58	08:30		

January 22, 23, 24 UT (Mon., Tue., Wed.)

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	120°51.00		S22°18.37	196°36.44	S23°32.72	86°24.71	N12° 37.95	143°6.20	S11°3.67			
1	$135^{\circ}53.47$	227°39.29	18.52	211°36.85	32.56	101°27.01	38.02	158°8.41	3.57	Alpheratz	357°35.78 353°8.09	29°13.45 -42°10.80
2	$150^{\circ}55.93$	242°38.43	18.68	226°37.26	32.40	116°29.30	38.09	$173^{\circ}10.62$	3.47	Ankaa Schedar	353 8.09 349°32.17	-42 10.80 56°40.36
3	165°58.40	257° 37.57	• • 18.83	241°37.68	• • 32.23	131°31.59	• • 38.16	188° 12.83	• • 3.37	Diphda	348°48.20	-17°51.47
4 5	181°0.86 196°3.32	272°36.71 287°35.86	18.98 19.13	256°38.09 271°38.50	32.07 31.90	146°33.88 161°36.17	38.24 38.31	203° 15.04 218° 17.24	3.27 3.17	Achernar	$335^{\circ}20.82$	-57°7.20
6	211°5.79	302° 35.00	S22°19.28	286°38.91	\$1.90 \$23°31.74	101 30.17 176°38.45	N12° 38.38	233° 19.45	511°3.07	Hamal	327°52.08	23°34.62
7	226°8.25	317°34.14	19.43	301°39.32	31.58	191°40.74	38.45	248°21.66	2.97	Polaris	314°16.92	89°22.24
8	241°10.72	332°33.28	19.58	316°39.73	31.41	206°43.03	38.52	263°23.87	2.86	Acamar Menkar	315°12.25 314°6.88	-40°12.75 4°10.99
9	256° 13.18	347°32.43	• • 19.72	331°40.14	• • 31.24	221°45.32	• • 38.60	278°26.08	• • 2.76	Mirfak	308°29.20	49°56.97
10	271° 15.65	2°31.57	19.87	346°40.55	31.08	236°47.61	38.67	293°28.28	2.66	Aldebaran	290°40.31	16°33.46
11 12	286° 18.11 301° 20.57	17° 30.71 32° 29.85	20.01 \$22°20.15	1°40.96 16°41.37	30.91 \$23°30.74	251°49.90 266°52.18	38.74 N12°38.81	308°30.49 323°32.70	2.56 \$11°2.46	Rigel	$281^{\circ}4.37$	-8°10.51
13	316° 23.04	47°28.99	20.29	31°41.78	30.58	281°54.47	38.89	338°34.91	2.36	Capella	280°22.69	46°1.42
14	331°25.50	62°28.13	20.44	46°42.20	30.41	296°56.76	38.96	353°37.11	2.26	Bellatrix Elnath	278°23.46 278°2.57	6°22.25 28°37.70
15	346°27.97	77°27.27	• • 20.57	61°42.61	• • 30.24	311°59.04	• • 39.03	8°39.32	• • 2.16	Alnilam	275°38.26	-1°11.25
16	1°30.43	92°26.41	20.71	76°43.02	30.07	327°1.33	39.11	23°41.53	2.06	Betelgeuse	270°52.65	7°24.66
17 18	16°32.90 31°35.36	107°25.55 122°24.70	20.85 \$22°20.99	91°43.43 106°43.84	29.90 \$23°29.73	342°3.61 357°5.90	39.18 N12°39.25	38°43.74 53°45.94	1.95 \$11° 1.85	Canopus	263°52.24	-52°42.59
19	46° 37.82	137° 23.84	21.12	100°43.04 121°44.25	29.56	12°8.18	39.33	68° 48.15	1.75	Sirius	258°26.61	-16°45.01
20	61°40.29	152°22.98	21.25	136°44.66	29.39	27°10.47	39.40	83°50.36	1.65	Adhara	255°6.12	-29°0.34
21	76°42.75	$167^{\circ}22.12$	• • 21.39	151°45.07	• • 29.22	42°12.75	• • 39.47	98°52.56	•• 1.55	Procyon Pollux	244°51.33 243°17.89	5°9.76 27°58.05
22	91°45.22	182°21.25	21.52	166°45.48	29.04	57°15.04	39.55	113°54.77	1.45	Avior	234°14.41	-59°35.13
23	106° 47.68	197°20.39	21.65	181°45.90	28.87	72°17.32	39.62	128° 56.98	1.34	Suhail	222°46.46	-43°31.71
Mer.p	bass. 15:54	ν -0.9 $'$ d0.	.2′ m-3.94	$ u$ 0.4 $^{\prime}$ d-0	.2′ m1.34	ν 2.3′ d0	.1′ m-2.42	ν 2.2′ d-0	$.1'~{\sf m0.98}$	Miaplacidus	221°37.55	-69°48.80
										Alphard	217°48.22	-8°45.79
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.99	11°50.90
0	121°50.14	212°19.53	S22°21.78	196°46.31	\$23°28.70	$87^{\circ}19.61$	N12°39.69	143°59.18	S11°1.24	Dubhe Denebola	193°41.46 182°25.57	61°37.06 14°26.14
1	136° 52.61	227° 18.67	21.90	211°46.72	28.53	102°21.89	39.77	159°1.39	1.14	Gienah	175°44.25	-17°40.48
2	151°55.07	242°17.81	22.03	226°47.13	28.35	117°24.17	39.84	174°3.60	1.04	Acrux	173°0.73	-63°13.67
3 4	166° 57.54 182° 0.00	257° 16.95 272° 16.09	· · 22.16 22.28	241°47.54 256°47.95	· · 28.18 28.00	132°26.45 147°28.74	· · 39.92 39.99	189°5.80 204°8.01	· · 0.94 0.84	Gacrux	$171^{\circ}52.32$	$\text{-}57^{\circ}14.62$
5	197°2.47	287° 15.23	22.40	271°48.36	27.83	162°31.02	40.07	219° 10.22	0.74	Alioth	166°13.48	55°49.46
6	212°4.93	302°14.37	S22°22.53	286°48.77	\$23°27.65	177°33.30	N12°40.14	234° 12.42	S11°0.63	Spica	158°23.09	-11°17.20 49°11.29
7	227°7.39	$317^{\circ}13.51$	22.65	301°49.19	27.48	192°35.58	40.22	$249^{\circ}14.63$	0.53	Alkaid Hadar	152°52.59 148°37.17	-60°29.06
8	242°9.86	332°12.64	22.77	316°49.60	27.30	207°37.86	40.29	264° 16.84	0.43	Menkent	147°58.57	-36°29.14
9	257°12.32	347°11.78	• • 22.89	331°50.01	• • 27.13	222°40.14	• • 40.36	279° 19.04	• • 0.33	Arcturus	145°48.66	19°3.25
10 11	272° 14.79 287° 17.25	2°10.92 17°10.06	23.00 23.12	346°50.42 1°50.83	26.95 26.77	237°42.42 252°44.70	40.44 40.51	294°21.25 309°23.45	0.23 0.12	Rigil Kent.	139°41.51	-60°55.80
12	302° 19.72	32°9.19	\$22°23.23	16°51.24	\$23°26.59	267°46.98	N12° 40.59	324°25.66	\$11°0.02	Kochab	137°20.01	74°3.02
13	317°22.18	47°8.33	23.35	31°51.65	26.41	282°49.26	40.67	339°27.87	10°59.92	Zuben'ubi	136°56.97 126°4.56	-16°8.47 26°37.80
14	$332^{\circ}24.64$	62°7.47	23.46	46°52.07	26.24	297°51.54	40.74	354°30.07	59.82	Alphecca Antares	120 4.50 112° 17.04	-26°29.06
15	347°27.11	77°6.61	• • 23.57	61°52.48	• • 26.06	312°53.82	• • 40.82	9°32.28	• • 59.72	Atria	107°12.39	-69°4.01
16	2°29.57	92°5.74	23.68	76°52.89	25.88	327°56.10	40.89	24°34.48	59.61	Sabik	$102^{\circ}3.95$	$-15^{\circ}45.30$
17 18	17°32.04 32°34.50	107°4.88 122°4.02	23.79 \$22°23.90	91°53.30 106°53.71	25.70 \$23°25.52	342°58.38 358°0.66	40.97 N12°41.04	39°36.69 54°38.89	59.51 \$10°59.41	Shaula	96°11.78	-37°7.21
19	47°36.96	137°3.15	24.01	121°54.12	25.33	13°2.93	41.12	69°41.10	59.31	Rasalhague	95°59.56	12°32.41
20	62°39.43	152°2.29	24.12	136°54.54	25.15	28°5.21	41.19	84°43.31	59.21	Eltanin Kaus Aust.	90°43.01 83°33.93	51°28.90 -34°22.38
21	77° 41.89	167°1.43	• • 24.22	151°54.95	• • 24.97	43°7.49	• • 41.27	99° 45.51	•• 59.10	Vega	80°34.16	38°48.17
22	92°44.36	182°0.56	24.32	166°55.36	24.79	58°9.76	41.35	114°47.72	59.00	Nunki	75°49.09	-26°16.05
23	107°46.82	196°59.70	24.43	181°55.77	24.61	73°12.04	41.42	129°49.92	58.90	Altair	$62^{\circ}1.07$	$8^{\circ}55.80$
Mer.p	bass. 15:50	ν -0.9' d0.	.1′ m-3.94	ν 0.4′ d-0	.2′ m1.34	ν 2.3′ d0	.1′ m-2.42	ν 2.2′ d-0	.1' m 0.98	Peacock	53°7.56	-56°39.54
										Deneb	49°26.82	45°21.91 9°59.03
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°39.88 27°34.30	-46°50.88
0	122°49.29	211°58.84	S22°24.53	196°56.18	S23°24.42	88°14.32	N12°41.50	144°52.13	S10°58.80	Fomalhaut	15°15.65	-29°29.90
1	137°51.75	226°57.97	24.63	211°56.59	24.24	103°16.59	41.58	159°54.33	58.70	Scheat	$13^{\circ}46.24$	$28^{\circ}12.81$
2	152° 54.21 167° 56.68	241°57.11 256°56.24	24.73 •• 24.83	226°57.01 241°57.42	24.05 •• 23.87	118°18.87 133°21.14	41.65 •• 41.73	174°56.54 189°58.74	58.59 •• 58.49	Markab	13°30.93	15°20.04
4	182° 59.14	271°55.38	24.83	256°57.83	23.68	148°23.42	41.73	205°0.95	58.39	Jan 22 Mon	SHA	Mer.pass
5	198°1.61	286° 54.51	25.02	271°58.24	23.50	163°25.69	41.88	220° 3.15	58.29	Venus	$91^{\circ}49.14$	09:50
6	213°4.07		S22°25.11	286°58.65	S23°23.31	178°27.97	N12°41.96	235°5.36	S 10°58.18	Mars	75°45.44	10:53
7	228°6.54	316°52.78	25.21	301°59.07	23.13	193°30.24	42.04	250°7.56	58.08	Jupiter	325°33.71	18:12
8 9	243°9.00 258°11.46	331°51.92 346°51.05	25.30	316°59.48	22.94 •• 22.75	208°32.51 223°34.79	42.11 •• 42.19	265°9.77 280°11.97	57.98	Saturn	22°15.20	14:25
10	273° 13.93	1°50.19	· · 25.39 25.48	331°59.89 347°0.30	22.75	238°37.06	42.19	200 11.97 295° 14.17	•• 57.88 57.77	Jan 23 Tue	SHA	Mer.pass
11	288° 16.39	16°49.32	25.57	2°0.71	22.38	253°39.33	42.35	310° 16.38	57.67	Venus	90°29.39	09:51
12	303°18.86	31°48.46	S22°25.66	17°1.13	S23°22.19	268°41.61	N12°42.42	325°18.58	S10°57.57	Mars	74°56.16	10:53
13	318°21.32	46°47.59	25.74	32°1.54	22.00	283°43.88	42.50	340°20.79	57.47	Jupiter Saturn	325°29.46 22°9.04	18:08 14:22
14	333°23.78	61°46.73	25.83	47°1.95	21.81	298°46.15	42.58	355°22.99	57.36			
15 16	348°26.25 3°28.71	76°45.86 91°44.99	· · 25.91 26.00	62°2.36 77°2.77	· · 21.62 21.43	313°48.42 328°50.69	· · 42.66 42.73	10°25.20 25°27.40	•• 57.26 57.16	Jan 24 Wed	SHA 80°0 55	Mer.pass
17	3 20.71 18°31.18	106°44.13	26.00	92°3.19	21.43	343°52.96	42.73	40° 29.60	57.16	Venus Mars	89°9.55 74°6.90	09:53 10:52
18	33°33.64	121°43.26	S22°26.16	107° 3.60	S23°21.05	358°55.23	N12°42.89	55°31.81	\$10°56.95	Jupiter	325°25.03	18:04
19	48°36.11	136°42.39	26.24	122°4.01	20.85	13°57.50	42.97	70°34.01	56.85	Saturn	22°2.84	14:18
20	63°38.57	151°41.53	26.32	137°4.42	20.66	28°59.77	43.05	85°36.22	56.75	Horizon	ntal parallax	
21 22	78° 41.03 93° 43.50	166°40.66 181°39.79	· · 26.40 26.47	152° 4.83 167° 5.25	· · 20.47 20.28	44°2.04 59°4.31	· · 43.13 43.20	100°38.42 115°40.62	• • 56.65 56.54	71011201	Venus:	0.1
23	93 45.50 108° 45.96	196° 38.93	26.55	182° 5.66	20.28	74°6.58	43.28	130° 42.83	56.44		Mars:	0.1
ivier.p	bass. 15:46	ν -0.9′ d0.	.1′ m-3.94	νυ.4′ d -0	.2′ m1.34	ν 2.3' $d0$.1′ m-2.41	ν 2.2′ d-0	.1. mu.98			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°10.60	S19°50.34	43°53.23	7.8'	N27°13.29	4.2'	56.2'
1	192°10.43	49.78	58°20.00	7.8'	$27^{\circ}17.53$	4.1'	56.2'
2	207°10.26	49.21	72°46.75	7.7'	27°21.61	3.9'	56.1'
3	222°10.09	• • 48.65	87°13.49	7.7'	27°25.54	3.8'	56.1'
4 5	237° 9.91 252° 9.74	48.09 47.52	101°40.20 116°6.90	7.7' 7.7'	27°29.31 27°32.93	3.6' 3.5'	56.1' 56.1'
6	267° 9.57	\$19°46.96	130°33.58	7.7'	N27°36.39	3.3'	56.1
7	282° 9.40	46.40	145° 0.25	7.7'	27°39.69	3.2'	56.0'
8	297° 9.23	45.83	159°26.91	7.6'	27°42.85	3.0'	56.0'
9	312°9.06	• • 45.26	173°53.55	7.6'	27°45.84	2.8'	56.0'
10	327°8.89	44.70	188°20.19	7.6'	27°48.68	2.7'	56.0'
11	342°8.72	44.13	202°46.82	7.6'	27°51.36	2.5'	56.0'
12 13	357° 8.55 12° 8.38	\$19°43.56 42.99	217°13.45 231°40.07	7.6' 7.6'	N27°53.89 27°56.26	2.4' 2.2'	55.9' 55.9'
13	27° 8.21	42.42 42.42	246° 6.69	7.6'	27°58.47	2.1'	55.9'
15	42° 8.05	• • 41.85	260°33.30	7.6'	28°0.53	1.9'	55.9'
16	57°7.88	41.28	274°59.92	7.6'	28°2.43	1.7'	55.9'
17	72°7.71	40.71	289°26.54	7.6'	28°4.17	1.6'	55.8'
18	87°7.54	S19°40.14	303°53.17	7.6'	N28°5.76	1.4'	55.8'
19	102°7.38	39.56	318°19.80	7.6'	28°7.19	1.3'	55.8'
20	117°7.21	38.99	332°46.44	7.6'	28°8.46	1.1'	55.8'
21 22	132°7.04 147°6.88	· · 38.42 37.84	347°13.08 1°39.74	7.7' 7.7'	28°9.58 28°10.54	1.0' 0.8'	55.8' 55.7'
22	147° 6.88 162° 6.71	37.84 37.27	1°39.74 16°6.41	7.7'	28°10.54 28°11.34	0.8	55.7' 55.7'
23			10 0.41			5.0	33.1
	SD = 16.2'	d = -0.6'		SL	0 = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 6.55 192° 6.38	\$19°36.69	30°33.09	7.7'	N28°11.99 28°12.49	0.5'	55.7'
1 2	192°6.38 207°6.22	36.11 35.54	44°59.79 59°26.51	7.7' 7.7'	28°12.49 28°12.82	0.3' 0.2'	55.7' 55.7'
3	207 0.22 222°6.05	34.96	73°53.25	7.8'	28°13.01	0.2	55.6'
4	237°5.89	34.38	88°20.00	7.8'	28°13.03	-0.1	55.6'
5	252° 5.73	33.80	102°46.78	7.8'	$28^{\circ}12.91$	-0.3'	55.6'
6	267° 5.56	S19°33.22	117°13.58	7.8'	N28°12.62	-0.4'	55.6'
7	282°5.40	32.64	131°40.41	7.9'	28°12.19	-0.6'	55.6'
8	297° 5.24	32.06	146°7.26	7.9'	28°11.60	-0.7'	55.5'
9 10	312°5.08 327°4.91	· · 31.48 30.90	160°34.15 175°1.06	7.9' 7.9'	28°10.85 28°9.96	-0.9' -1.0'	55.5' 55.5'
11	327 4.91 342° 4.75	30.32	175 1.06 189°28.01	7.9 8.0'	28 9.96 28°8.91	-1.0 -1.2'	55.5'
12	357° 4.59	519°29.73	203°54.99	8.0'	N28°7.71	-1.4	55.5'
13	12°4.43	29.15	218°22.00	8.1'	28°6.35	-1.5'	55.5'
14	27°4.27	28.56	232°49.05	8.1'	28°4.85	-1.7'	55.4'
15	42°4.11	•• 27.98	247°16.14	8.1'	28°3.19	-1.8'	55.4'
16	57° 3.95	27.39	261°43.27	8.2'	28°1.39	-2.0'	55.4'
17 18	72°3.79 87°3.63	26.81 \$19°26.22	276°10.44 290°37.65	8.2' 8.3'	27°59.43 N27°57.33	-2.1' -2.3'	55.4' 55.4'
19	102°3.47	25.63	290 37.05 305°4.91	o.s 8.3'	27°55.07	-2.3 -2.4'	55.3'
20	117° 3.32	25.04	319°32.21	8.3'	27°52.67	-2.5'	55.3'
21	132°3.16	• • 24.45	333°59.56	8.4'	27°50.12	-2.7'	55.3'
22	147°3.00	23.86	348°26.96	8.4'	27°47.42	-2.8'	55.3'
23	162°2.84	23.27	2°54.40	8.5'	27°44.58	-3.0'	55.3'
	SD = 16.2'	d = -0.6'		SD	0 = 15.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 2.69	S19°22.68	17°21.90	8.6'	N27°41.59	-3.1'	55.3'
1	192°2.53	22.09	31°49.45	8.6'	27°38.46	-3.3'	55.2'
2	207°2.37	21.50	46°17.06	8.7'	27°35.19	-3.4'	55.2'
3 4	222°2.22 237°2.06	· · 20.91 20.31	60°44.72 75°12.44	8.7' 8.8'	27°31.77 27°28.20	-3.6' -3.7'	55.2' 55.2'
5	252° 1.91	19.72	89°40.21	8.8'	27°24.50	-3.1' -3.8'	55.2'
6	267° 1.75	S19°19.12	104°8.04	8.9'	N27°20.65	-4.0'	55.2'
7	282°1.60	18.53	118°35.94	9.0'	$27^{\circ}16.67$	-4.1'	55.1'
8	297°1.44	17.93	133°3.89	9.0'	27°12.54	-4.3'	55.1'
9	312°1.29	. 17.34	147°31.91	9.1'	27°8.28	-4.4'	55.1'
10 11	327°1.13 342°0.98	16.74 16.14	161°59.99 176°28.13	9.1' 9.2'	27°3.87 26°59.34	-4.5' -4.7'	55.1' 55.1'
11	342°0.98 357°0.83	16.14 \$19°15.54	176°28.13 190°56.35	9.2	26°59.34 N26°54.66	-4.7' -4.8'	55.1'
13	12° 0.68	14.95	205°24.62	9.3'	26°49.85	-4.0 -4.9'	55.0'
14	27° 0.52	14.35	219°52.97	9.4	26°44.90	-5.1'	55.0'
15	42°0.37	•• 13.75	234°21.38	9.5'	$26^{\circ}39.82$	-5.2'	55.0'
16	57° 0.22	13.15	248°49.87	9.6'	26°34.61	-5.3'	55.0'
17	72°0.07	12.54	263°18.42	9.6'	26°29.27	-5.5'	55.0'
18 19	86°59.92 101°59.77	\$19°11.94 11.34	277°47.05 292°15.74	9.7' 9.8'	N26°23.80 26°18.19	-5.6' -5.7'	55.0' 54.9'
20	101°59.77 116°59.62	11.34 10.74	306°44.52	9.8'	26° 18.19 26° 12.46	-5.7° -5.9°	54.9' 54.9'
21	131°59.47	. 10.13	321°13.36	9.9'	26°6.60	-6.0'	54.9'
22	146°59.32	9.53	335°42.28	10.0'	26°0.61	-6.1'	54.9'
23	161°59.17	8.92	$350^{\circ}11.28$	10.1'	25°54.50	-6.2'	54.9'
	SD = 16.2'	d = -0.6'		SD	0 = 15.1'		

Naut. Civil Sumset Civil Naut. N 72° 07:41 09:20 ■ 15:04 16:44 N 70° 07:29 08:54 10:44 13:40 15:31 16:56 68° 07:19 08:34 09:59 14:26 15:50 17:05 66° 07:11 08:18 09:29 14:55 16:06 17:14 64° 07:04 08:05 09:07 15:17 16:19 17:21 62° 06:57 07:54 08:49 15:35 16:30 17:27 60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:04	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° 07:29 08:54 10:44 13:40 15:31 16:56 68° 07:19 08:34 09:59 14:26 15:50 17:05 66° 07:11 08:18 09:29 14:55 16:06 17:14 64° 07:04 08:05 09:07 15:17 16:19 17:21 62° 06:57 07:54 08:49 15:35 16:30 17:27 60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° 07:19 08:34 09:59 14:26 15:50 17:05 66° 07:11 08:18 09:29 14:55 16:06 17:14 64° 07:04 08:05 09:07 15:17 16:19 17:21 62° 06:57 07:54 08:49 15:35 16:30 17:27 60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47	N 72°	07:41	09:20			15:04	16:44
66° 07:11 08:18 09:29 14:55 16:06 17:14 64° 07:04 08:05 09:07 15:17 16:19 17:21 62° 06:57 07:54 08:49 15:35 16:30 17:27 60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38	N 70°	07:29	08:54	10:44	13:40	15:31	16:56
64° 07:04 08:05 09:07 15:17 16:19 17:21 62° 06:57 07:54 08:49 15:35 16:30 17:27 60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:54 18:23 20° 05:47 06:14		07:19	08:34	09:59	14:26	15:50	17:05
62° 06:57 07:54 08:49 15:35 16:30 17:27 60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:54 18:13 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14		07:11	08:18	09:29	14:55	16:06	17:14
60° 06:52 07:44 08:34 15:50 16:40 17:32 N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00							
N 58° 06:47 07:36 08:22 16:02 16:48 17:38 56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:55 05:31							
56° 06:42 07:28 08:11 16:13 16:56 17:42 54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 50° 05:55 05:31	60°	06:52	07:44	08:34	15:50	16:40	17:32
54° 06:38 07:21 08:02 16:22 17:03 17:46 52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14	N 58°	06:47	07:36	08:22	16:02	16:48	17:38
52° 06:34 07:15 07:53 16:31 17:09 17:50 50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 30° 06:00 06:29 06:55 17:19 17:54 18:17 30° 06:00 06:25 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14 05:38 18:45 19:29 20:01 35° 04:07 04:41 05:10		06:42	07:28	08:11	16:13	16:56	17:42
50° 06:30 07:10 07:46 16:38 17:14 17:54 45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14 05:38 18:45 19:09 19:37 30° 04:22 04:54 05:20 19:03 19:29 20:01 40° 03:48 04:26		06:38	07:21		-	17:03	
45° 06:22 06:57 07:29 16:54 17:26 18:02 N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14 05:38 18:45 19:09 19:37 30° 04:22 04:54 05:20 19:03 19:29 20:01 35° 04:07 04:41 05:10 19:13 19:42 20:16 40° 03:48 04:26							
N 40° 06:14 06:47 07:16 17:08 17:37 18:10 35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14 05:38 18:45 19:09 19:37 30° 04:22 04:54 05:20 19:03 19:29 20:01 35° 04:07 04:41 05:10 19:13 19:42 20:16 40° 03:48 04:26 04:57 19:25 19:56 20:35 45° 03:24 04:08							
35° 06:07 06:38 07:05 17:19 17:46 18:17 30° 06:00 06:29 06:55 17:29 17:54 18:23 20° 05:47 06:14 06:38 17:46 18:09 18:36 N 10° 05:34 06:00 06:22 18:01 18:23 18:49 0° 05:21 05:46 06:08 18:15 18:37 19:03 S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14 05:38 18:45 19:09 19:37 30° 04:22 04:54 05:20 19:03 19:29 20:01 35° 04:07 04:41 05:10 19:13 19:42 20:16 40° 03:48 04:26 04:57 19:25 19:56 20:35 45° 03:24 04:08 04:43 19:40 20:14 20:58 50° 02:51 03:45	45°	06:22	06:57	07:29	16:54	17:26	18:02
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		06:14					18:10
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
S 10° 05:05 05:31 05:54 18:30 18:52 19:18 20° 04:46 05:14 05:38 18:45 19:09 19:37 30° 04:22 04:54 05:20 19:03 19:29 20:01 35° 04:07 04:41 05:10 19:13 19:42 20:16 40° 03:48 04:26 04:57 19:25 19:56 20:35 45° 03:24 04:08 04:43 19:40 20:14 20:58 S 50° 02:51 03:45 04:25 19:57 20:37 21:31 52° 02:34 03:34 04:17 20:06 20:48 21:48 54° 02:12 03:21 04:07 20:15 21:01 22:09 56° 01:42 03:05 03:57 20:25 21:16 22:37 58° 00:49 02:47 03:45 20:37 21:34 23:25							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1	05:21	05:46	06:08	18:15	18:37	19:03
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:05			18:30		19:18
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
45° 03:24 04:08 04:43 19:40 20:14 20:58 \$ 50° 02:51 03:45 04:25 19:57 20:37 21:31 52° 02:34 03:34 04:17 20:06 20:48 21:48 54° 02:12 03:21 04:07 20:15 21:01 22:09 56° 01:42 03:05 03:57 20:25 21:16 22:37 58° 00:49 02:47 03:45 20:37 21:34 23:25							
S 50° 02:51 03:45 04:25 19:57 20:37 21:31 52° 02:34 03:34 04:17 20:06 20:48 21:48 54° 02:12 03:21 04:07 20:15 21:01 22:09 56° 01:42 03:05 03:57 20:25 21:16 22:37 58° 00:49 02:47 03:45 20:37 21:34 23:25							
52° 02:34 03:34 04:17 20:06 20:48 21:48 54° 02:12 03:21 04:07 20:15 21:01 22:09 56° 01:42 03:05 03:57 20:25 21:16 22:37 58° 00:49 02:47 03:45 20:37 21:34 23:25		03:24	04:08	04:43	19:40	20:14	20:58
54° 02:12 03:21 04:07 20:15 21:01 22:09 56° 01:42 03:05 03:57 20:25 21:16 22:37 58° 00:49 02:47 03:45 20:37 21:34 23:25							
56° 01:42 03:05 03:57 20:25 21:16 22:37 58° 00:49 02:47 03:45 20:37 21:34 23:25							
58° 00:49 02:47 03:45 20:37 21:34 23:25							
S 60° /// 02:24 03:30 20:51 21:57 ///							
	S 60°	////	02:24	03:30	20:51	21:57	////

Lat.		Moonris	е		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°						
62°	10:03		12:31	08:44		10:04
60°	11:06	11:55	13:16	07:41	08:47	09:19
N 58°	11:41	12:32	13:46	07:07	08:10	08:49
56°	12:06	12:58	14:09	06:42	07:44	08:26
54°	12:26	13:19	14:27	06:22	07:23	08:07
52°	12:43	13:37	14:43	06:05	07:06	07:51
50°	12:57	13:51	14:56	05:51	06:51	07:37
45°	13:27	14:21	15:24	05:21	06:21	07:09
N 40°	13:50	14:45	15:45	04:59	05:57	06:47
35°	14:09	15:04	16:03	04:40	05:38	06:29
30°	14:26	15:21	16:19	04:24	05:21	06:13
20°	14:53	15:49	16:45	03:56	04:53	05:46
N 10°	15:17	16:13	17:07	03:33	04:29	05:23
0°	15:40	16:35	17:28	03:11	04:06	05:01
S 10°	16:02	16:57	17:49	02:49	03:44	04:39
20°	16:26	17:21	18:11	02:26	03:20	04:16
30°	16:54	17:49	18:37	01:59	02:51	03:48
35°	17:11	18:06	18:52	01:43	02:35	03:32
40°	17:30	18:25	19:10	01:24	02:15	03:13
45°	17:54	18:48	19:31	01:02	01:51	02:50
S 50°	18:24	19:18	19:57	00:33	01:21	02:21
52°	18:40	19:33	20:10	00:19	01:06	02:06
54°	18:57	19:50	20:25	00:03	00:48	01:49
56°	19:18	20:10	20:42		00:27	01:29
58°	19:46	20:36	21:03	•• ••	00:00	01:04
S 60°	20:24	21:11	21:29	23:21		00:28

Sun

mm:ss

11:26

11:42

11:57

Mer.

Pass

hh:mm

12:11

12:12

12:12

Eqn.of Time 12^h

mm:ss

11:18

11:34

11:49

Day

22 23 24 Moon

Lower

hh:mm

09:25 10:21

11:15

Age

11-13 86-97%

Mer.Pass.

Upper hh:mm

21:53

22:48

23:41

January 25, 26, 27 UT (Thu., Fri., Sat.)

The Dec Color	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1	Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1 1896 100 200 270 170 100 200 270 170 100 100 100 100 100 100 100 100 1							
186 186	1						
8 1997 92 50 27 1998 1	2	153° 53.35	241°36.33 26.77	227°6.90 19.50	119°13.39 43.52	175°49.44 56.13	
19							
1							
7 229°5 08 316°19.99 271.1 30°5 90 18.22 194°2 47 2 43.91 297°4 5 50.21 1							
8 224°61.6 331°13.12 27.17 317°0.37 18.21 200°2.00 4.190 200°2.60 5.51 1 9 309°10.00 30°0.00 30°0.00 30°7.00 31.70 30°7.00 18.12 20°7.00 31.10 30°1.00 18.10 19.10							Polaris 314°18.29 89°22.25
0 279 130 179							
11 2891152 19°252 27°30 2°106 1773 28°377 44.15 209°76 5.31 1 1 2891152 19°252 27°30 2°106 1773 28°377 44.31 30°1147 50°55 10 12 39911510 37°250 522°74.3 17°102 523°173 29°350 17°44.3 30°1147 50°55 10 13 3997253 70°250 10°251 27°5 47°112 50°153 31°42.3 4.15 20°151 20°55 10 15 3997253 70°250 10°251 27°5 47°112 50°153 31°42.3 4.15 20°151 20°50 10°5							
19	10						
15 991 800	11	289° 15.53			254°33.78 44.23	311°9.27 55.21	
Bellativ 1967 1978 197							
15 349°2539 17°2540 27.50 27.50 27.50 27.50 16.63 314°2588 32°40 14.64 30°50 30°40							
A							Elnath 278°2.57 28°37.70
19 19 19 19 19 19 19 19							
18 34 37 37 37 37 37 37 37							
Additional Color							
19	19	49°35.25			14°51.90 44.87	71°26.89 54.38	
Policy 1971	20						
23 108 25 25 26 26 26 26 26 26							
Fri GHA CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec CHA							
Fri GHA 0 144*4757 211*1722 527*385 391*1898 524*51.00 0 124*4757 211*1722 527*385 391*1898 524*51.00 0 124*4757 211*1722 527*385 391*1898 524*51.00 0 124*4757 211*1722 527*385 391*1898 524*51.00 0 124*4757 211*1722 527*385 391*1898 524*51.00 0 125*4572 40 24*17548 2 24.4 227*18.18 14.90 0 105*437 4 43.36 161*14*01 3 1.69*5490 24*17548 1 28.18 24*1722 1.148 135*1999 4.552 191*14*50 5335.5 0 199*599 286*1212 72.2 1.148 135*1999 4.552 191*14*50 5335.5 0 199*599 286*1212 32.27*13.74 1 2.83.3 27*17.05 1 1.22*8 1.06*13.18 1 4.60 20*17.73 24.54 1 1.76*43.0 53.66 63*13.06 63*13.	23	109° 45.10	196°18.09 28.01		75°0.94 45.20	131°35.69 53.97	Suhail 222°46.45 -43°31.72
Fig. GHA	Mer.	pass. 15:42	ν -0.9 $'$ d 0.1 $'$ m-3.93	$ u 0.4' \ d$ -0.2' m1.34	$\nu 2.3' \ d0.1' \ \text{m-}2.40$	$\nu 2.2' \ d$ -0.1' m0.99	Miaplacidus 221°37.54 -69°48.82
Fig. CHA Dec CHA Dec CHA Dec CHA Dec CHA Dec Dubble 193°41.2 61°37.0							
1 139°503 226°163°5 221°163° 140°171599 323°1810 90°3 21' N12°45.38 146°370 510°53.86 100°595.40 241°15.48 121°1639 141 491 120°773 4536 161°20.10 53.76 2 154°52.49 256°14.61 22818 227°1281 14.69 120°773 4536 170°42.30 53.66 3 169°54.60 256°14.61 22818 227°128 11.48 135°99 4.552 191°45.60 256°14.61 235.55 100°596 266°1287 228.23 237°176.3 14.28 135°99 4.552 191°45.60 256°14.61 235.55 100°596 266°1287 228.23 237°176.3 14.28 135°99 4.552 21°46.91 5.35 100°596 266°1287 228.23 237°176.3 14.28 135°99 4.552 21°46.91 5.35 100°596 266°1287 228.23 237°176.3 14.28 135°99 4.552 21°46.91 5.35 100°596 266°1287 228.23 237°176.3 14.28 135°10.70 151°45.1 45.60 200°46.70 53.45 100°596 266°1287 228.23 237°176.3 14.28 130°10.10 151°1.51 151°53.24 100°14.67 1676.5 228.23 120°18.46 5.33°13.86 100°16.77 112°45.7 230°51.31 510°53.24 11 200°14.67 16°7.65 28.49 2°20.53 12.82 25°22.54 4.60 11 281°57.1 22.33 11 200°14.67 16°7.65 28.49 2°20.53 12.82 25°22.64 4.60 11 281°57.1 22.33 11 200°14.67 16°7.65 28.49 2°20.53 12.82 25°22.64 4.60 11 281°57.0 25.23 11 230°19.60 46°5.91 28.69 2°20.53 12.82 25°20.60 46.09 296°9.91 1.53 0 448°1.0 11.2 20°20.1 1.2 20°2	Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 139°5030 226°16.35 2810 212°16.39 14.90 105°9.47 45.36 161°a.010 53.76 2 154°52.40 241°15.46 2814 2814 272°16.81 14.69 120°7.73 45.44 176°a.230 53.56 3 169°54.66 1 2818 242°17.22 11.44 81 135°19.99 14.55 2 191°a.44.60 153.35 5 169°59.89 262°12.87 22°16.86 14.07 165°14.51 45.68 221°a.89 1 53.35 6 215°2.35 301°12.00 522°28.31 287°14.66 243°1.25 45.60 2.00°6.67 0 53.45 4 184°57.42 271°13.14 28.23 25°717.63 14.35 150°12.29 45.93 250°51.15 150°3.04 Alcient field fiel							
2 114 5249 241 1548 2214 16 31 14 227 16 31 14 69 1207 7.7 45.44 176 42 30 53.65 Across 173 50.28 6.83 13.09 12.00 12.10 12.00 12.	1	139°50.03					
3 199 5496 256 14.61 28.38 242 17.22 14.48 1359 99 45.52 191 44.50 153.54 56 6 6 197.52 28.38 1379 190 598 260 12.67 22.71 27.13 14.28 150 17.22 45.68 227 48.91 153.53 46 160 13.13 159 59.94 65 199 59.89 260 12.67 22.23 27 27.21 10.05 14.07 165 14.51 45.68 227 48.91 153.53 46 15.25 14.07 14.0	2	$154^{\circ}52.49$		227°16.81 14.69	120°7.73 45.44		
14 194 574 42 271 1374 42 271							
5 1997-988 300°120 522°2837 272°1848 532°1336 180°11077 112°4577 236°5111 10°5324 Alkali 15°2555 40°1123 10°757 10°758 10°757 10°758 10°757 10°758							
8 249°6, 28 331°11.3 28.34 302°18.87 13.66 195°19.03 45.88 21°53.31 53.14 More Market 11°2.5.25°5 9.12°6 12°6 12°6 12°6 12°6 12°6 12°6 12°6							
8 245°7.28 331°10.26 28.38 317°19.29 13.45 210°21.29 45.93 266°55.51 53.04 Mexikent 147°58.5 36°59.15 19.26°74 346°9.39 28.45 32°19.10 13.24 22°22.34 46.01 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 46.00 46.00 281°57.11 52.93 51.80 46.00 46.00 281°57.11 52.93 51.80 46.00 46.00 281°57.11 52.00 46.00 46.00 281°57.11 52.00 46.00 46.00 281°57.11 52.00 46.00 46.00 46.00 281°57.11 52.00 46							
9 260°9.74 346°9.39 -28.42 332°19.70 -13.24 256°23.54 -46.01 281°57.71 -52.93 Arctural 145°4.64 60°55.61 11 290°14.67 16°7.65 28.49 2°20.53 12.82 255°28.06 -46.18 312°2.12 52.72 Kochab 13°19.04 -47.18 -4							
10 275*12.21 1*8.52 28.45 347*20.11 13.03 240*28.80 40.09 290*69.91 25.83 Rigil Kent. 139*41.66 60*55.81 12 20*67.76 28.49 2*20.53 12.82 255*28.06 40.18 312*21 52.72 52.7							
11 290°14.67 16°7.68 522°26.52 17°2094 523°12.61 285°28.06 46.18 312°2.12 52.72 Kochab 33°19.94 74°3.01 12°305°17.14 31°6.76 522°26.52 17°2094 523°12.61 24.00 285°32.58 46.34 342°6.55 25.52 41 46°8.48 32°0.95 40°6.91 28.58 47°2.177 12.19 305°34.83 46.42 35°7.872 52.41 46.01 46.07 40°7.30 15°350°24.53 76°4.17 28.61 62°22.18 11.98 315°37.09 46.50 12°10.92 52.31 47°1.00 10°2.24 52.11 12°10.92 52.11 40°2.29 11.77 330°39.35 46.59 27°1.31 25.21 12°10.92 52.11 40°3.09 106°2.43 28.66 77°22.59 11.77 330°39.35 46.59 27°1.31 25.21 12°10.92 52.11 12°10							
13 305°17.14 31°67.8 12°22°28.52 12°20.55 12°40 525°32.58 46.34 342°6.52 5.25 25 25 25 25 25 25 25 25 25 25 25 25 2	11	290°14.67					
13 320°19:00	12	305°17.14					
14 335°22.06 61°5.04 28.88 47°21.77 12.19 300°34.83 40.42 357°8.72 52.41 15 350°24.53 76°4.17 2.86.16 62°22.18 11.98 315°37.09 46.50 12°10.92 52.31 16 5°26.99 91°3.30 28.64 77°22.59 11.77 330°39.35 46.59 27°13.12 52.21 18 35°31.92 121°1.56 \$22°28.69 10°7°23.42 \$23°211.34 0°43.86 N12°46.75 57°17.52 \$10°52.00 19 50°34.38 136°10.99 28.71 122°23.84 11.13 15°46.11 46.83 7°17.52 \$10°52.00 19 50°34.38 136°10.99 28.71 122°23.84 11.13 15°46.11 46.83 7°19.72 \$10.72 \$10.92 \$1.79 18 35°31.92 121°1.56 \$22°28.69 10°23.42 \$23°11.34 0°43.86 N12°46.75 57°17.52 \$10°52.00 18 30°31.11 65°36.85 \$150°59.82 28.74 137°24.25 10.92 30°48.37 40.92 87°21.92 51.79 18 30°31.11 65°36.85 \$150°59.82 28.74 137°24.25 10.92 30°48.37 40.92 87°21.92 51.79 18 30°31.11 65°36.89 5 28.76 152°24.66 10.10 70 45°50.62 47.00 11.72 63.3 51.58 110°44.24 195°57.21 28.00 182°25.49 10.27 75°55.13 47.17 132°28.53 51.48 14 30°21.25 40.17 10°2.25 55.46 28.64 21.22°23.29 81.06 90°57.39 N12°47.25 147°30.73 \$10°51.38 18 40°49.17 225°55.46 28.64 212°26.32 98.44 105°59.64 47.33 16°32.93 51.27 140°49.17 225°55.46 28.64 212°26.32 98.44 105°59.64 47.53 10°23.93 51.27 140°49.17 225°55.46 28.64 212°26.32 98.44 105°59.64 47.53 10°23.93 51.07 14 185°56.56 270°52.55 28.88 257°27.56 9.19 9151°6.40 47.58 20°39.33 51.00 125°46.71 20°52.55 28.88 257°27.56 9.19 151°6.40 47.58 20°39.35 5.00 125°46.71 20°52.55 28.88 257°27.56 9.19 151°6.40 47.58 20°39.35 5.00 125°46.71 20°38.83 345°48.49 28.93 332°9.94 8.98 166°8.65 47.67 222°41.73 5.08 14 186°42.25 28.90 28.92 28.91 151°54.91 118°47.95 222°41.73 5.08 14 186°42.25 28.90 28.92 28.91 151°54.91 118°47.95 222°41.73 5.08 15 200°59.03 285°51.98 28.99 27°27.98 8.98 166°8.65 47.67 222°41.73 5.08 15 201°38.83 345°48.99 28.89 27°27.56 9.19 151°64.04 47.58 20°73.93 5.50 5.04 16 201°1.88 345°4.99 28.89 28.92 27°27.56 9.19 151°64.04 47.58 20°73.93 5.50 5.04 17 201°38.89 345°4.99 28.89 27°27.56 9.19 151°64.04 47.58 20°73.93 5.50 5.04 18 201°38.89 345°4.99 28.89 27°27.56 9.19 10°31.14 47.90 20°73.93							
16 5°26.99 91°3.30 28.64 77°22.59 11.77 30°39.35 46.59 27°13.12 52.21 5361K 12°2.93 12°12.05 345°41.60 46.67 57°17.52 51.09 51.09 50°34.38 136°0.69 28.71 122°23.84 11.13 15°46.11 46.92 67°5 57°17.52 51.09 50°34.38 136°0.69 28.71 122°23.84 11.13 15°46.11 46.92 67°5 57°17.52 51.09 51.09 51.09 51°28.83 22°95.47 181.05°50.09 28.76 152°24.66 10.70 45°50.62 47.00 102°24.12 51.69 51.58 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.68 51.09 51°28.85 51.08 51.00 51.09 51°28.85 51.08 51.00 51°28.55 51.08 51.00 51°28.55 51.08 51.00 51°28.55 51.08 51.00 51°28.55 51.08 51.00 51°28.55 51.00 51°28.55 51.00 51°28.55 51.00 51°28.55 51.00 51°28.55 51.00 51°28.55 51.00 51°28.55 51.00 51°28.55 51°28.85 51°29.55 51°29.85							
18 3 5 3 1.92 121 1.15 5 22 2.28 6.6 92 2.20 1 11.56 34.5 4.1							
18 35°31.92 121°1.56 \$22°2.86 9 107°2.34 \$23°1.13 15°4.61 1 46.87 \$7°1.75 \$1.0°5.20 0							
19 50°34.38 136°0.69 28.71 122°23.84 11.13 15°46.11 46.83 72°19.72 51.89 20 65°36.85 150°9.92 22.874 137°42.5 10.92 30°43.7 46.92 87°21.92 51.79 21.72 633 65.189 22 95°41.78 180°58.08 28.78 167°25.08 10.49 60°52.88 47.08 117°26.33 51.58 Nunki 75°40.07 26°16.04							
20 65°36.85 150°99.82 28.74 137°24.25 10.92 30°48.37 46.92 87°21.92 51.79 Kaus Airst. 83°33.91 34°22.38 22 °95°41.78 180°58.08 28.78 167°25.08 10.49 60°52.88 47.08 117°26.33 51.58 Numi. 75°49.07 -26°16.04 75°55.13 47.17 132°28.53 51.48 Numi. 75°49.07 -26°16.04 75°55.13 7							
21 80°39.31 165°88.95 · · · · · · · · · · · · · · · · · ·							
23 110°4.24 180°58.08 28.78 16°°25.08 10.49 60°52.88 47.08 117°25.33 51.58 Munki 75°49.07 -26°16.04 87.55 13 47.17 132°25.33 51.58 Murki 75°49.07 -26°16.04 87.55 13 47.17 132°25.33 51.48 Altair 62°1.05 8°55.75 13 40°56.34 522°28.82 197°25.91 523°10.06 90°57.39 N12°47.25 147°30.73 510°51.38 51.77 51.05 120°25.55 1.63 240°54.59 28.85 227°26.73 9.63 121°1.89 47.42 177°35.13 51.17 5.05 29°29.89 13 10°55.65 270°52.85 28.88 25°27.75.6 9.19 151°6.40 47.56 192°37.33 51.06 520.04 47.56 120°25.05 13 40°55.13 15°25.05 29°29.89 15°20.04 150°25.05 13 15°50.24 28.89 27°27.98 8.99 160°8.65 47.67 222°41.73 50.85 18 120°45.15 122°28.89 28°22.79 8.99 151°6.40 47.56 25°41.35 50.65 18 120°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°28.99 18°45.49 10°45.15 122°35.49 10°4	21	80°39.31	165°58.95 · · 28.76	152°24.66 · · 10.70	45°50.62 · · 47.00	102°24.12 · · 51.69	
Mer.pass. 15:38 \(\cdot \) \(\cdot \							
Sat GHA GHA Dec GHA	23	110°44.24	195°57.21 28.80	182°25.49 10.27	75°55.13 47.17	132°28.53 51.48	
Sat GHA GHA Dec Horizontal and property of the proper	Mer.	pass. 15:38	ν -0.9' d0.0' m-3.93	ν 0.4′ d-0.2′ m1.34	$\nu 2.3' \ d0.1' \ \text{m-}2.39$	$\nu 2.2' \ d$ -0.1' m0.99	Peacock 53°7.54 -56°39.53
Sat GHA CHA CHA CHA CHA CHA CHA CHA CHA CHA C							
0 125°46,71 210°56,34 S22°28,82 197°25,91 S23°10,06 99°57,39 N12°47,25 147°30,73 S10°51,38 1 140°49,17 225°55,46 28.84 212°26,32 9.84 105°59,64 47.33 162°32,93 51.27 Scheel 13°46,24 28°12,81 15°15,65 -29°29,89 Scheel 13°46,24 28°12,81 13°10°10,10 15°15,65 -29°29,89 Scheel 13°46,24 28°12,81 13°30,93 15°20,04 148°12,14 147°12,14 147°12,14 147°13,14 147°14,14 147	Sat	СНФ	GHA Doc	GHA Doc	GHA Doc	GHA Doc	
1 140°49.17 225°55.46 28.84 212°26.32 9.84 105°59.64 47.33 162°32.93 51.27 2286°52.16 240°54.59 28.85 227°26.73 9.63 121°1.89 47.42 177°35.13 51.17 21°1.89 47.42 177°35.13 51.17 21°28.60 105°4.10 240°54.59 28.85 227°27.56 9.19 151°6.40 47.58 207°39.53 50.96 216°1.49 300°51.11 522°28.90 287°28.39 523°8.76 181°0.91 N12°47.75 237°43.93 510°50.75 7 231°3.95 315°50.24 28.92 302°28.81 8.54 196°13.16 47.84 252°46.13 50.65 246°6.64 330°49.36 28.92 317°29.22 8.32 211°15.41 47.92 267°48.33 50.54 21°19°13.81 15°46.75 28.95 22°30.46 7.66 256°22.16 48.17 312°54.93 50.23 11°29°13.81 15°46.75 28.95 17°30.88 523°7.44 271°24.41 N12°48.26 327°57.13 510°50.13 191°13.81 15°46.75 28.95 17°30.88 523°7.44 271°24.41 N12°48.26 327°57.13 510°50.13 191°13.81 15°46.75 28.95 17°30.88 523°7.44 271°24.41 N12°48.26 327°57.13 510°50.13 191°13.81 15°46.75 28.95 17°30.88 523°7.44 271°24.41 N12°48.26 327°57.13 510°50.13 191°13.81 15°46.75 28.95 17°30.88 523°7.44 271°24.41 N12°48.26 327°57.13 510°50.13 191°13.81 15°46.75 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.92 15°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.92 11°15°13.35°10.50 18 36°31.06 120°40.64 \$22°28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 11°13.84 15°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 100°10.10°							
2 155°51.63 240°54.59 28.85 227°26.73 9.63 121°1.89 47.42 177°35.13 51.17 3 170°54.10 255°53.72 · 28.87 242°27.15 · 9.41 136°4.15 · 47.50 192°37.33 · 51.06 4 185°56.56 270°52.85 28.88 257°27.56 9.19 151°6.40 47.58 207°39.53 50.96 5 200°59.03 285°51.98 28.89 272°27.98 8.98 166°8.65 47.67 222°41.73 50.85 6 216°1.49 300°51.11 522°28.90 287°28.39 523°8.76 181°10.91 N12°47.75 237°43.93 510°50.75 7 231°3.95 315°50.24 28.92 302°28.81 8.54 196°13.16 47.84 252°46.13 50.65 8 246°6.42 330°49.36 28.92 317°29.22 8.32 211°15.41 47.92 267°48.33 50.54 9 261°8.88 345°48.49 · 28.93 332°29.64 · 8.10 226°17.66 · 48.00 282°50.53 · 50.44 10 276°11.35 0°47.62 28.94 347°30.05 7.88 241°19.91 48.09 297°52.73 50.33 11 291°13.81 15°46.75 28.95 2°30.46 7.66 256°22.16 48.17 312°54.93 50.23 12 306°16.27 30°45.88 \$22°28.95 17°30.88 \$23°7.44 271°24.41 N12°48.26 327°57.13 \$10°50.13 13 321°18.74 45°45.01 28.95 32°31.29 7.22 286°26.66 48.34 342°59.33 50.02 14 336°21.20 60°44.13 28.96 47°31.71 7.00 301°28.91 48.43 358°1.53 49.92 15 351°23.67 75°43.26 · 28.96 62°32.12 · .6.78 316°31.16 · 48.51 13°3.73 · .49.81 16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.00 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°61.1 1°37.91 N12°48.77 58°10.33 \$10°59.50 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°61.1 1°37.91 N12°48.77 58°10.33 \$10°59.50 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 21 81°38.45 165°38.03 · 28.94 152°34.61 · 5.44 46°4.69 49.11 118°9.12 49.08 21 81°38.45 165°38.03 · 28.94 152°34.61 · 5.44 46°4.69 49.11 118°9.12 49.08 21 81°38.45 165°38.03 · 28.94 152°34.61 · 5.44 46°4.69 49.11 118°9.12 49.08 21 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98							
3 170°\$4.10 255°\$3.72 · · · · · · · · · · · · · · · · · · ·							
5 200°59.03 285°51.98 28.89 272°27.98 8.98 166°8.65 47.67 222°41.73 50.85 6 216°1.49 300°51.11 522°28.90 287°28.39 523°8.76 181°10.91 N12°47.75 237°43.93 510°50.75 Mars 73°17.65 10.51 7 231°3.95 315°50.24 28.92 302°28.81 8.54 196°13.16 47.84 252°46.13 50.65 8 246°6.42 330°49.36 28.92 317°29.22 8.32 211°15.41 47.92 267°48.33 50.54 10.54 10.55 10.5							
6 216°1.49 300°51.11 \$22°28.90 287°28.39 \$23°8.76 181°10.91 N12°47.75 237°43.93 \$10°50.75 7 231°3.95 315°50.24 28.92 302°28.81 8.54 196°13.16 47.84 252°46.13 50.65 325°20.42 18:01 8 246°6.42 330°49.36 28.92 317°29.22 8.32 211°15.41 47.92 267°48.33 50.54 10.51 325°20.42 18:01 8 261°8.88 345°48.49 · 28.93 332°29.64 · 8.10 226°17.66 · 48.00 282°50.53 · 50.44 10 276°11.35 0°47.62 28.94 347°30.05 7.88 241°19.91 48.09 297°52.73 50.33 12 201°13.81 15°46.75 28.95 2°30.46 7.66 256°22.16 48.17 312°54.93 50.23 12 306°16.27 30°45.88 \$22°28.95 17°30.88 \$23°7.44 271°24.41 N12°48.26 327°57.13 \$10°50.13 321°18.74 45°45.01 28.95 32°31.29 7.22 286°26.66 48.34 342°59.33 50.02 14 336°21.20 60°44.13 28.96 47°31.71 7.00 301°28.91 48.43 358°1.53 49.92 15 351°23.67 75°43.26 · 28.96 62°32.12 · 6.78 316°31.16 · 48.51 13°3.73 · 49.81 66°29.66 155°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 15°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 15°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 15°51.50 38.97 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°4.72 49.29 138°38.45 165°38.03 · 28.94 152°34.61 · 5.44 46°44.65 · 49.02 103°16.92 · 49.19 133°21.32 48.98 10.1 10 21°40.40 15°40.40 15°40.40 15°40.40 11 18°19.12 49.08 140.20							
7 231°3.95 315°50.24 28.92 302°28.81 8.54 196°13.16 47.84 252°46.13 50.65 8 246°6.42 330°49.36 28.92 317°29.22 8.32 211°15.41 47.92 267°48.33 50.54 9 261°8.88 345°48.49 · · · 28.93 332°29.64 · · · 8.10 226°17.66 · · · 48.00 282°50.53 · · 50.44 10 276°11.35 0°47.62 28.94 347°30.05 7.88 241°19.91 48.09 297°52.73 50.33 11 291°13.81 15°46.75 28.95 2°30.46 7.66 256°22.16 48.17 312°54.93 50.23 12 306°16.27 30°45.88 \$22°28.95 17°30.88 \$23°7.44 271°24.41 N12°48.26 327°57.13 \$10°50.13 13 321°18.74 45°45.01 28.95 32°31.29 7.22 286°26.66 48.34 342°59.33 50.02 14 336°21.20 60°44.13 28.96 47°31.71 7.00 301°28.91 48.43 358°1.53 49.92 15 351°23.67 75°43.26 · · · 28.96 62°32.12 · 6.78 316°31.16 · · · 48.51 13°3.73 · · · 49.81 16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 71 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 Mars 71°39.20 10:50 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°6.11 1°37.91 N12°48.77 58°10.33 \$10°49.50 Jupiter 325°10.68 17:53 25°10.68 17:53 296°40.92 180°37.16 28.93 167°35.03 5.21 61°46.90 49.11 118°19.12 49.08 10.1 118°19.12 49.08 10.1 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 10.1 18.01							_
8 246°6.42 330°49.36 28.92 317°29.22 8.32 211°15.41 47.92 267°48.33 50.54 9 261°8.88 345°48.49 · 28.93 332°29.64 · 8.10 226°17.66 · · 48.00 282°50.53 · · 50.44 10 276°11.35 0°47.62 28.94 347°30.05 7.88 241°19.91 48.09 297°52.73 50.33 11 291°13.81 15°46.75 28.95 2°30.46 7.66 256°22.16 48.17 312°54.93 50.23 12 306°16.27 30°45.88 \$22°28.95 17°30.88 \$23°7.44 271°24.41 N12°48.26 327°57.13 \$10°50.13 13 321°18.74 45°45.01 28.95 32°31.29 7.22 286°26.66 48.34 342°59.33 50.02 14 336°21.20 60°44.13 28.96 47°31.71 7.00 301°28.91 48.43 358°1.53 49.92 15 351°23.67 75°43.26 · · 28.96 62°32.12 · · 6.78 316°31.16 · · · 48.51 13°3.73 · · · 49.81 16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°6.11 1°37.91 N12°48.77 58°10.33 \$10°49.50 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 21 81°38.45 165°38.03 · · 28.94 152°34.61 · · 5.44 46°44.65 · · · 49.02 103°16.92 · · · 49.19 22 96°40.92 180°37.16 28.93 167°35.03 5.21 61°46.90 49.11 118°19.12 49.08 23 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 Saturn 21°56.60 14:15 ShA Mer.pass Venus 86°29.66 09.55 Ndars 72°28.41 10.51 Jupiter 325°15.64 17:57 Saturn 21°56.00 14:15							
9 261°8.88 345°48.49 · · · 28.93 332°29.64 · · · 8.10 226°17.66 · · · 48.00 282°50.53 · · · 50.44 10 276°11.35 0°47.62 28.94 347°30.05 7.88 241°19.91 48.09 297°52.73 50.33 11 291°13.81 15°46.75 28.95 2°30.46 7.66 256°22.16 48.17 312°54.93 50.23 12 306°16.27 30°45.88 \$22°28.95 17°30.88 \$23°7.44 271°24.41 N12°48.26 327°57.13 \$10°50.13 13 321°18.74 45°45.01 28.95 32°31.29 7.22 286°26.66 48.34 342°59.33 50.02 14 336°21.20 60°44.13 28.96 47°31.71 7.00 301°28.91 48.43 358°1.53 49.92 15 351°23.67 75°43.26 · · · 28.96 62°32.12 · · · 6.78 316°31.16 · · · 48.51 13°3.73 · · · 49.81 16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 18 36°31.06 120°40.64 \$22°28.95 107°33.75 \$23°6.11 1°37.91 N12°48.77 58°10.33 \$10°49.50 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 18 81°38.45 165°38.03 · · 28.94 152°34.61 · · 5.44 46°44.65 · · 49.02 103°16.92 · · 49.19 49.08 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 104 152°1.01 10.51 118°1.12 49.08 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 104 152°1.01 10.51 118°1.12 49.08 10.1							· ·
10 276 11.35							
12 306°16.27 30°45.88 \$22°28.95 17°30.88 \$23°7.44 271°24.41 N12°48.26 327°57.13 \$10°50.13 13 321°18.74 45°45.01 28.95 32°31.29 7.22 286°26.66 48.34 342°59.33 50.02 14 336°21.20 60°44.13 28.96 47°31.71 7.00 301°28.91 48.43 358°1.53 49.92 15 351°23.67 75°43.26 · · 28.96 62°32.12 · · 6.78 316°31.16 · · 48.51 13°3.73 · · 49.81 16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°6.11 1°37.91 N12°48.77 58°10.33 \$10°49.50 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 21 81°38.45 165°38.03 · · 28.94 152°34.61 · · 5.44 46°44.65 · · 49.02 103°16.92 · · 49.19 133°21.32 48.98							
12 300° 16.27 30° 45.88 522° 28.95 17° 30.88 523° 7.44 271° 24.41 N12° 48.26 327° 57.13 \$10° 50.13 13 321° 18.74 45° 45.01 28.95 32° 31.29 7.22 286° 26.66 48.34 342° 59.33 50.02 14 336° 21.20 60° 44.13 28.96 47° 31.71 7.00 301° 28.91 48.43 358° 15.3 49.92 15 351° 23.67 75° 43.26 ··· 28.96 62° 32.12 ··· 6.78 316° 31.16 ··· 48.51 13° 3.73 ··· 49.81 16 6° 26.13 90° 42.39 28.96 77° 32.54 6.56 331° 33.41 48.60 28° 5.93 49.71 17 21° 28.60 105° 41.52 28.96 92° 32.95 6.33 346° 35.66 48.68 43° 8.13 49.60 18 36° 31.06 120° 40.64 \$22° 28.95 107° 33.37 \$23° 6.11 1° 37.91 N12° 48.77 58° 10.33 \$10° 49.50 19 51° 33.52 135° 39.77 28.95 122° 33.78 5.89 16° 40.16 48.85 73° 12.53 49.40 20 66° 35.99 150° 38.90 28.95 137° 34.20 5.66 31° 42.41 48.94 88° 14.72 49.29 21 81° 38.45 165° 38.03 ·· 28.94 152° 34.61 ·· 5.44 46° 44.65 ·· 49.02 103° 16.92 ·· 49.19 22 96° 40.92 180° 37.16 28.93 167° 35.03 5.21 61° 46.90 49.11 118° 19.12 49.08 Mars: 0.1 Natural Park 17:57 Saturn 21° 50.33 12:15.64 17:57 Saturn 21° 50.33 14:11 18:00.1 18:00.1 18:00.1 18:00.1 19:00.1							
13 321 18.74							
15 351°23.67 75°43.26 · · 28.96 62°32.12 · · 6.78 316°31.16 · · 48.51 13°3.73 · · 49.81 16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°6.11 1°37.91 N12°48.77 58°10.33 \$10°49.50 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 21 81°38.45 165°38.03 · · · 28.94 152°34.61 · · · 5.44 46°44.65 · · · 49.02 103°16.92 · · · 49.19 22 96°40.92 180°37.16 28.93 167°35.03 5.21 61°46.90 49.11 118°19.12 49.08 23 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 Jan 27 Sat SHA Mer.pass 49.92 Mars 71°39.20 10:50 Mars 71°39.20 10:50 Mars 71°39.20 10:50 Saturn 21°44.02 14:08 Horizontal parallax Venus 0.1 Mars: 0.1							· ·
16 6°26.13 90°42.39 28.96 77°32.54 6.56 331°33.41 48.60 28°5.93 49.71 Venus 85°9.63 09:57 17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 Mars 71°39.20 10:50 18 36°31.06 120°40.64 S22°28.95 107°33.37 S23°6.11 1°37.91 N12°48.77 58°10.33 S10°49.50 Jupiter 325°10.68 17:53 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 Saturn 21°44.02 14:08 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 48°14.72 49.29 49.29 49.19 49.19 49.19 49.08 49.19 49.08 49.19 49.08 49.08 49.08 49.08 49.08 49.98 49.98 49.98 49.98 49.98 49.98 49.98 49.98 49.98 49.98 49.98 49.98 49.98 4							
17 21°28.60 105°41.52 28.96 92°32.95 6.33 346°35.66 48.68 43°8.13 49.60 18 36°31.06 120°40.64 \$22°28.95 107°33.37 \$23°6.11 1°37.91 \$N12°48.77 58°10.33 \$10°49.50 19 51°33.52 135°39.77 28.95 122°33.78 5.89 16°40.16 48.85 73°12.53 49.40 20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 21 81°38.45 165°38.03 · · 28.94 152°34.61 · · 5.44 46°44.65 · · 49.02 103°16.92 · · 49.19 22 96°40.92 180°37.16 28.93 167°35.03 5.21 61°46.90 49.11 118°19.12 49.08 23 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 Mars 71°39.20 10:50 Jupiter 325°10.68 17:53 Saturn 21°44.02 14:08 Horizontal parallax Venus: 0.1 Mars 01°39.20 10:50 Jupiter 325°10.68 17:53 Saturn 21°44.02 14:08							
18							
19 51° 33.52 135° 39.77 28.95 122° 33.78 5.89 16° 40.16 48.85 73° 12.53 49.40 20 66° 35.99 150° 38.90 28.95 137° 34.20 5.66 31° 42.41 48.94 88° 14.72 49.29 21 81° 38.45 165° 38.03 · · 28.94 152° 34.61 · · 5.44 46° 44.65 · · · 49.02 103° 16.92 · · · 49.19 22 96° 40.92 180° 37.16 28.93 167° 35.03 5.21 61° 46.90 49.11 118° 19.12 49.08 23 111° 43.38 195° 36.28 28.92 182° 35.44 4.99 76° 49.15 49.19 133° 21.32 48.98 16° 40.16 48.85 73° 12.53 49.40 88° 14.72 49.29 Horizontal parallax Venus: 0.1 Mars: 0.1							
20 66°35.99 150°38.90 28.95 137°34.20 5.66 31°42.41 48.94 88°14.72 49.29 21 81°38.45 165°38.03 · · 28.94 152°34.61 · · 5.44 46°44.65 · · 49.02 103°16.92 · · 49.19 22 96°40.92 180°37.16 28.93 167°35.03 5.21 61°46.90 49.11 118°19.12 49.08 23 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 Mars: 0.1		51°33.52		122°33.78 5.89		73°12.53 49.40	
22 96°40.92 180°37.16 28.93 167°35.03 5.21 61°46.90 49.11 118°19.12 49.08 Venus: 0.1 23 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 Mars: 0.1							
23 111°43.38 195°36.28 28.92 182°35.44 4.99 76°49.15 49.19 133°21.32 48.98 Mars: 0.1							
25 111 15.50 155 36.20 26.51 15.55 16.55							
Mer.pass. 15:34 ν -0.9' d 0.0' m-3.93 ν 0.4' d -0.2' m1.34 ν 2.3' d 0.1' m-2.39 ν 2.2' d -0.1' m0.99							171013. U.1
	Mer.	pass. 15:34	ν-0.9′ d0.0′ m-3.93	ν0.4' d-0.2' m1.34	ν2.3' d0.1' m-2.39	ν2.2′ d-0.1′ m0.99	

	Su	n	Moon				
าน	GHA	Dec	GHA	ν	Dec	d	НР
)	176°59.02	S19°8.32	4°40.35	10.1'	N25°48.26	-6.4'	54.9'
	191°58.87	7.71	19°9.49	10.2'	25°41.90	-6.5'	54.9
	206°58.72	7.10	33°38.72	10.3'	25°35.41	-6.6'	54.8
	221°58.58	. 6.50	48°8.02	10.4	25°28.80	-6.7'	54.8
	236°58.43	5.89	62°37.40	10.5'	25°22.08	-6.8'	54.8
	251°58.28	5.28	77°6.87	10.5	25° 15.23	-0.0'	54.8
	266°58.14	5.28 \$19°4.67	91°36.41		N25°8.26		
				10.6'		-7.1'	54.8
•	281°57.99	4.06	106°6.03	10.7'	25°1.18	-7.2'	54.8
	296°57.84	3.45	120°35.73	10.8'	24°53.97	-7.3'	54.8
)	311°57.70	• • 2.84	135°5.51	10.9'	24°46.66	-7.4'	54.7
0	326°57.55	2.23	149°35.37	10.9'	24°39.23	-7.5'	54.7
1	341°57.41	1.62	164°5.32	11.0'	24°31.68	-7.7'	54.7
2	356°57.26	S19°1.00	178°35.34	11.1'	N24°24.02	-7.8'	54.7
3	11°57.12	19°0.39	193°5.45	11.2'	24° 16.25	-7.9'	54.7
4	26°56.97	18°59.78	207°35.64	11.3'	24°8.37	-8.0'	54.7
5	41°56.83	59.16	222°5.92	11.4'	24°0.38	-8.1	54.7
5	56°56.69	58.55	236° 36.28	11.4	23°52.29	-8.2	54.6
					23°44.08		
7	71°56.54	57.93	251°6.72	11.5'		-8.3'	54.6
8	86°56.40	S 18°57.31	265°37.24	11.6'	N23°35.77	-8.4'	54.6
9	101°56.26	56.70	280°7.85	11.7'	23°27.36	-8.5'	54.6
0	116°56.12	56.08	294°38.54	11.8'	23°18.84	-8.6'	54.6
1	131°55.98	• • 55.46	309°9.32	11.9'	23°10.22	-8.7'	54.6
2	146°55.83	54.84	323°40.17	11.9'	23°1.49	-8.8'	54.6
<u>2</u> 3	161°55.69	54.22	338°11.12	12.0'	23° 52.67	-8.9'	54.5
ر	101 35.09	54.22	330 11.12	1∠.0	22 52.07	-0.9	54.5
	SD = 16.2'	d = -0.6'		SI	D = 15.0'		
_					_		
ri	GHA	Dec	GHA	ν	Dec	d	HP
	176°55.55	S18°53.60	352°42.14	12.1'	N22°43.75	-9.0'	54.5
	191°55.41	52.98	7°13.25	12.2'	22°34.72	-9.1'	54.5
	206°55.27	52.36	21°44.45	12.3'	22°25.60	-9.2'	54.5
	221°55.13	• • 51.74	36° 15.72	12.4'	22°16.39	-9.3'	54.5
	236°55.00	51.12	50°47.08	12.4'	22°7.08	-9.4	54.5
	251°54.86	50.49	65°18.53	12.5'	21°57.67	-9.4 -9.5'	54.5
5	266°54.72	S18°49.87	79°50.05	12.6'	N21°48.18	-9.6'	54.5
	281°54.58	49.25	94°21.66	12.7'	21°38.59	-9.7'	54.4
3	296°54.44	48.62	108°53.36	12.8'	21°28.91	-9.8'	54.4
)	311°54.30	• • 47.99	123°25.13	12.9'	21°19.14	-9.9'	54.4
)	326°54.17	47.37	137°56.99	12.9'	21°9.28	-9.9'	54.4
1	341°54.03	46.74	152°28.93	13.0'	20°59.33	-10.0'	54.4
2	356°53.89	518°46.12	167°0.95	13.1'	N20°49.30	-10.1	54.4
	11°53.76		107 0.95 181°33.05	13.1	20°39.18	-10.1 -10.2'	
3		45.49	196°5.23		20° 28.98		54.4
4	26°53.62	44.86		13.3'		-10.3'	54.4
5	41°53.49	• • 44.23	210°37.50	13.3'	20°18.70	-10.4'	54.4
5	56°53.35	43.60	225°9.84	13.4'	20°8.33	-10.4'	54.3
7	71°53.22	42.97	239°42.26	13.5'	19°57.88	-10.5'	54.3
8	86°53.08	S18°42.34	254°14.77	13.6'	N19°47.36	-10.6'	54.3
9	101°52.95	41.71	268°47.35	13.7'	19°36.75	-10.7'	54.3
)	116°52.82	41.08	283°20.01	13.7'	19°26.06	-10.8'	54.3
1	131°52.68	• • 40.44	297°52.75	13.8'	19° 15.30	-10.8'	54.3
2	146°52.55	39.81	312°25.56	13.9'	19°4.47	-10.9'	54.3
3	161°52.42	39.18	326°58.46	14.0'	18° 53.55	-11.0'	54.3
	$SD = 16.2^{\prime}$	d = -0.6'		SI	D = 14.9'		
ıt	GHA	Dec	GHA	ν	Dec	d	HP
	176°52.29	\$18°38.54	341°31.43	14.0'	N18° 42.57	-11.1'	54.3
	191°52.15	37.91	356°4.47	14.1'	18°31.51	-11.1'	54.3
	206°52.02	37.27	10°37.59	14.2'	18°20.38	-11.2'	54.2
	221°51.89	• • 36.64	25°10.79	14.3'	$18^{\circ}9.18$	-11.3'	54.2
	236°51.76	36.00	39°44.06	14.3'	17° 57.91	-11.3'	54.2
					17° 46.57	-11.4'	54.2
	251°51 63	35.36	54° 17 40	144'		±1.7	54.2
	251°51.63	35.36 \$18°34.72	54°17.40	14.4'		_11 5'	
	266°51.50	S18°34.72	68° 50.82	14.5'	$N17^{\circ}35.16$	-11.5'	
	266°51.50 281°51.37	\$18° 34.72 34.09	68° 50.82 83° 24.31	14.5' 14.6'	N17°35.16 17°23.69	-11.5'	54.2
i i	266°51.50 281°51.37 296°51.24	\$18° 34.72 34.09 33.45	68° 50.82 83° 24.31 97° 57.87	14.5' 14.6' 14.6'	N17° 35.16 17° 23.69 17° 12.15	-11.5' -11.6'	54.2 54.2
	266°51.50 281°51.37 296°51.24 311°51.11	\$18° 34.72 34.09 33.45 · · 32.81	68° 50.82 83° 24.31 97° 57.87 112° 31.50	14.5' 14.6' 14.6' 14.7'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55	-11.5' -11.6' -11.7'	54.2° 54.2° 54.2°
	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98	\$18° 34.72 34.09 33.45	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20	14.5' 14.6' 14.6' 14.7' 14.8'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88	-11.5' -11.6'	54.2° 54.2° 54.2°
	266°51.50 281°51.37 296°51.24 311°51.11	\$18° 34.72 34.09 33.45 · · 32.81 32.17 31.53	68° 50.82 83° 24.31 97° 57.87 112° 31.50	14.5' 14.6' 14.6' 14.7'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55	-11.5' -11.6' -11.7'	54.2° 54.2° 54.2° 54.2°
i i i i i	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98	\$18° 34.72 34.09 33.45 · · 32.81 32.17	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20	14.5' 14.6' 14.6' 14.7' 14.8'	N17°35.16 17°23.69 17°12.15 17°0.55 16°48.88	-11.5' -11.6' -11.7' -11.7' -11.8'	54.2° 54.2° 54.2° 54.2°
i i i i i i i	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73	\$18° 34.72 34.09 33.45 · · 32.81 32.17 31.53 \$18° 30.89	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82	14.5' 14.6' 14.6' 14.7' 14.8' 14.8' 14.9'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9'	54.2° 54.2° 54.2° 54.2° 54.2°
i i i i i i i i i i i	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60	\$18° 34.72 34.09 33.45 · · 32.81 32.17 31.53 \$18° 30.89 30.24	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72	14.5' 14.6' 14.6' 14.7' 14.8' 14.8' 14.9' 15.0'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9' -11.9'	54.2° 54.2° 54.2° 54.2° 54.2° 54.2°
6 6 7 7 7 7 7 7 8 7 8 7 8 7 8 7 8 7 8 7	266°51.50 281°51.37 296°51.24 311°51.11 326°50.85 356°50.73 11°50.60 26°50.47	\$18° 34.72 34.09 33.45 · 32.81 32.17 31.53 \$18° 30.89 30.24 29.60	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70	14.5' 14.6' 14.7' 14.8' 14.8' 14.9' 15.0' 15.0'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9' -12.0'	54.2° 54.2° 54.2° 54.2° 54.2° 54.2° 54.2°
5 5 0 11 22 33 44 55	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34	\$18° 34.72 34.09 33.45 · 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 · 28.96	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74	14.5' 14.6' 14.7' 14.8' 14.8' 14.9' 15.0' 15.0' 15.1'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9' -12.0' -12.0'	54.2° 54.2° 54.2° 54.2° 54.2° 54.2° 54.1° 54.1°
5 5 10 11 12 13 14 15 15	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.96 28.31	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85	14.5' 14.6' 14.7' 14.8' 14.8' 14.9' 15.0' 15.0' 15.1' 15.2'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9' -12.0' -12.0' -12.1'	54.2 54.2 54.2 54.2 54.2 54.2 54.1 54.1
5 5 10 11 12 13 14 15 15	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34	\$18° 34.72 34.09 33.45 32.17 31.53 \$18° 30.89 30.24 29.60 28.96 28.31 27.67	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74	14.5' 14.6' 14.7' 14.8' 14.8' 14.9' 15.0' 15.0' 15.1'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9' -12.0' -12.0'	54.2° 54.2° 54.2° 54.2° 54.2° 54.2° 54.1° 54.1°
5 6 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.96 28.31	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85	14.5' 14.6' 14.7' 14.8' 14.8' 14.9' 15.0' 15.0' 15.1' 15.2'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60	-11.5' -11.6' -11.7' -11.7' -11.8' -11.9' -12.0' -12.0' -12.1'	54.2° 54.2° 54.2° 54.2° 54.2° 54.1° 54.1° 54.1°
1 5 6 7 8 9	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22 71°50.09 86°49.97	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.96 28.31 27.67 \$18° 27.03	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85 229° 3.03 243° 37.27	14.5' 14.6' 14.6' 14.7' 14.8' 14.9' 15.0' 15.0' 15.1' 15.2' 15.2' 15.3'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51 N15° 13.37	-11.5' -11.6' -11.7' -11.8' -11.9' -12.0' -12.0' -12.1' -12.1' -12.2'	54.2 54.2 54.2 54.2 54.2 54.2 54.1 54.1 54.1 54.1
5 5 6 7 8 9	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22 71°50.09 86°49.97 101°49.84	\$18° 34.72 34.09 33.45 · 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 · 28.96 28.31 27.67 \$18° 27.03 26.38	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85 229° 3.03 243° 37.27 258° 11.57	14.5' 14.6' 14.6' 14.7' 14.8' 14.9' 15.0' 15.0' 15.1' 15.2' 15.2' 15.3' 15.4'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51 N15° 13.37 15° 1.18	-11.5' -11.6' -11.7' -11.8' -11.9' -12.0' -12.0' -12.1' -12.1' -12.2' -12.3'	54.2 54.2 54.2 54.2 54.2 54.2 54.1 54.1 54.1 54.1 54.1
5 5 7 8 9	266°51.50 281°51.37 296°51.24 311°51.11 326°50.98 341°50.85 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22 71°50.09 86°49.97 101°49.84 116°49.71	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.96 28.31 27.67 \$18° 27.03 26.38 25.73	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85 229° 3.03 243° 37.27 258° 11.57 272° 45.93	14.5' 14.6' 14.7' 14.8' 14.9' 15.0' 15.1' 15.2' 15.2' 15.2' 15.3' 15.4' 15.4'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51 N15° 13.37 15° 1.18 14° 48.93	-11.5' -11.6' -11.7' -11.8' -11.9' -12.0' -12.0' -12.1' -12.1' -12.2' -12.3' -12.3'	54.2 54.2 54.2 54.2 54.2 54.2 54.1 54.1 54.1 54.1 54.1 54.1
0 1 1 2 3 4 5 5 7 7 3 9 0 1	266°51.50 281°51.37 296°51.24 311°51.11 326°50.95 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22 71°50.09 86°49.97 101°49.84 116°49.71 131°49.59	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.31 27.67 \$18° 27.03 26.38 25.73 25.09	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85 229° 3.03 243° 37.27 258° 11.57 272° 45.93 287° 20.36	14.5' 14.6' 14.7' 14.8' 14.8' 15.0' 15.0' 15.1' 15.2' 15.2' 15.3' 15.4' 15.4' 15.5'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51 N15° 13.37 15° 1.18 14° 48.93 14° 36.62	-11.5' -11.6' -11.7' -11.8' -11.9' -12.0' -12.1' -12.1' -12.2' -12.3' -12.3' -12.4'	54.2 54.2 54.2 54.2 54.2 54.1 54.1 54.1 54.1 54.1 54.1 54.1
0 1 2 3 3 4 5 5 7 7 8 9 9 1 1 2 2	266°51.50 281°51.37 296°51.24 311°51.11 326°50.85 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22 71°50.09 86°49.97 101°49.84 116°49.71 131°49.59 146°49.46	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.96 28.31 27.67 \$18° 27.03 26.38 25.73 25.09 24.44	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85 229° 3.03 243° 37.27 258° 11.57 272° 45.93 287° 20.36 301° 54.85	14.5' 14.6' 14.7' 14.8' 14.9' 15.0' 15.1' 15.2' 15.2' 15.3' 15.4' 15.4' 15.5' 15.5'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51 N15° 13.37 15° 1.18 14° 48.93 14° 36.62 14° 24.27	-11.5' -11.6' -11.7' -11.8' -11.9' -12.0' -12.0' -12.1' -12.1' -12.2' -12.3' -12.3' -12.4' -12.4'	54.2 54.2 54.2 54.2 54.2 54.1 54.1 54.1 54.1 54.1 54.1 54.1
0 1 1 5 7 3 3 9 0	266°51.50 281°51.37 296°51.24 311°51.11 326°50.95 356°50.73 11°50.60 26°50.47 41°50.34 56°50.22 71°50.09 86°49.97 101°49.84 116°49.71 131°49.59	\$18° 34.72 34.09 33.45 32.81 32.17 31.53 \$18° 30.89 30.24 29.60 28.31 27.67 \$18° 27.03 26.38 25.73 25.09	68° 50.82 83° 24.31 97° 57.87 112° 31.50 127° 5.20 141° 38.97 156° 12.82 170° 46.72 185° 20.70 199° 54.74 214° 28.85 229° 3.03 243° 37.27 258° 11.57 272° 45.93 287° 20.36	14.5' 14.6' 14.7' 14.8' 14.8' 15.0' 15.0' 15.1' 15.2' 15.2' 15.3' 15.4' 15.4' 15.5'	N17° 35.16 17° 23.69 17° 12.15 17° 0.55 16° 48.88 16° 37.15 N16° 25.36 16° 13.51 16° 1.60 15° 49.63 15° 37.60 15° 25.51 N15° 13.37 15° 1.18 14° 48.93 14° 36.62	-11.5' -11.6' -11.7' -11.8' -11.9' -12.0' -12.1' -12.1' -12.2' -12.3' -12.3' -12.4'	54.2' 54.2' 54.2' 54.2' 54.2' 54.2' 54.1' 54.1' 54.1' 54.1' 54.1' 54.1' 54.1' 54.1' 54.1'

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:31	09:07	11:53	12:33	15:19	16:55
N 70°	07:21	08:44	10:24	14:02	15:42	17:05
68°	07:12	08:25	09:45	14:40	16:00	17:14
66°	07:05	08:11	09:19	15:07	16:15	17:21
64°	06:58	07:58	08:59	15:27	16:27	17:28
62°	06:52	07:48	08:42	15:44	16:38	17:33
60°	06:47	07:39	08:28	15:57	16:47	17:38
N 58°	06:42	07:31	08:17	16:09	16:54	17:43
56°	06:38	07:24	08:06	16:19	17:01	17:47
54°	06:34	07:18	07:57	16:28	17:08	17:51
52°	06:31	07:12	07:49	16:36	17:14	17:55
50°	06:27	07:07	07:42	16:43	17:19	17:58
45°	06:19	06:55	07:27	16:58	17:30	18:06
N 40°	06:12	06:45	07:14	17:11	17:40	18:13
35°	06:06	06:36	07:03	17:22	17:49	18:20
30°	05:59	06:28	06:54	17:31	17:57	18:26
20°	05:47	06:14	06:37	17:48	18:11	18:38
N 10°	05:35	06:00	06:23	18:02	18:24	18:50
0°	05:22	05:47	06:09	18:16	18:38	19:03
S 10°	05:07	05:33	05:55	18:30	18:52	19:18
20°	04:48	05:16	05:40	18:45	19:08	19:36
30°	04:25	04:57	05:23	19:02	19:28	19:59
35°	04:10	04:45	05:13	19:12	19:40	20:14
40°	03:52	04:30	05:01	19:23	19:54	20:32
45°	03:30	04:13	04:47	19:37	20:11	20:54
S 50°	02:58	03:51	04:30	19:54	20:33	21:25
52°	02:42	03:40	04:22	20:01	20:43	21:41
54°	02:22	03:28	04:13	20:10	20:56	22:00
56°	01:56	03:13	04:03	20:20	21:10	22:26
58°	01:16	02:56	03:52	20:31	21:26	23:03
S 60°	////	02:35	03:38	20:45	21:47	////

Lat.		Moonris	e		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°			15:45			11:53
N 70°			16:25			11:11
68°		14:31	16:52		11:32	10:43
66°		15:16	17:13		10:47	10:21
64°	13:44	15:45	17:29	10:39	10:17	10:04
62°	14:23	16:06	17:42	09:59	09:54	09:49
60°	14:50	16:24	17:53	09:31	09:35	09:37
N 58°	15:12	16:39	18:03	09:09	09:20	09:26
56°	15:29	16:51	18:12	08:51	09:07	09:17
54°	15:44	17:02	18:19	08:36	08:55	09:09
52°	15:56	17:12	18:26	08:23	08:45	09:01
50°	16:07	17:20	18:32	08:11	08:36	08:55
45°	16:31	17:38	18:45	07:47	08:17	08:40
N 40°	16:49	17:53	18:55	07:28	08:01	08:28
35°	17:05	18:05	19:05	07:12	07:48	08:18
30°	17:18	18:16	19:12	06:58	07:36	08:09
20°	17:41	18:35	19:26	06:33	07:16	07:53
N 10°	18:00	18:51	19:38	06:13	06:58	07:40
0°	18:19	19:05	19:49	05:53	06:42	07:27
S 10°	18:37	19:20	20:00	05:33	06:25	07:14
20°	18:56	19:36	20:12	05:12	06:07	07:00
30°	19:18	19:54	20:25	04:47	05:46	06:44
35°	19:32	20:04	20:33	04:33	05:34	06:34
40°	19:47	20:16	20:41	04:16	05:20	06:23
45°	20:04	20:30	20:52	03:55	05:03	06:11
S 50°	20:26	20:47	21:04	03:30	04:42	05:55
52°	20:37	20:55	21:09	03:17	04:32	05:48
54°	20:48	21:04	21:16	03:03	04:21	05:39
56°	21:02	21:14	21:22	02:46	04:08	05:30
58°	21:17	21:25	21:30	02:25	03:53	05:20
S 60°	21:36	21:38	21:39	02:00	03:35	05:07

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%	
25	12:04	12:11	12:12	-:-	12:06		
26	12:18	12:24	12:12	00:30	12:54		
27	12:31	12:37	12:13	01:16	13:38		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	126° 45.84	210°35.41 S 22°28.92	197°35.86 \$23°4.76	91°51.39 N12°49.28	148°23.52 S 10°48.87	
1	141°48.31	225°34.54 28.91	212°36.27 4.54	106°53.64 49.36	163°25.72 48.77	Alpheratz 357°35.79 29°13.44 Ankaa 353°8.11 -42°10.79
2	156° 50.77	240°33.67 28.89	227°36.69 4.31	121°55.89 49.45	178°27.92 48.66	Schedar 349°32.21 56°40.34
3	171°53.24	255°32.79 · · 28.88	242°37.10 · · 4.08	136°58.13 · · 49.53	193°30.12 · · 48.56	Diphda 348°48.21 -17°51.46
4 5	186° 55.70 201° 58.16	270°31.92 28.87 285°31.05 28.85	257°37.52 3.86 272°37.93 3.63	152°0.38 49.62 167°2.62 49.71	208°32.32 48.45 223°34.52 48.35	Achernar 335°20.86 -57°7.19
6	217°0.63	300°30.18 S22°28.84	287°38.35 \$23°3.40	182°4.87 N12°49.79	238°36.71 \$10°48.25	Hamal 327°52.10 23°34.62
7	232°3.09	315°29.30 28.82	302°38.76 3.17	197°7.11 49.88	253°38.91 48.14	Polaris 314°19.88 89°22.26
8	247°5.56	330°28.43 28.80	317°39.18 2.94	212°9.36 49.96	268°41.11 48.04	Acamar 315°12.28 -40°12.75
9	262°8.02	345°27.56 · · 28.78	332°39.60 · · 2.71	227°11.60 · · 50.05	283°43.31 · · 47.93	Menkar 314°6.90 4°10.99 Mirfak 308°29.23 49°56.98
10	277° 10.48	0°26.69 28.76	347°40.01 2.48	242°13.85 50.14	298° 45.51 47.83	Aldebaran 290°40.32 16°33.47
11	292°12.95	15°25.81 28.74	2°40.43 2.25	257°16.09 50.22	313° 47.71 47.72	Rigel 281°4.38 -8°10.52
12 13	307° 15.41 322° 17.88	30°24.94 S22°28.71 45°24.07 28.69	17°40.84	272°18.33 N12°50.31 287°20.58 50.40	328°49.91 \$10°47.62 343°52.10 47.51	Capella 280°22.71 46°1.44
14	337°20.34	60°23.19 28.66	47°41.67 1.56	302°22.82 50.48	343°52.10 47.51 358°54.30 47.41	Bellatrix 278°23.47 6°22.25
15	352° 22.81	75°22.32 · · 28.64	62°42.09 · · 1.33	317°25.06 · · 50.57	13°56.50 · · 47.30	Elnath 278°2.57 28°37.70
16	7°25.27	90°21.45 28.61	77°42.51 1.09	332°27.30 50.66	28°58.70 47.20	Alnilam 275°38.26 -1°11.25 Betelgeuse 270°52.65 7°24.66
17	22°27.73	105°20.58 28.58	92°42.92 0.86	347°29.55 50.74	44°0.90 47.09	Betelgeuse 270°52.65 7°24.66 Canopus 263°52.26 -52°42.62
18	37° 30.20	120°19.70 S22°28.55	107°43.34 \$23°0.63	2°31.79 N12°50.83	59°3.09 \$10°46.99	Sirius 258°26.61 -16°45.03
19	52° 32.66	135°18.83 28.52	122°43.75 0.39	17°34.03 50.92	74°5.29 46.88	Adhara 255°6.12 -29°0.36
20 21	67° 35.13 82° 37.59	150°17.96 28.49 165°17.08 •• 28.45	137°44.17 23°0.16 152°44.59 22°59.92	32°36.27 51.01 47°38.51 · · 51.09	89°7.49 46.78 104°9.69 • 46.67	Procyon 244°51.32 5°9.75
22	97°40.05	180°16.21 28.42	167°45.00 59.69	62°40.75 51.18	119°11.89 46.57	Pollux 243°17.88 27°58.05
23	112°42.52	195°15.34 28.38	182°45.42 59.45	77°42.99 51.27	134°14.08 46.46	Avior 234°14.42 -59°35.16
Max	ness 15.20		ν0.4' d-0.2' m1.33			Suhail 222°46.45 -43°31.74 Miaplacidus 221°37.54 -69°48.84
ivier.	pass. 15:30	ν-0.9' d-0.0' m-3.93	νυ.4° α-υ.2° m1.33	ν2.2' d0.1' m-2.38	ν2.2' d-0.1' m0.99	Miaplacidus 221°37.54 -69°48.84 Alphard 217°48.20 -8°45.80
						Regulus 207°34.96 11°50.89
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.39 61°37.07
0	127° 44.98	210°14.47 \$22°28.34	197°45.83	92°45.23 N12°51.36	149°16.28 \$10°46.36	Denebola 182°25.52 14°26.13
1 2	142° 47.45 157° 49.91	225°13.59 28.31 240°12.72 28.27	212°46.25 58.98 227°46.67 58.74	107°47.47 51.44 122°49.71 51.53	164°18.48 46.25 179°20.68 46.15	Gienah 175°44.21 -17°40.51
3	172° 52.37	255°11.85 · · 28.23	242°47.08 · · 58.50	137°51.95 · · 51.62	194°22.87 · · 46.04	Acrux 173°0.65 -63°13.70
4	187° 54.84	270°10.97 28.18	257°47.50 58.27	152°54.19 51.71	209°25.07 45.94	Gacrux 171°52.25 -57°14.65
5	202°57.30	285°10.10 28.14	272°47.92 58.03	167°56.42 51.80	224° 27.27 45.83	Alioth 166°13.40 55°49.46 Spica 158°23.04 -11°17.22
6	217° 59.77	300°9.23 S 22°28.10	287°48.33 S 22°57.79	182°58.66 N12°51.88	239°29.47 \$10°45.73	Alkaid 152°52.52 49°11.28
7	233°2.23	315°8.35 28.05	302°48.75 57.55	198°0.90 51.97	254°31.66 45.62	Hadar 148°37.08 -60°29.07
8	248°4.69	330°7.48 28.00	317°49.17 57.31	213°3.14 52.06	269°33.86 45.52	Menkent 147°58.52 -36°29.16
9 10	263°7.16 278°9.62	345°6.61 · · 27.96 0°5.73 27.91	332°49.58 · · 57.07 347°50.00 56.83	228°5.37 · · 52.15 243°7.61 52.24	284°36.06 · · 45.41 299°38.26 45.31	Arcturus 145°48.60 19°3.23
11	293° 12.09	15°4.86 27.86	2°50.42 56.59	258° 9.85 52.33	314°40.45 45.20	Rigil Kent. 139°41.42 -60°55.82
12	308° 14.55	30°3.99 S22°27.81	17°50.83 \$22°56.35	273°12.08 N12°52.42	329°42.65 \$10°45.09	Kochab 137°19.87 74°3.00
13	323°17.01	45°3.12 27.75	32°51.25 56.11	288°14.32 52.51	344°44.85 44.99	Zuben'ubi 136°56.92 -16°8.49 Alphecca 126°4.51 26°37.78
14	$338^{\circ}19.48$	60°2.24 27.70	47°51.67 55.86	303°16.56 52.59	359°47.04 44.88	Antares 112°16.98 -26°29.07
15	353°21.94	75°1.37 · · 27.65	62°52.08 · · 55.62	318°18.79 · · 52.68	14°49.24 · · 44.78	Atria 107°12.28 -69°4.00
16	8°24.41	90°0.50 27.59	77°52.50 55.38	333°21.03 52.77	29°51.44 44.67	Sabik 102°3.90 -15°45.31
17 18	23°26.87 38°29.33	104°59.62 27.53 119°58.75 \$22°27.48	92°52.92 55.13 107°53.34 \$22°54.89	348°23.26 52.86 3°25.49 N12°52.95	44°53.63 44.57 59°55.83 \$10°44.46	Shaula 96°11.73 -37°7.21
19	53° 31.80	134°57.88 27.42	122°53.75 54.65	18°27.73 53.04	74°58.03 44.36	Rasalhague 95°59.52 12°32.38
20	68° 34.26	149°57.00 27.36	137°54.17 54.40	33°29.96 53.13	90°0.22 44.25	Eltanin 90°42.97 51°28.86
21	83°36.73	164°56.13 · · 27.29	152°54.59 · · 54.15	48°32.20 · · 53.22	105°2.42 · · 44.15	Kaus Aust. 83°33.89 -34°22.37 Vega 80°34.13 38°48.13
22	98°39.19	179°55.26 27.23	167°55.01 53.91	63°34.43 53.31	120°4.62 44.04	Nunki 75°49.06 -26°16.05
23	113°41.66	194°54.38 27.17	182°55.42 53.66	78°36.66 53.40	135°6.81 43.93	Altair 62°1.04 8°55.78
Mer.	pass. 15:26	ν-0.9' d-0.0' m-3.92	ν0.4' d-0.2' m1.33	ν2.2' d0.1' m-2.37	ν2.2' d-0.1' m0.99	Peacock 53°7.53 -56°39.52
	-					Deneb 49°26.81 45°21.87
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.87 9°59.02
0	128° 44.12	209°53.51 \$22°27.10	197°55.84 \$22°53.42	93°38.90 N12°53.49	150°9.01 \$10°43.83	Al Na'ir 27°34.30 -46°50.86 Fomalhaut 15°15.66 -29°29.89
1	143° 46.58	224°52.64 27.04	212°56.26 53.17	108°41.13 53.58	165°11.20 43.72	Fomalhaut 15°15.66 -29°29.89 Scheat 13°46.25 28°12.80
2	158° 49.05	239°51.76 26.97	227°56.68 52.92	123°43.36 53.67	180° 13.40 43.62	Markab 13°30.93 15°20.03
3	173°51.51	254°50.89 · · 26.90	242°57.09 · · 52.67	138°45.59 · · 53.76	195°15.60 · · 43.51	
4	188° 53.98	269°50.02 26.83	257°57.51 52.42	153°47.82 53.85	210°17.79 43.41	Jan 28 Sun SHA Mer.pass Venus 83°49.57 09:58
5 6	203° 56.44 218° 58.90	284°49.15 26.76 299°48.27 \$22°26.69	272°57.93 52.18 287°58.35 S 22°51.93	168°50.05 53.94 183°52.28 N12°54.03	225°19.99 43.30 240°22.19 \$10°43.19	Venus 83 49.57 09:58 Mars 70°50.01 10:49
7	234°1.37	314°47.40 26.61	302°58.77 51.68	198°54.52 54.12	255°24.38 43.09	Jupiter 325°5.55 17:50
8	249°3.83	329°46.53 26.54	317°59.18 51.43	213°56.75 54.21	270°26.58 42.98	Saturn 21°37.68 14:04
9	264°6.30	344°45.65 · · 26.46	332°59.60 · · 51.18	228°58.98 · · 54.30	285°28.77 · · 42.88	
10	279°8.76	359°44.78 26.39	348° 0.02 50.93	244°1.21 54.39	300°30.97 42.77	Jan 29 Mon SHA Mer.pass Venus 82°29.48 10:00
11	294° 11.22	14°43.91 26.31	3°0.44 50.67	259°3.43 54.48	315°33.16 42.66	Mars 70°0.85 10:49
12 13	309° 13.69 324° 16.15	29°43.04 \$22°26.23 44°42.16 26.15	18° 0.86 S22° 50.42 33° 1.27 50.17	274°5.66 N12°54.57 289°7.89 54.67	330°35.36 \$10°42.56 345°37.56 42.45	Jupiter 325°0.25 17:46
13 14	324° 16.15 339° 18.62	44°42.16 26.15 59°41.29 26.07	48°1.69 49.92	289°7.89 54.67 304°10.12 54.76	0°39.75 42.35	Saturn 21°31.30 14:01
15	354°21.08	74°40.42 · · 25.99	63°2.11 · · 49.66	319°12.35 · · 54.85	15°41.95 · · 42.24	Jan 30 Tue SHA Mer.pass
16	9° 23.54	89°39.54 25.90	78°2.53 49.41	334°14.58 54.94	30°44.14 42.14	Venus 81°9.39 10:01
17	24°26.01	104°38.67 25.82	93°2.95 49.16	349°16.81 55.03	45°46.34 42.03	Mars 69°11.72 10:48
18	39° 28.47	119°37.80 \$22°25.73	108°3.37 S 22°48.90	4°19.03 N12°55.12	60°48.53 \$10°41.92	Jupiter 324°54.78 17:43
19	54° 30.94	134°36.93 25.64	123° 3.79 48.65	19°21.26 55.21	75°50.73 41.82	Saturn 21°24.89 13:57
20 21	69° 33.40 84° 35.86	149°36.05 25.56 164°35.18 •• 25.47	138° 4.20 48.39 153° 4.62 • • 48.14	34°23.49 55.31 49°25.71 •• 55.40	90°52.92 41.71 105°55.12 • 41.61	Horizontal parallax
22	99° 38.33	179°34.31 25.38	168°5.04 47.88	64°27.94 55.49	120° 57.31 41.50	Venus: 0.1
23	114° 40.79	194°33.43 25.28	183° 5.46 47.62	79°30.17 55.58	135°59.51 41.39	Mars: 0.1
	pass. 15:23	ν-0.9' d-0.1' m-3.92	ν0.4' d-0.2' m1.33	ν2.2' d0.1' m-2.36	ν2.2' d-0.1' m0.99	
ivier.	pass. 10:23	ν-υ.σ u-υ.1 III-3.92	νυ. + α-υ.∠ III1.33	ν Δ.Δ UU.1 III-2.30	ν Δ. Δ U-U.1 IIIU.99	

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.22	S18°23.14	$331^{\circ}4.01$	15.7'	$N13^{\circ}59.40$	-12.5'	54.1'
1	191°49.09	22.50	345°38.68	15.7'	13°46.90	-12.6'	54.1'
2 3	206°48.97 221°48.85	21.85 •• 21.20	0°13.40 14°48.18	15.8' 15.8'	13°34.34 13°21.74	-12.6' -12.7'	54.1' 54.1'
4	236°48.72	20.55	29°23.02	15.9'	13°9.09	-12.7'	54.1
5	251°48.60	19.89	43°57.92	15.9'	$12^{\circ}56.39$	-12.7'	54.0'
6	266°48.48	S18° 19.24	58° 32.86	16.0'	N12°43.65 12°30.86	-12.8'	54.0'
7 8	281°48.36 296°48.24	18.59 17.94	73°7.87 87°42.92	16.1' 16.1'	12° 30.86 12° 18.04	-12.8' -12.9'	54.0' 54.0'
9	311°48.12	17.28	102° 18.03	16.2'	12°5.16	-12.9'	54.0'
10	326°48.00	16.63	116°53.18	16.2'	11°52.25	-13.0'	54.0'
11	341°47.88 356°47.76	15.98 \$18° 15.32	131°28.39 146°3.65	16.3'	11°39.30 N11°26.30	-13.0'	54.0'
12 13	11°47.64	14.67	140 3.05 160°38.95	16.3' 16.4'	11°13 27	-13.0' -13.1'	54.0' 54.0'
14	26°47.52	14.01	175° 14.30	16.4'	11°0.20	-13.1'	54.0'
15	41°47.40	• • 13.35	189°49.70	16.4'	10°47.09	-13.1'	54.0'
16 17	56°47.28 71°47.16	12.69 12.04	204°25.14 219°0.63	16.5' 16.5'	10°33.95 10°20.76	-13.2' -13.2'	54.0' 54.0'
18	86°47.05	518° 11.38	233° 36.16	16.6'	N10°7.55	-13.2	54.0'
19	101°46.93	10.72	248°11.73	16.6'	09°54.30	-13.3'	54.0'
20	116°46.81	10.06	262° 47.34	16.7'	09°41.01	-13.3'	54.0'
21 22	131°46.70 146°46.58	• • 9.40 8.74	277°23.00 291°58.69	16.7' 16.7'	09°27.70 09°14.35	-13.3' -13.4'	54.0' 54.0'
23	140 46.58 161°46.46	8.74 8.08	306°34.42	16.7	09 14.35 09°0.97	-13.4' -13.4'	54.0'
	SD = 16.2'	d = -0.6'			D = 14.7'		
Mon	GHA 176°46.35	Dec \$18°7.41	GHA 321°10.19	u 16.8'	Dec N08° 47.56	d -13.4'	HP 54.0'
0 1	176°46.35 191°46.23	6.75	321°10.19 335°46.00	16.8'	08° 34.12	-13.4 -13.5'	54.0' 54.0'
2	206°46.12	6.09	350°21.84	16.9'	08°20.65	-13.5'	54.0'
3	221°46.00	• • 5.43	4°57.71	16.9'	08°7.15	-13.5'	54.0'
4 5	236°45.89 251°45.78	4.76 4.10	19°33.62 34°9.56	16.9' 17.0'	07°53.63 07°40.08	-13.6' -13.6'	54.0' 54.0'
6	266°45.66	518°3.43	48° 45.54	17.0'	N07°26.50	-13.6'	54.0'
7	281°45.55	2.76	63°21.54	17.0'	07° 12.90	-13.6'	54.0'
8	296°45.44	2.10	77° 57.57	17.1'	06°59.28	-13.6'	54.0'
9 10	311°45.32 326°45.21	· · 1.43 0.76	92°33.63 107°9.72	17.1' 17.1'	06°45.63 06°31.95	-13.7' -13.7'	54.0' 54.0'
11	341°45.10	18°0.10	107 9.72 121°45.84	17.1'	06° 18.26	-13.7'	54.0'
12	356°44.99	\$17°59.43	136°21.97	17.2'	N06°4.54	-13.7'	54.0'
13	11°44.88	58.76	150° 58.14	17.2'	05°50.81	-13.8'	54.0'
14 15	26°44.77 41°44.66	58.09 •• 57.42	165°34.32 180°10.53	17.2' 17.2'	05°37.05 05°23.28	-13.8' -13.8'	54.0' 54.0'
16	56°44.55	56.75	194° 46.76	17.2'	05°23.28	-13.8'	54.0'
17	71°44.44	56.07	$209^{\circ}23.01$	17.3'	$04^{\circ}55.67$	-13.8'	54.0'
18	86°44.33 101°44.22	\$17°55.40	223°59.28	17.3'	N04°41.84 04°28.00	-13.8'	54.0'
19 20	101°44.22 116°44.11	54.73 54.06	238°35.57 253°11.87	17.3' 17.3'	04° 28.00 04° 14.14	-13.9'	54.0' 54.0'
21	131°44.00	• • 53.38	267°48.19	17.3'	04°0.26	-13.9'	54.0'
22	146°43.89	52.71	$282^{\circ}24.52$	17.3'	03°46.37	-13.9'	54.0'
23	161°43.79	52.03	297°0.87	17.4'	03°32.47	-13.9'	54.0'
	SD = 16.2'	d = -0.7'		SI	O = 14.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°43.68	\$17°51.36	311°37.23	17.4'	N03° 18.55	-13.9'	54.0'
1 2	191°43.57 206°43.47	50.68 50.01	326°13.60 340°49.98	17.4' 17.4'	03°4.62 02°50.68	-13.9' -14.0'	54.0' 54.0'
3	221°43.36	• • 49.33	$355^{\circ}26.37$	17.4'	02°36.73	-14.0'	54.0'
4	236°43.25	48.65	10°2.77	17.4'	02°22.77	-14.0'	54.0'
5 6	251°43.15 266°43.04	47.97 \$17° 47.29	24°39.18 39°15.59	17.4' 17.4'	02°8.80 N01°54.82	-14.0' -14.0'	54.0' 54.0'
7	200 43.04 281°42.94	46.61	53° 52.00	17.4 17.4'	01°40.83	-14.0' -14.0'	54.0'
8	296°42.83	45.93	68°28.42	17.4'	$01^{\circ}26.84$	-14.0'	54.0'
9	311°42.73	45.25	83°4.85	17.4	01°12.84	-14.0'	54.0'
10 11	326°42.63 341°42.52	44.57 43.89	97°41.27 112°17.70	17.4' 17.4'	00°58.83 00°44.81	-14.0' -14.0'	54.0' 54.1'
12	356°42.42	\$17°43.21	112 17.70 126°54.12	17.4	N00° 30.80	-14.0'	54.1
13	11°42.32	42.53	141°30.54	17.4'	$00^{\circ}16.77$	-14.0'	54.1'
14	26°42.21	41.84	156° 6.96	17.4'	N00°2.75	-14.0'	54.1'
15 16	41°42.11 56°42.01	· · 41.16 40.48	170°43.38 185°19.79	17.4' 17.4'	\$00°11.28 00°25.31	14.0' 14.0'	54.1' 54.1'
17	71°41.91	39.79	105 19.79 199°56.19	17.4' 17.4'	00°25.31 00°39.34	14.0'	54.1'
18	86°41.81	S17°39.11	214°32.59	17.4'	S00°53.37	14.0'	54.1'
19	101°41.71	38.42	229°8.98	17.4	01°7.41	14.0'	54.1'
20 21	116°41.61 131°41.51	37.73 •• 37.05	243°45.35 258°21.72	17.4' 17.4'	01°21.44 01°35.47	14.0' 14.0'	54.1' 54.1'
22	131 41.51 146°41.41	36.36	272°58.08	17.4	01° 49.50	14.0'	54.1'
23	161°41.31	35.67	287°34.42	17.3'	02°3.52	14.0'	54.1'
	SD = 16.2'	d = -0.7'		SI	D = 14.7'		

	Twi	Twilight		_	Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	07:22	08:54	11:01	13:26	15:33	17:06	
N 70°	07:12	08:33	10:05	14:22	15:54	17:15	
68°	07:04	08:16	09:32	14:55	16:11	17:23	
66°	06:58	08:03	09:09	15:18	16:24	17:29	
64°	06:52	07:52	08:50	15:37	16:35	17:35	
62°	06:47	07:42	08:35	15:52	16:45	17:40	
60°	06:42	07:34	08:22	16:05	16:53	17:45	
N 58°	06:38	07:26	08:11	16:16	17:01	17:49	
56°	06:34	07:20	08:01	16:25	17:07	17:53	
54°	06:31	07:14	07:53	16:34	17:13	17:56	
52°	06:27	07:08	07:45	16:41	17:18	17:59	
50°	06:24	07:03	07:38	16:48	17:23	18:03	
45°	06:17	06:52	07:24	17:03	17:34	18:10	
N 40°	06:10	06:43	07:12	17:15	17:44	18:16	
35°	06:04	06:35	07:01	17:25	17:52	18:22	
30° 20°	05:58	06:27	06:52	17:34	17:59	18:28	
N 10°	05:47 05:35	06:13 06:01	06:36 06:23	17:50 18:04	18:13 18:26	18:39 18:51	
0°	05:33	05:48	06:09	18:17	18:38	19:04	
S 10°	05:08	05:34	05:56	18:30	18:52	19:18	
20°	04:51	05:18	05:42	18:44	19:07	19:35	
30°	04:31	04:59	05:42	19:00	19:26	19:57	
35°	04:14	04:48	05:16	19:10	19:38	20:11	
40°	03:57	04:34	05:05	19:21	19:51	20:28	
45°	03:35	04:18	04:52	19:34	20:07	20:50	
S 50°	03:06	03:57	04:35	19:50	20:28	21:19	
52°	02:50	03:46	04:28	19:57	20:38	21:34	
54°	02:32	03:35	04:19	20:05	20:50	21:52	
56°	02:08	03:21	04:10	20:15	21:03	22:14	
58°	01:35	03:05	03:59	20:25	21:18	22:46	
S 60°	////	02:46	03:47	20:38	21:38	23:50	

Lat.		Moonris	e		Moonset	į.
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	18:15	20:17	22:13	10:51	10:12	09:41
N 70°	18:32	20:23	22:10	10:32	10:04	09:39
68°	18:45	20:28	22:08	10:16	09:56	09:38
66°	18:55	20:32	22:06	10:04	09:50	09:37
64°	19:04	20:35	22:04	09:54	09:45	09:37
62°	19:12	20:38	22:03	09:45	09:40	09:36
60°	19:19	20:41	22:02	09:37	09:36	09:35
N 58°	19:24	20:43	22:01	09:30	09:33	09:35
56°	19:29	20:45	22:00	09:24	09:30	09:34
54°	19:34	20:47	21:59	09:19	09:27	09:34
52°	19:38	20:48	21:58	09:14	09:24	09:34
50°	19:42	20:50	21:57	09:09	09:22	09:33
45°	19:50	20:53	21:56	09:00	09:17	09:32
N 40°	19:56	20:56	21:55	08:52	09:12	09:32
35°	20:02	20:58	21:53	08:45	09:09	09:31
30°	20:07	21:00	21:52	08:38	09:05	09:31
20°	20:15	21:03	21:51	08:28	08:59	09:30
N 10°	20:23	21:07	21:49	08:18	08:54	09:29
0°	20:30	21:09	21:48	08:09	08:49	09:28
S 10°	20:37	21:12	21:47	08:00	08:44	09:27
20°	20:44	21:15	21:46	07:50	08:39	09:26
30°	20:53	21:19	21:44	07:39	08:33	09:25
35°	20:58	21:21	21:43	07:33	08:29	09:25
40°	21:03	21:23	21:42	07:25	08:25	09:24
45°	21:09	21:26	21:41	07:16	08:20	09:23
S 50°	21:17	21:29	21:40	07:06	08:15	09:22
52°	21:20	21:30	21:39	07:01	08:12	09:22
54°	21:24	21:32	21:39	06:55	08:09	09:21
56°	21:28	21:33	21:38	06:49	08:06	09:21
58°	21:33	21:35	21:37	06:43	08:02	09:20
S 60°	21:38	21:37	21:36	06:35	07:58	09:20

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-84%
28	12:43	12:49	12:13	01:59	14:20	
29	12:55	13:00	12:13	02:40	14:59	
30	13:05	13:10	12:13	03:19	15:38	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	129°43.26	209°32.56	198°5.88 S 22°47.37	94°32.39 N12°55.67	151°1.70 \$10°41.29	Alpheratz 357°35.81	29°13.43
1	$144^{\circ}45.72$	224°31.69 25.10	213°6.30 47.11	109°34.62 55.77	166°3.90 41.18	Alpheratz 357°35.81 Ankaa 353°8.12	-42°10.78
2	159°48.18	239°30.82 25.00	228° 6.72 46.85	124°36.84 55.86	181°6.09 41.07	Schedar 349°32.24	56°40.34
3	174° 50.65	254°29.94 · · 24.90	243°7.14 · · 46.59	139°39.07 · · 55.95	196°8.29 · · 40.97	Diphda 348°48.23	-17°51.47
4 5	189°53.11	269°29.07 24.81	258° 7.56 46.33 273° 7.97 46.07	154°41.29 56.04 169°43.51 56.13	211°10.48 40.86 226°12.68 40.76	Achernar 335°20.88	-57°7.19
6	204° 55.58 219° 58.04	284°28.20 24.71 299°27.33 \$22°24.61	273°7.97 46.07 288°8.39 \$22°45.81	169°43.51 56.13 184°45.74 N12°56.23	226°12.68 40.76 241°14.87 \$10°40.65	Hamal 327°52.12	23°34.61
7	235°0.51	314°26.46 24.51	303°8.81 45.55	199°47.96 56.32	256°17.07 40.54	Polaris 314°21.45	89°22.26
8	250°2.97	329°25.58 24.40	318° 9.23 45.29	214°50.19 56.41	271°19.26 40.44	Acamar 315°12.30	-40°12.75
9	265°5.43	344°24.71 · · 24.30	333°9.65 · · 45.03	229°52.41 · · 56.51	286°21.46 · · 40.33	Menkar 314° 6.91 Mirfak 308° 29.26	4°10.98 49°56.98
10	280°7.90	359°23.84 24.20	348°10.07 44.77	244°54.63 56.60	301°23.65 40.22	Aldebaran 290°40.33	16°33.46
11	295° 10.36	14°22.97 24.09	3°10.49 44.51	259°56.85 56.69	316°25.84 40.12	Rigel 281° 4.39	-8°10.52
12	310° 12.83	29°22.09 \$22°23.98 44°21.22 23.87	18°10.91	274°59.08 N12°56.78	331°28.04 \$10°40.01 346°30.23 39.90	Capella 280°22.72	46°1.44
13 14	325° 15.29 340° 17.75	44°21.22 23.87 59°20.35 23.76	33°11.33 43.98 48°11.75 43.72	290°1.30 56.88 305°3.52 56.97	346°30.23 39.90 1°32.43 39.80	Bellatrix 278°23.48	6°22.25
15	355°20.22	74°19.48 · · 23.65	63°12.17 · · 43.46	320°5.74 · · 57.06	16°34.62 · · 39.69	Elnath 278° 2.59	28°37.71
16	10°22.68	89° 18.61 23.54	78°12.59 43.19	335°7.96 57.16	31°36.82 39.59	Alnilam 275°38.28	-1°11.26
17	$25^{\circ}25.15$	104° 17.73 23.43	93°13.01 42.93	350°10.18 57.25	46°39.01 39.48	Betelgeuse 270°52.66 Canopus 263°52.28	7°24.66 -52°42.63
18	40°27.61	119°16.86	108°13.43	5°12.40 N12°57.35	61°41.20 \$10°39.37	Sirius 258°26.62	-16°45.04
19	55° 30.07	134°15.99 23.20	123°13.85 42.40	20°14.62 57.44	76°43.40 39.27	Adhara 255° 6.13	-29°0.37
20 21	70° 32.54 85° 35.00	149°15.12 23.08 164°14.25 · · 22.97	138°14.27 42.13 153°14.69 • 41.87	35°16.84 57.53 50°19.06 • 57.63	91°45.59 39.16 106°47.79 · · 39.05	Procyon 244°51.32	5° 9.75
22	100°37.47	179°13.38 22.85	168°15.11 41.60	65°21.28 57.72	121°49.98 38.95	Pollux 243°17.88	27°58.06
23	115°39.93	194° 12.50 22.73	183°15.53 41.33	80°23.50 57.81	136°52.17 38.84	Avior 234°14.42	-59°35.18
						Suhail 222°46.44	-43°31.76
Wer.p	pass. 15:19	ν-0.9' d-0.1' m-3.92	ν0.4' d-0.3' m1.33	ν2.2' d0.1' m-2.36	ν2.2' d-0.1' m0.99	Miaplacidus 221°37.53 Alphard 217°48.19	-69°48.86 -8°45.81
						Regulus 207°34.95	11°50.89
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.36	61°37.08
0	130°42.39	209°11.63	198°15.95 \$22°41.06	95°25.72 N12°57.91	151°54.37 \$10°38.73	Denebola 182°25.51	14°26.13
1	145° 44.86	224°10.76 22.48	213°16.37 40.80	110°27.94 58.00	166°56.56 38.63	Gienah 175°44.19	-17°40.51
2	160° 47.32 175° 49.79	239°9.89 22.36 254°9.02 · · 22.24	228°16.79 40.53 243°17.21 • 40.26	125°30.16 58.10 140°32.37 · · 58.19	181°58.75 38.52 197°0.95 · · 38.41	Acrux 173°0.62	-63°13.71
4	190°52.25	269°8.15 22.11	258°17.64 39.99	155°34.59 58.29	212°3.14 38.31	Gacrux 171°52.23	-57°14.66
5	205°54.71	284°7.28 21.98	273°18.06 39.72	170°36.81 58.38	227°5.33 38.20	Alioth 166°13.37 Spica 158°23.02	55°49.46 -11°17.23
6	220°57.18	299°6.40 S 22°21.86	288°18.48 S 22°39.45	185°39.03 N12°58.48	242°7.53 \$10°38.09	Spica 158°23.02 Alkaid 152°52.49	-11 17.23 49°11.28
7	$235^{\circ}59.64$	314°5.53 21.73	303°18.90 39.18	200°41.24 58.57	257°9.72 37.98	Hadar 148°37.05	-60°29.08
8	251°2.11	329°4.66 21.60	318°19.32 38.91	215°43.46 58.67	272°11.91 37.88	Menkent 147°58.49	-36°29.17
9	266°4.57	344°3.79 · · 21.46	333°19.74 · · 38.64	230°45.67 · · 58.76	287°14.11 · · 37.77	Arcturus 145°48.58	19°3.23
10 11	281°7.03 296°9.50	359°2.92 21.33 14°2.05 21.20	348°20.16 38.37 3°20.58 38.09	245°47.89 58.86 260°50.11 58.95	302°16.30 37.66 317°18.49 37.56	Rigil Kent. 139°41.38	-60°55.82
12	311°11.96	29°1.18	18°21.00 \$22°37.82	275°52.32 N12°59.05	332°20.69 \$10°37.45	Kochab 137°19.81	74°3.00
13	326° 14.43	44°0.31 20.93	33°21.42 37.55	290°54.54 59.14	347°22.88 37.34	Zuben'ubi 136°56.90	-16°8.50
14	341°16.89	58°59.44 20.79	48°21.85 37.27	305°56.75 59.24	2°25.07 37.24	Alphecca 126° 4.49	26°37.77 -26°29.08
15	$356^{\circ}19.36$	73°58.57 · · 20.65	63°22.27 · · 37.00	320°58.96 · · 59.33	17°27.27 · · · 37.13	Antares 112°16.96 Atria 107°12.23	-20 29.06 -69°4.00
16	11°21.82	88°57.70 20.51	78°22.69 36.73	336°1.18 59.43	32°29.46 37.02	Sabik 102°3.88	-15°45.31
17	26°24.28	103°56.83 20.37	93°23.11 36.45	351°3.39 59.52	47°31.65 36.92	Shaula 96°11.71	-37°7.21
18	41°26.75	118°55.96	108°23.53 \$22°36.18	6°5.61 N12°59.62	62°33.85 \$10°36.81	Rasalhague 95°59.50	12°32.37
19 20	56° 29.21 71° 31.68	133°55.09 20.09 148°54.22 19.94	123°23.95 35.90 138°24.38 35.62	21°7.82 59.71 36°10.03 59.81	77°36.04 36.70 92°38.23 36.59	Eltanin 90°42.95	51°28.85
21	86°34.14	163°53.35 · · 19.80	153°24.80 · · 35.35	51°12.25 12°59.91	107°40.42 · · 36.49	Kaus Aust. 83°33.87	-34°22.37
22	101°36.60	178°52.48 19.65	168°25.22 35.07	66°14.46 13°0.00	122° 42.62 36.38	Vega 80°34.11	38°48.12
23	116°39.07	193°51.61 19.50	183°25.64 34.79	81°16.67 0.10	137° 44.81 36.27	Nunki 75°49.05 Altair 62°1.04	-26°16.04 8°55.77
Merr	pass. 15:15	ν-0.9' d-0.1' m-3.92	ν0.4' d-0.3' m1.33	ν2.2' d0.1' m-2.35	ν2.2' d-0.1' m0.99	Peacock 53°7.52	-56°39.51
- IVICI.	Dass. 13.13	ν-0.9 d-0.1 III-3.92			ν2.2 d-0.1 mo.99	Deneb 49°26.81	45°21.86
	C	CIIA	CHA	CIIA =	CIIA -	Enif 33°39.88	9°59.01
Fri 0	GHA 131° 41.53	GHA Dec 208°50.74 \$22°19.35	GHA Dec 198°26.06 \$22°34.51	GHA Dec 96°18.88 N13°0.19	GHA Dec 152°47.00 \$10°36.17	Al Na'ir 27°34.30	-46°50.85
1	131 41.53 146°44.00	208 50.74 S 22 19.35 223°49.87 19.20	213°26.49 34.24	111°21.09 0.29	167°49.19 36.06	Fomalhaut 15°15.66	-29°29.89
2	161°46.46	238°49.00 19.05	228°26.91 33.96	126°23.30 0.39	182°51.39 35.95	Scheat 13°46.26 Markab 13°30.94	28°12.78 15°20.02
3	176°48.92	253°48.13 · · 18.90	243°27.33 · · 33.68	141°25.51 · · 0.48	197°53.58 · · 35.84		10 20.02
4	191°51.39	268° 47.26 18.75	258°27.75 33.40	156°27.73 0.58	212°55.77 35.74	Jan 31 Wed SHA	Mer.pass
5	206° 53.85	283°46.39 18.59	273°28.18 33.12	171°29.94 0.68	227°57.96 35.63	Venus 79°49.31	10:02
6	221°56.32	298°45.52	288°28.60 \$22°32.84	186°32.15 N13°0.77	243°0.15 \$10°35.52	Mars 68°22.62	10:47
7 8	236° 58.78 252° 1.24	313°44.65 18.28 328°43.78 18.12	303°29.02 32.56 318°29.44 32.28	201°34.36 0.87 216°36.57 0.97	258°2.35 35.41 273°4.54 35.31	Jupiter 324°49.13 Saturn 21°18.45	17:39 13:54
9	252 1.24 267°3.71	343°42.91 · · 17.96	318 29.44 32.28 333°29.87 · · 31.99	231°38.77 · · 1.07	288°6.73 · · 35.20		
10	282°6.17	358°42.04 17.80	348°30.29 31.71	246°40.98 1.16	303°8.92 35.09	Feb 01 Thu SHA	Mer.pass
11	297°8.64	13°41.17 17.64	3°30.71 31.43	261°43.19 1.26	318° 11.11 34.99	Venus 78°29.24 Mars 67°33.56	10:04
12	312°11.10	28°40.30 S 22°17.47	18°31.14 S 22°31.15	276°45.40 N13°1.36	333°13.31 \$10°34.88	Jupiter 324°43.32	10:47 17:36
13	327° 13.57	43°39.44 17.31	33°31.56 30.86	291°47.61 1.45	348°15.50 34.77	Saturn 21°11.97	13:50
14	342°16.03	58°38.57 17.15	48°31.98 30.58	306°49.82 1.55	3°17.69 34.66		
15 16	357° 18.49 12° 20.96	73°37.70 · · 16.98 88°36.83 16.81	63°32.40 · · · 30.29 78°32.83	321°52.02 · · 1.65 336°54.23 1.75	18°19.88 · · 34.56 33°22.07 34.45	Feb 02 Fri SHA Venus 77°9.20	Mer.pass
17	27°23.42	103°35.96 16.64	93°33.25 29.72	351°56.44 1.84	48°24.27 34.34	Venus 77°9.20 Mars 66°44.53	10:05 10:46
18	42°25.89	118°35.09 S22°16.47	108°33.67 S 22°29.44	6°58.64 N13°1.94	63°26.46 S10°34.23	Jupiter 324°37.35	17:32
19	57°28.35	133°34.23 16.30	123°34.10 29.15	22°0.85 2.04	78°28.65 34.13	Saturn 21°5.47	13:47
20	72°30.81	148°33.36 16.13	138°34.52 28.87	37°3.06 2.14	93°30.84 34.02		
21	87°33.28	163°32.49 · · 15.96	153°34.95 · · 28.58	52°5.26 · · 2.24	108° 33.03 · · 33.91	Horizontal parallax Venus:	0.1
22 23	102° 35.74 117° 38.21	178°31.62 15.78 193°30.75 15.61	168°35.37 28.29 183°35.79 28.01	67°7.47 2.33 82°9.67 2.43	123° 35.22 33.80 138° 37.41 33.69	Mars:	0.1
							-
Mer.p	pass. 15:11	ν -0.9′ <i>d</i> -0.2′ m-3.91	$ u 0.4' \ d$ -0.3' m1.32	$ u 2.2' \ d0.1' \ \text{m-}2.34$	ν 2.2′ <i>d</i> -0.1′ m0.99		

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	$176^{\circ}41.21$	S17°34.98	$302^{\circ}10.75$	17.3'	S02°17.55	14.0'	54.2'
1	191°41.11	34.29	316°47.06	17.3'	02°31.56	14.0'	54.2'
2	206°41.01 221°40.92	33.60 •• 32.91	331°23.36 345°59.64	17.3' 17.3'	02°45.58 02°59.59	14.0' 14.0'	54.2' 54.2'
4	236°40.82	32.22	0°35.90	17.2'	03°13.59	14.0'	54.2'
5	251°40.72	31.53	$15^{\circ}12.14$	17.2'	$03^{\circ}27.58$	14.0'	54.2'
6	266°40.62	S17°30.84	29°48.36	17.2'	S03°41.57	14.0'	54.2'
7 8	281°40.53 296°40.43	30.15 29.45	44°24.55 59°0.73	17.2' 17.1'	03°55.55 04°9.52	14.0' 14.0'	54.2' 54.2'
9	311°40.34	28.76	73°36.88	17.1'	04°23.48	14.0'	54.3'
10	326°40.24	28.07	88°13.00	17.1'	04°37.44	13.9'	54.3'
11 12	341°40.15 356°40.05	27.37 \$17°26.68	102°49.10 117°25.16	17.1' 17.0'	04°51.38 \$05°5.31	13.9' 13.9'	54.3' 54.3'
13	11°39.96	25.98	117 25.10 132°1.20	17.0'	05° 19.22	13.9'	54.3'
14	26°39.86	25.28	146°37.21	17.0'	05°33.13	13.9'	54.3'
15	41°39.77	• • 24.59	161°13.19	16.9'	05°47.02	13.9'	54.3'
16 17	56°39.68 71°39.58	23.89 23.19	175°49.13 190°25.04	16.9' 16.9'	06°0.89 06°14.75	13.9' 13.8'	54.3' 54.4'
18	86°39.49	\$17°22.49	205° 0.92	16.8'	506°28.60	13.8'	54.4'
19	101°39.40	21.79	219°36.76	16.8'	$06^{\circ}42.42$	13.8'	54.4'
20	116°39.31	21.10	234°12.56	16.8'	06°56.24	13.8'	54.4'
21 22	131°39.21 146°39.12	· · 20.40 19.69	248°48.32 263°24.04	16.7' 16.7'	07° 10.03 07° 23.80	13.8' 13.8'	54.4' 54.4'
23	140 39.12 161°39.03	18.99	203 24.04 277°59.72	16.7	07 23.80 07°37.56	13.7	54.4'
	SD = 16.2'	d = -0.7'			0 = 14.8'		
	- 10.2			JL	17.0		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°38.94 191°38.85	\$17°18.29 17.59	292°35.36 307°10.96	16.6' 16.6'	\$07°51.29 08°5.00	13.7' 13.7'	54.5' 54.5'
2	206°38.76	16.89	321°46.51	16.5	08° 18.69	13.7'	54.5'
3	221°38.67	• • 16.18	336°22.01	16.5'	08°32.36	13.6'	54.5'
4	236°38.58	15.48	350°57.47	16.4'	08°46.01	13.6'	54.5'
5 6	251°38.49 266°38.41	14.78 \$17°14.07	5°32.88 20°8.24	16.4' 16.3'	08°59.63 \$09°13.22	13.6' 13.6'	54.5' 54.6'
7	281°38.32	13.37	34°43.55	16.3'	09°26.79	13.5'	54.6'
8	296°38.23	12.66	49°18.81	16.2'	09°40.34	13.5'	54.6'
9	311°38.14	• • 11.95	63°54.01	16.1'	09°53.85	13.5'	54.6'
10 11	326°38.06 341°37.97	11.25 10.54	78°29.16 93°4.26	16.1' 16.0'	10°7.34 10°20.80	13.5' 13.4'	54.6' 54.7'
12	356°37.88	S17°9.83	107°39.29	16.0'	S10°34.23	13.4'	54.7'
13	11°37.80	9.12	122°14.27	15.9'	10°47.63	13.4'	54.7'
14 15	26°37.71 41°37.63	8.41 •• 7.70	136°49.19 151°24.05	15.9' 15.8'	11°0.99 11°14.33	13.3' 13.3'	54.7' 54.7'
16	56°37.54	6.99	165°58.85	15.6	11 14.33 11°27.63	13.3'	54.7 54.8'
17	71°37.46	6.28	180°33.59	15.7'	11°40.90	13.2'	54.8'
18	86°37.37	\$17°5.57	195°8.26	15.6'	S11°54.13	13.2'	54.8'
19 20	101°37.29 116°37.20	4.86 4.15	209°42.87 224°17.41	15.5' 15.5'	12°7.33 12°20.49	13.2'	54.8' 54.8'
21	131°37.12	• • 3.44	238°51.88	15.4'	12° 33.61	13.1	54.9'
22	146°37.04	2.72	253°26.28	15.3'	$12^{\circ}46.70$	13.0'	54.9'
23	161°36.96	2.01	268°0.62	15.3'	12°59.74	13.0'	54.9'
	SD = 16.2'	d = -0.7'		SE	0 = 14.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.87	\$17°1.29	282°34.88	15.2'	\$13°12.74	13.0'	54.9'
1	191°36.79	17°0.58	$297^{\circ}9.07$	15.1'	13°25.71	12.9'	54.9'
2	206°36.71 221°36.63	16°59.86 •• 59.15	311°43.19 326°17.23	15.0' 15.0'	13°38.63 13°51.51	12.9' 12.8'	55.0' 55.0'
3 4	221°36.63 236°36.55	58.43	326°17.23 340°51.19	15.0° 14.9°	13°51.51 14°4.34	12.8'	55.0' 55.0'
5	251°36.47	57.72	355°25.08	14.8'	$14^{\circ}17.13$	12.7'	55.0'
6	266°36.39	\$16°57.00	9°58.89	14.7'	\$14° 29.87	12.7'	55.1'
7 8	281°36.31 296°36.23	56.28 55.56	24°32.63 39°6.28	14.7' 14.6'	14° 42.57 14° 55.21	12.6' 12.6'	55.1' 55.1'
9	311°36.15	• • 54.84	53°39.84	14.5'	15°7.81	12.5'	55.1'
10	326°36.07	54.12	68°13.33	14.4'	15°20.36	12.5'	55.2'
11	341°35.99	53.40	82°46.73	14.3'	15°32.86	12.4	55.2'
12 13	356°35.91 11°35.84	\$16°52.68 51.96	97°20.05 111°53.28	14.2' 14.1'	\$15°45.30 15°57.70	12.4' 12.3'	55.2' 55.2'
14	26°35.76	51.24	126°26.42	14.1'	16°10.03	12.3'	55.3'
15	41°35.68	• • 50.52	140°59.47	14.0'	16°22.31	12.2'	55.3'
16 17	56°35.61 71°35.53	49.80 49.07	155°32.43 170°5.31	13.9' 13.8'	16° 34.54 16° 46.71	12.2' 12.1'	55.3' 55.4'
18	71°35.53 86°35.45	49.07 \$16°48.35	170°5.31 184°38.09	13.8	\$16° 58.82	12.1	55.4'
19	101°35.38	47.63	199°10.77	13.6'	17° 10.87	12.0'	55.4'
20	116°35.30	46.90	213°43.37	13.5'	17°22.85	11.9'	55.4'
21 22	131°35.23 146°35.15	•• 46.18 45.45	228°15.87 242°48.27	13.4' 13.3'	17° 34.78 17° 46.64	11.9' 11.8'	55.5' 55.5'
23	161°35.18	45.45 44.72	257°20.57	13.2'	17 40.04 17°58.44	11.7	55.5'
	SD = 16.2'	d = -0.7'		SF	0 = 15.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:11	08:41	10:31	13:57	15:48	17:17
N 70°	07:03	08:22	09:48	14:40	16:06	17:25
68°	06:56	08:07	09:19	15:09	16:21	17:32
66°	06:51	07:55	08:58	15:30	16:34	17:38
64°	06:45	07:44	08:41	15:47	16:44	17:43
62°	06:41	07:35	08:27	16:01	16:53	17:47
60°	06:37	07:28	08:15	16:13	17:00	17:51
N 58°	06:33	07:21	08:05	16:23	17:07	17:55
56°	06:30	07:15	07:56	16:32	17:13	17:58
54°	06:26	07:09	07:48	16:40	17:19	18:01
52°	06:23	07:04	07:41	16:47	17:24	18:04
50°	06:21	06:59	07:34	16:53	17:28	18:07
45°	06:14	06:49	07:21	17:07	17:38	18:14
N 40°	06:08	06:40	07:09	17:18	17:47	18:19
35°	06:02	06:33	06:59	17:28	17:55	18:25
30°	05:57	06:26	06:51	17:37	18:02	18:30
20°	05:46	06:13	06:36	17:52	18:15	18:41
N 10°	05:35	06:01	06:22	18:05	18:27	18:52
0°	05:23	05:48	06:10	18:17	18:39	19:04
S 10°	05:09	05:35	05:57	18:29	18:52	19:17
20°	04:53	05:20	05:44	18:43	19:06	19:34
30°	04:31	05:02	05:28	18:58	19:24	19:55
35°	04:18	04:51	05:19	19:08	19:35	20:08
40°	04:01	04:38	05:08	19:18	19:48	20:25
45°	03:41	04:23	04:56	19:30	20:03	20:45
S 50°	03:13	04:03	04:41	19:45	20:23	21:12
52°	02:59	03:53	04:34	19:52	20:33	21:26
54°	02:42	03:42	04:26	20:00	20:43	21:43
56°	02:20	03:29	04:17	20:09	20:56	22:04
58°	01:52	03:14	04:07	20:19	21:10	22:31
S 60°	01:05	02:57	03:55	20:30	21:28	23:13

Lat.		Moonris	е		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°		00:12	02:32	09:09	08:34	07:42
N 70°		00:00	02:02	09:15	08:49	08:13
68°	23:50		01:41	09:20	09:01	08:36
66°	23:42		01:24	09:25	09:11	08:55
64°	23:35		01:10	09:28	09:19	09:09
62°	23:29		00:59	09:31	09:27	09:22
60°	23:24		00:49	09:34	09:33	09:33
N 58°	23:19		00:41	09:37	09:39	09:42
56°	23:15		00:34	09:39	09:44	09:50
54°	23:12		00:27	09:41	09:48	09:58
52°	23:09		00:21	09:43	09:53	10:04
50°	23:06		00:16	09:44	09:56	10:10
45°	22:59		00:05	09:48	10:04	10:23
N 40°	22:54	23:55		09:51	10:11	10:34
35°	22:50	23:48	•• ••	09:54	10:17	10:43
30°	22:46	23:41	•• ••	09:56	10:22	10:51
20°	22:39	23:29		10:00	10:31	11:05
N 10°	22:33	23:18		10:04	10:39	11:18
0°	22:28	23:09	23:53	10:07	10:47	11:29
S 10°	22:22	22:59	23:39	10:10	10:55	11:41
20°	22:16	22:49	23:25	10:14	11:03	11:54
30°	22:10	22:37	23:08	10:18	11:12	12:08
35°	22:06	22:31	22:59	10:20	11:17	12:16
40°	22:02	22:23	22:48	10:23	11:23	12:26
45°	21:57	22:15	22:35	10:26	11:31	12:37
S 50°	21:51	22:04	22:20	10:30	11:39	12:51
52°	21:49	21:59	22:13	10:32	11:43	12:57
54°	21:46	21:54	22:05	10:34	11:48	13:05
56°	21:43	21:48	21:56	10:36	11:53	13:13
58°	21:39	21:42	21:46	10:38	11:58	13:22
S 60°	21:35	21:35	21:35	10:41	12:04	13:32

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	77-60%
31	13:15	13:20	12:13	03:58	16:17	
01	13:24	13:28	12:13	04:37	16:58	
02	13:33	13:36	12:14	05:19	17:41	

February 03, 04, 05 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	132° 40.67	208°29.89 \$22°15.43		97°11.88 N13°2.53	153°39.61 \$10°33.59	
1	147°43.13	223°29.02 15.2		112°14.08 2.63	168°41.80 33.48	Alpheratz 357°35.82 29°13.42 Ankaa 353°8.14 -42°10.78
2	162°45.60	238° 28.15 15.0°	7 228°37.06 27.14	127°16.29 2.73	183°43.99 33.37	Ankaa 353°8.14 -42°10.78 Schedar 349°32.25 56°40.33
3	177° 48.06	253°27.28 · · 14.89		142°18.49 · · 2.83	198°46.18 · · 33.26	Diphda 348°48.24 -17°51.47
4	192°50.53	268°26.42 14.7		157°20.70 2.93	213°48.37 33.16	Achernar 335°20.91 -57°7.19
5 6	207° 52.99 222° 55.46	283°25.55 14.55 298°24.68 \$22°14.3		172°22.90 3.02 187°25.10 N13°3.12	228°50.56 33.05 243°52.75 \$10°32.94	Hamal 327°52.13 23°34.61
7	237°57.92	313°23.82 14.10		202°27.31 3.22	258°54.94 32.83	Polaris 314°22.80 89°22.26
8	253°0.38	328°22.95 13.9°		217°29.51 3.32	273°57.13 32.72	Acamar 315°12.32 -40°12.76
9	268°2.85	343°22.08 · · 13.79		232°31.71 · · 3.42	288°59.32 · · 32.62	Menkar 314°6.93 4°10.98 Mirfak 308°29.28 49°56.97
10	283°5.31	358°21.22 13.60		247°33.91 3.52	304°1.52 32.51	Aldebaran 290°40.34 16°33.46
11	298°7.78	13°20.35 13.4		262°36.11 3.62	319° 3.71 32.40	Rigel 281°4.40 -8°10.53
12	313° 10.24 328° 12.70	28°19.48		277°38.32 N13°3.72 292°40.52 3.82	334°5.90 \$10°32.29 349°8.09 32.19	Capella 280°22.73 46°1.45
13 14	343° 15.17	43°18.62 13.03 58°17.75 12.83		292°40.52 3.82 307°42.72 3.92	349°8.09 32.19 4°10.28 32.08	Bellatrix 278°23.49 6°22.24
15	358° 17.63	73°16.89 · · 12.64		322°44.92 · · 4.02	19°12.47 · · 31.97	Elnath 278°2.60 28°37.70
16	13°20.10	88°16.02 12.4		337°47.12 4.12	34°14.66 31.86	Alnilam 275°38.28 -1°11.27
17	28°22.56	103°15.15 12.29	5 93°43.43 22.75	352°49.32 4.22	49°16.85 31.75	Betelgeuse 270°52.67 7°24.65 Canopus 263°52.30 -52°42.65
18	43°25.02	118°14.29 S 22°12.0		7°51.52 N13°4.32	64°19.04 \$10°31.65	Sirius 258°26.62 -16°45.05
19	58° 27.49	133°13.42 11.89		22°53.72 4.42	79°21.23 31.54	Adhara 255°6.13 -29°0.39
20	73°29.95 88°32.42	148°12.56 11.69		37°55.92 4.52	94°23.42 31.43	Procyon 244°51.32 5°9.74
21 22	88 32.42 103°34.88	163°11.69 · · 11.49 178°10.83		52°58.12 · · 4.62 68°0.32 4.72	109°25.61 · · 31.32 124°27.80 31.21	Pollux 243°17.88 27°58.06
23	118° 37.35	193°9.96 11.0		83°2.52 4.82	139°29.99 31.10	Avior 234°14.42 -59°35.20
						Suhail 222°46.44 -43°31.77
Mer.	pass. 15:07	ν-0.9' d-0.2' m-3.9	ν 0.4' d-0.3' m1.32	ν2.2′ d0.1′ m-2.34	ν2.2′ d-0.1′ m0.99	Miaplacidus 221°37.53 -69°48.88 Alphard 217°48.18 -8°45.82
						Regulus 207°34.94 11°50.89
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.34 61°37.09
0	133°39.81	208°9.10 \$22°10.8		98°4.71 N13°4.92	154°32.18 \$10°31.00	Denebola 182°25.49 14°26.12
1 2	148° 42.27 163° 44.74	223°8.23 10.65 238°7.37 10.45		113°6.91 5.02 128°9.11 5.12	169°34.37 30.89 184°36.56 30.78	Gienah 175°44.17 -17°40.53
3	178° 47.20	253°6.50 · · 10.2		143°11.31 · · 5.22	199°38.75 · · 30.67	Acrux 173°0.58 -63°13.73
4	193°49.67	268°5.64 10.0		158°13.50 5.32	214°40.94 30.56	Gacrux 171°52.19 -57°14.68
5	208°52.13	283°4.78 9.80		173°15.70 5.42	229°43.13 30.46	Alioth 166°13.34 55°49.46 Spica 158°23.00 -11°17.24
6	223°54.59	298°3.91 S22°9.59	288°48.97 S 22°18.87	188°17.90 N13°5.52	244°45.32 \$10°30.35	Alkaid 152°52.46 49°11.27
7	238° 57.06	313°3.05 9.3°		203°20.09 5.62	259°47.51 30.24	Hadar 148°37.00 -60°29.09
8	253° 59.52	328°2.18 9.10		218°22.29 5.72	274°49.70 30.13	Menkent 147°58.47 -36°29.17
9 10	269°1.99 284°4.45	343°1.32 · · 8.99		233°24.48 · · 5.82	289°51.89 · · 30.02 304°54.08	Arcturus 145°48.56 19°3.22
11	299°6.92	358°0.46 8.73 12°59.59 8.53		248°26.68 5.92 263°28.87 6.03	304°54.08 29.91 319°56.27 29.81	Rigil Kent. 139°41.34 -60°55.83
12	314°9.38	27°58.73 \$22°8.29		278°31.07 N13°6.13	334°58.46 \$10°29.70	Kochab 137°19.75 74°3.00
13	329°11.84	42°57.87 8.0°		293°33.26 6.23	350°0.65 29.59	Zuben'ubi 136°56.88 -16°8.51 Alphecca 126°4.46 26°37.76
14	$344^{\circ}14.31$	57°57.01 7.89	5 48°52.38 16.45	308°35.46 6.33	5°2.84 29.48	Antares 112° 16.94 -26° 29.08
15	359° 16.77	72°56.14 · · 7.6		323°37.65 · · 6.43	20°5.03 · · 29.37	Atria 107°12.18 -69°3.99
16	14° 19.24	87°55.28 7.4		338°39.85 6.53	35°7.22 29.26	Sabik 102°3.86 -15°45.31
17 18	29°21.70 44°24.16	102°54.42 7.13 117°53.56 \$22°6.90		353°42.04 6.64 8°44.23 N13°6.74	50°9.41 29.15 65°11.60 \$10°29.05	Shaula 96°11.68 -37°7.20
19	59°26.63	132°52.69 6.73	_	23°46.43 6.84	80°13.79 28.94	Rasalhague 95°59.48 12°32.37
20	74°29.09	147°51.83 6.50		38°48.62 6.94	95°15.97 28.83	Eltanin 90°42.93 51°28.84
21	89°31.56	162°50.97 · · 6.2	3 153°55.37 ·· 14.31	53°50.81 · · 7.04	110°18.16 · · 28.72	Kaus Aust. 83°33.85 -34°22.37 Vega 80°34.10 38°48.11
22	104°34.02	177°50.11 6.09		68°53.00 7.15	125°20.35 28.61	Nunki 75°49.03 -26°16.04
23	119°36.49	192°49.25 5.8	183°56.23 13.69	83°55.19 7.25	140°22.54 28.50	Altair 62°1.03 8°55.76
Mer.	pass. 15:03	ν-0.9' d-0.2' m-3.93	ν 0.4' d-0.3' m1.32	ν2.2' d0.1' m-2.33	ν2.2' d-0.1' m0.99	Peacock 53°7.51 -56°39.50
			_			Deneb 49°26.80 45°21.84
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.87 9°59.00
0	134°38.95	207°48.38 \$22°5.58		98°57.39 N13°7.35	155°24.73 \$10°28.40	Al Na'ir 27°34.31 -46°50.84 Fomalhaut 15°15.67 -29°29.88
1	$149^{\circ}41.41$	222°47.52 5.3		113°59.58 7.45	170°26.92 28.29	Scheat 13°46.26 28°12.78
2	164° 43.88	237°46.66 5.1		129°1.77 7.56	185°29.11 28.18	Markab 13°30.95 15°20.01
3	179° 46.34	252°45.80 · · 4.88		144°3.96 · · 7.66	200°31.30 · · 28.07	
4	194° 48.81 209° 51.27	267°44.94 4.6		159°6.15 7.76 174°8.34 7.86	215°33.49 27.96 230°35.68 27.85	Feb 03 Sat SHA Mer.pass Venus 75°49.22 10:07
5 6	209°51.27 224°53.74	282°44.08 4.40 297°43.22 \$22°4.10		174°8.34 7.86 189°10.53 N13°7.97	230°35.68 27.85 245°37.86 \$10°27.74	Mars 65°55.55 10:45
7	239° 56.20	312° 42.36 3.93		204°12.72 8.07	260°40.05 27.63	Jupiter 324°31.21 17:29
8	254° 58.66	327°41.50 3.66	_	219°14.91 8.17	275°42.24 27.53	Saturn 20°58.93 13:43
9	$270^{\circ}1.13$	342°40.64 · · 3.4	334°0.51 · · 10.59	234°17.10 · · 8.28	290°44.43 · · 27.42	Feb 04 Sun SHA Mer.pass
10	285°3.59	357°39.78 3.20		249°19.29 8.38	305°46.62 27.31	Venus 74°29.29 10:08
11	300°6.06	12° 38.92 2.99		264°21.47 8.48	320°48.81 27.20	Mars 65°6.60 10:45
12 13	315°8.52 330°10.98	27°38.06 \$22°2.73 42°37.20 2.40		279°23.66 N13°8.59 294°25.85 8.69	335°51.00 \$10°27.09 350°53.18 26.98	Jupiter 324°24.90 17:25
14	345° 13.45	57°36.34 2.2	_	309°28.04 8.79	5°55.37 26.87	Saturn 20°52.37 13:40
15	0° 15.91	72°35.48 · · 1.9	64°3.08 · · 8.71	324°30.23 · · 8.90	20°57.56 · · 26.76	Feb 05 Mon SHA Mer.pass
16	$15^{\circ}18.38$	87°34.62 1.7	79°3.51 8.39	339°32.41 9.00	35°59.75 26.65	Venus 73°9.43 10:09
17	30° 20.84	102°33.77 1.4		354°34.60 9.10	51°1.94 26.55	Mars 64°17.71 10:44
18	45°23.31	117°32.91 \$22°1.2		9°36.79 N13°9.21	66° 4.13 \$10° 26.44	Jupiter 324°18.44 17:22
19 20	60°25.77 75°28.23	132°32.05 0.99 147°31.19 0.70		24°38.97 9.31 39°41.16 9.42	81°6.31 26.33 96°8.50 26.22	Saturn 20°45.78 13:36
21	75 28.23 90°30.70	162°30.33 · · 0.4		54°43.34 · · 9.52	111°10.69 · · 26.11	Horizontal parallax
22	105°33.16	177°29.47 22°0.18		69°45.53 9.62	126°12.88 26.00	Venus: 0.1
23	$120^{\circ}35.63$	192°28.62 21°59.93		84°47.71 9.73	141°15.07 25.89	Mars: 0.1
Mer.	pass. 14:59	ν-0.9' d-0.2' m-3.9	ν 0.4' d-0.3' m1.32	ν2.2' d0.1' m-2.32	ν2.2' d-0.1' m0.99	
1						

h	Su	Moon					
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.00	S16°44.00	271°52.77	13.1'	S18° 10.17	11.7'	55.5'
1	191°34.93	43.27	$286^{\circ}24.88$	13.0'	$18^{\circ}21.84$	11.6'	55.6'
2	206°34.86	42.54	300°56.89	12.9'	18° 33.44	11.5'	55.6'
3	221°34.79	• • 41.81	315°28.79	12.8'	18°44.97	11.5'	55.6'
4	236°34.71 251°34.64	41.09 40.36	330°0.59 344°32.29	12.7' 12.6'	18°56.42 19°7.81	11.4' 11.3'	55.7' 55.7'
5 6	266°34.57	\$16°39.63	359°3.88	12.5'	S19° 19.12	11.3	55.7'
7	281°34.50	38.90	13° 35.37	12.4	19° 30.36	11.2'	55.8'
8	296°34.43	38.17	28°6.75	12.3'	19°41.52	11.1'	55.8'
9	311°34.36	• • 37.43	42°38.02	12.2'	$19^{\circ}52.61$	11.0'	55.8'
10	326°34.28	36.70	57°9.19	12.1'	20°3.62	10.9'	55.9'
11	341°34.21	35.97	71°40.24	11.9'	20° 14.55	10.8'	55.9'
12 13	356°34.15 11°34.08	\$16°35.24 34.50	86°11.19 100°42.02	11.8' 11.7'	\$20°25.39 20°36.16	10.8' 10.7'	55.9' 55.9'
14	26°34.01	33.77	100 42.02 115°12.75	11.6'	20° 46.84	10.7	56.0'
15	41°33.94	• • 33.04	129°43.36	11.5'	20°57.44	10.5'	56.0'
16	56°33.87	32.30	144°13.86	11.4'	21°7.95	10.4'	56.0'
17	71°33.80	31.57	158°44.24	11.3'	$21^{\circ}18.37$	10.3'	56.1'
18	86°33.73	S16°30.83	173° 14.51	11.2'	S21°28.70	10.2'	56.1'
19	101°33.67 116°33.60	30.09	187° 44.67 202° 14.70	11.0'	21°38.94 21°49.09	10.2'	56.1'
20 21	116°33.60 131°33.53	29.36 •• 28.62	202°14.70 216°44.63	10.9' 10.8'	21°49.09 21°59.15	10.1' 10.0'	56.2' 56.2'
22	131 33.33 146°33.47	27.88	231° 14.43	10.6	21 39.13 22°9.11	9.9'	56.2
23	161°33.40	27.14	245°44.12	10.6'	22° 18.98	9.8'	56.3'
	SD = 16.2'	d = -0.7'			0 = 15.1'		
	JD — 10.2	<u>u = -0.1</u>		JL			
Sun	GHA	Dec	GHA	ν	Dec	d 0.7'	HP
0 1	176°33.34 191°33.27	\$16° 26.40 25.67	260°13.68 274°43.13	10.4' 10.3'	\$22°28.75 22°38.41	9.7' 9.6'	56.3' 56.4'
2	206°33.20	24.93	289° 12.46	10.3	22°47.98	9.5	56.4
3	221°33.14	• • 24.19	303°41.67	10.1'	22°57.45	9.4'	56.4'
4	236°33.08	23.44	$318^{\circ}10.76$	10.0'	$23^{\circ}6.81$	9.3'	56.5'
5	251°33.01	22.70	332°39.73	9.8'	23°16.07	9.1'	56.5'
6	266°32.95 281°32.89	\$16°21.96 21.22	347°8.58 1°37.30	9.7'	\$23°25.21 23°34.25	9.0'	56.5'
7 8	281 32.89 296°32.82	21.22	1°37.30 16°5.90	9.6' 9.5'	23° 43.19	8.9' 8.8'	56.6' 56.6'
9	311°32.76	. 19.73	30°34.39	9.4	23°52.00	8.7'	56.6'
10	326°32.70	18.99	45°2.74	9.2'	24°0.71	8.6'	56.7'
11	341°32.64	18.25	59°30.98	9.1'	24°9.30	8.5'	56.7'
12	356°32.57	S16°17.50	73°59.09	9.0'	S24°17.78	8.4'	56.7'
13	11°32.51 26°32.45	16.76	88° 27.09 102° 54.95	8.9' 8.7'	24°26.13 24°34.37	8.2'	56.8'
14 15	41°32.43	16.01 •• 15.26	102 54.95 117°22 70	8.6'	24 34.37 24°42 49	8.1' 8.0'	56.8' 56.9'
16	56°32.33	14.52	131°50.32	8.5'	24°50.48	7.9'	56.9'
17	71°32.27	13.77	$146^{\circ}17.82$	8.4'	$24^{\circ}58.35$	7.7'	56.9'
18	86°32.21	S16°13.02	160°45.20	8.3'	\$25°6.09	7.6'	57.0'
19	101°32.15	12.27	175° 12.45	8.1'	25° 13.71	7.5'	57.0'
20 21	116°32.10 131°32.04	11.52 •• 10.78	189°39.58 204°6.60	8.0' 7.9'	25°21.20 25°28.55	7.4' 7.2'	57.1' 57.1'
22	146°31.98	10.73	218° 33.48	7.8'	25°35.78	7.1	57.1'
23	161°31.92	9.28	233°0.25	7.6'	25°42.87	7.0'	57.2'
	SD = 16.2'	d = -0.7'		SE	0 = 15.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°31.86	\$16°8.52	247° 26.90	ν 7.5'	\$25°49.82	6.8'	57.2'
1	191°31.81	7.77	261°53.42	7.4	25° 56.64	6.7'	57.2'
2	206°31.75	7.02	$276^{\circ}19.83$	7.3'	$26^{\circ}3.31$	6.5'	57.3'
3	221°31.69	• • 6.27	290°46.11	7.2'	26°9.85	6.4'	57.3'
4 5	236°31.64 251°31.58	5.52 4.76	305°12.28 319°38.33	7.0' 6.9'	26° 16.25 26° 22.50	6.3' 6.1'	57.4' 57.4'
6	251°31.58 266°31.53	4.76 \$16°4.01	319°38.33 334°4.26	6.8'	526° 28.61	6.0'	57.4'
7	281°31.47	3.26	348°30.08	6.7'	26°34.57	5.8'	57.5'
8	296°31.42	2.50	$2^{\circ}55.78$	6.6'	$26^{\circ}40.38$	5.7'	57.5'
9	311°31.36	• • 1.75	17°21.36	6.5'	26°46.04	5.5'	57.6'
10	326°31.31	0.99	31°46.83	6.4'	26°51.55	5.4'	57.6'
11 12	341°31.26 356°31.20	16°0.24 \$15°59.48	46°12.18 60°37.43	6.2' 6.1'	26°56.90 \$27°2.10	5.2' 5.0'	57.6' 57.7'
13	11°31.15	515 59.48	75°2.56	6.0'	27°7.15	5.0 4.9'	57.7'
14	26°31.10	57.96	89°27.59	5.9'	27° 12.03	4.7'	57.8'
15	41°31.04	• • 57.21	$103^{\circ}52.50$	5.8'	$27^{\circ}16.76$	4.6'	57.8'
16	56°30.99	56.45	118° 17.31	5.7'	27°21.33	4.4'	57.8'
17	71°30.94	55.69	132° 42.01	5.6'	27°25.73	4.2'	57.9'
18 19	86°30.89 101°30.84	\$15°54.93 54.17	147°6.61 161°31.10	5.5' 5.4'	\$27°29.97 27°34.05	4.1' 3.9'	57.9' 58.0'
20	116°30.79	53.41	175°55.49	5.4	27°37.95	3.9 3.7'	58.0'
21	131°30.74	• • 52.65	190° 19.78	5.2'	27°41.69	3.6'	58.0'
22	146°30.69	51.89	204°43.97	5.1'	27°45.26	3.4'	58.1'
23	161°30.64	51.13	219°8.07	5.0'	27°48.66	3.2'	58.1'
	SD = 16.2'	d = -0.8'		SE	0 = 15.6'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:00	08:27	10:08	14:21	16:02	17:29
N 70°	06:54	08:10	09:32	14:57	16:19	17:36
68°	06:48	07:57	09:07	15:22	16:32	17:41
66°	06:43	07:46	08:47	15:41	16:43	17:46
64°	06:39	07:36	08:32	15:57	16:52	17:50
62°	06:35	07:28	08:19	16:10	17:00	17:54
60°	06:31	07:21	80:80	16:21	17:07	17:58
N 58°	06:28	07:15	07:58	16:30	17:13	18:01
56°	06:25	07:09	07:50	16:38	17:19	18:04
54°	06:22	07:04	07:43	16:46	17:24	18:07
52°	06:19	07:00	07:36	16:52	17:29	18:09
50°	06:17	06:55	07:30	16:58	17:33	18:12
45°	06:11	06:46	07:17	17:11	17:42	18:17
N 40°	06:05	06:38	07:06	17:22	17:50	18:23
35°	06:00	06:30	06:57	17:31	17:58	18:28
30°	05:55	06:24	06:49	17:39	18:04	18:33
20°	05:45	06:12	06:35	17:53	18:16	18:42
N 10°	05:35	06:00	06:22	18:06	18:27	18:53
0°	05:24	05:49	06:10	18:17	18:39	19:04
S 10°	05:11	05:36	05:58	18:29	18:51	19:17
20°	04:55	05:22	05:46	18:42	19:05	19:32
30°	04:34	05:05	05:31	18:57	19:22	19:53
35°	04:22	04:55	05:22	19:05	19:32	20:05
40°	04:06	04:42	05:12	19:15	19:45	20:21
45°	03:46	04:27	05:00	19:27	19:59	20:40
S 50°	03:20	04:08	04:46	19:41	20:18	21:06
52°	03:07	03:59	04:39	19:47	20:27	21:19
54°	02:51	03:49	04:32	19:55	20:37	21:34
56°	02:32	03:37	04:23	20:03	20:49	21:53
58°	02:07	03:24	04:14	20:12	21:02	22:17
S 60°	01:31	03:07	04:03	20:23	21:18	22:51

Lat.		Moonris	е	Moonset		
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	_					
N 70°	04:55			06:54		
68°	03:54			07:56		
66°	03:20	06:04		08:31	07:29	
64°	02:56	04:59		08:57	08:35	
62°	02:36	04:24	06:28	09:17	09:10	09:00
60°	02:21	03:59	05:43	09:33	09:36	09:45
N 58°	02:08	03:40	05:14	09:47	09:56	10:15
56°	01:56	03:23	04:52	09:59	10:13	10:37
54°	01:46	03:09	04:33	10:10	10:28	10:56
52°	01:38	02:57	04:18	10:19	10:40	11:12
50°	01:30	02:47	04:05	10:28	10:52	11:26
45°	01:13	02:25	03:37	10:46	11:15	11:54
N 40°	01:00	02:07	03:16	11:01	11:34	12:16
35°	00:48	01:52	02:58	11:13	11:49	12:34
30°	00:38	01:39	02:43	11:24	12:03	12:50
20°	00:21	01:17	02:17	11:43	12:26	13:17
N 10°	00:06	00:58	01:55	12:00	12:47	13:40
0°	•• ••	00:41	01:34	12:15	13:06	14:02
S 10°		00:24	01:14	12:31	13:25	14:23
20°		00:05	00:52	12:48	13:45	14:47
30°	23:44		00:27	13:07	14:09	15:14
35°	23:32		00:12	13:18	14:23	15:30
40°	23:18	23:55	•• ••	13:31	14:40	15:48
45°	23:01	23:35		13:47	14:59	16:11
S 50°	22:40	23:09	23:51	14:06	15:24	16:40
52°	22:31	22:57	23:36	14:15	15:36	16:54
54°	22:20	22:43	23:19	14:26	15:49	17:11
56°	22:08	22:27	22:59	14:37	16:05	17:30
58°	21:54	22:07	22:35	14:51	16:24	17:55
S 60°	21:37	21:43	22:01	15:06	16:47	18:28

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	50-30%
03	13:40	13:43	12:14	06:04	18:28	
04	13:47	13:50	12:14	06:53	19:20	
05	13:53	13:55	12:14	07:48	20:17	

February 06, 07, 08 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	135°38.09	207°27.76 S 21°59.66	199°6.95	99°49.90 N13°9.83	156°17.25 \$10°25.78	
1	$150^{\circ}40.55$	222°26.90 59.40	214°7.38 5.53	114°52.08 9.94	171°19.44 25.67	Alpheratz 357°35.82 29°13. Ankaa 353°8.14 -42°10.
2	165°43.02	237°26.05 59.14	229°7.81 5.21	129°54.27 10.04	186°21.63 25.56	Schedar 349°32.27 56°40.
3	180°45.48	252°25.19 · · 58.88	244°8.24 · · 4.89	144°56.45 · · 10.15	201°23.82 · · 25.46	Diphda 348°48.24 -17°51.
4	195° 47.95	267°24.33 58.61	259°8.67 4.57	159°58.64 10.25	216°26.01 25.35	Achernar 335°20.93 -57°7.
5 6	210° 50.41 225° 52.88	282°23.47 58.35 297°22.62 \$21°58.08	274°9.10 4.25 289°9.53 S 22°3.93	175°0.82 10.36 190°3.00 N13°10.46	231°28.19 25.24 246°30.38 \$10°25.13	Hamal 327°52.13 23°34.
7	240° 55.34	312°21.76 57.81	304°9.96 3.61	205°5.19 10.57	261°32.57 25.02	Polaris 314°24.04 89°22.
8	255° 57.80	327°20.91 57.54	319°10.39 3.29	220°7.37 10.67	276°34.76 24.91	Acamar 315°12.34 -40°12.
9	271°0.27	342°20.05 · · 57.27	334°10.82 · · 2.97	235°9.55 · · 10.78	291°36.94 · · 24.80	Menkar 314°6.93 4°10. Mirfak 308°29.29 49°56.
10	286°2.73	357°19.19 57.00	349°11.25 2.64	250°11.73 10.88	306°39.13 24.69	Aldebaran 290°40.35 16°33.
11	301°5.20	12°18.34 56.73	4°11.68 2.32	265°13.91 10.99	321°41.32 24.58	Rigel 281°4.41 -8°10.
12	316°7.66	27°17.48 \$21°56.46	19°12.11 \$22°2.00	280°16.10 N13°11.09	336°43.51 \$10°24.47	Capella 280°22.74 46°1.
13 14	331°10.13 346°12.59	42°16.63 56.18 57°15.77 55.91	34°12.55 1.67 49°12.98 1.35	295°18.28 11.20 310°20.46 11.30	351°45.69 24.36 6°47.88 24.25	Bellatrix 278°23.49 6°22.
15	1° 15.05	72°14.92 · · 55.63	64°13.41 · · 1.02	325°22.64 · · 11.41	21°50.07 · · 24.15	Elnath 278°2.60 28°37.
16	16° 17.52	87°14.07 55.35	79°13.84 0.70	340°24.82 11.51	36°52.26 24.04	Alnilam 275°38.29 -1°11.
17	31° 19.98	102°13.21 55.07	94°14.27 0.37	355°27.00 11.62	51°54.44 23.93	Betelgeuse 270°52.67 7°24.
18	46°22.45	117°12.36 S 21°54.79	109°14.70 \$22°0.05	10°29.18 N13°11.72	66°56.63 \$10°23.82	Canopus 263°52.31 -52°42. Sirius 258°26.62 -16°45.
19	61°24.91	132°11.50 54.51	124°15.13 21°59.72	25°31.36 11.83	81°58.82 23.71	Adhara 255°6.14 -29°0.
20	76° 27.38	147°10.65 54.23	139°15.57 59.39	40°33.54 11.94	97°1.00 23.60	Procyon 244°51.32 5°9.
21	91°29.84 106°32.30	162°9.80 · · 53.94	154°16.00 · · 59.07	55°35.72 · · 12.04	112°3.19 · · 23.49	Pollux 243°17.88 27°58.
22 23	100 32.30 121°34.77	177°8.94 53.66 192°8.09 53.37	169°16.43 58.74 184°16.86 58.41	70°37.90 12.15 85°40.08 12.25	127°5.38 23.38 142°7.57 23.27	Avior 234°14.42 -59°35.
				-	-	Suhail 222°46.43 -43°31.
Mer.	pass. 14:55	ν -0.9 $'$ d-0.3 $'$ m-3.91	u0.4′ d -0.3′ m1.32	$ u 2.2' \ d0.1' \ \text{m-}2.32$	$ u 2.2' \ d$ -0.1' m0.99	Miaplacidus 221°37.53 -69°48.
						Alphard 217°48.17 -8°45. Regulus 207°34.92 11°50.
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.92 11°50. Dubhe 193°41.31 61°37.
0	$136^{\circ}37.23$	207°7.24 S 21°53.09	199°17.29 S 21°58.08	100°42.25 N13°12.36	157°9.75 \$10°23.16	Denebola 182°25.47 14°26.
1	151°39.70	222°6.38 52.80	214°17.73 57.75	115°44.43 12.47	172°11.94 23.05	Gienah 175°44.15 -17°40.
2	166° 42.16	237°5.53 52.51	229°18.16 57.42	130°46.61 12.57	187°14.13 22.94	Acrux 173°0.54 -63°13.
3 4	181° 44.62 196° 47.09	252°4.68 · · 52.22 267°3.83 51.93	244°18.59 · · 57.09 259°19.02 56.76	145°48.79 · · 12.68 160°50.96 12.79	202°16.31 · · 22.83 217°18.50 22.72	Gacrux 171°52.16 -57°14.
5	211° 49.55	282°2.97 51.63	274°19.46 56.43	175°53.14 12.89	232°20.69 22.61	Alioth 166°13.30 55°49.
6	226° 52.02	297°2.12 S 21°51.34	289°19.89 S 21°56.10	190°55.32 N13°13.00	247°22.87 \$10°22.50	Spica 158°22.97 -11°17.
7	241°54.48	312°1.27 51.04	304°20.32 55.77	205°57.49 13.11	262°25.06 22.39	Alkaid 152°52.43 49°11. Hadar 148°36.95 -60°29.
8	$256^{\circ}56.95$	327°0.42 50.75	319°20.76 55.44	220°59.67 13.21	277° 27.25 22.28	Menkent 147°58.43 -36°29.
9	271°59.41	341°59.57 · · 50.45	334°21.19 · · 55.10	236°1.85 · · 13.32	292°29.43 · · 22.17	Arcturus 145°48.53 19°3.
10	287°1.87	356°58.72 50.15	349°21.62 54.77	251°4.02 13.43	307°31.62 22.07	Rigil Kent. 139°41.29 -60°55.
11 12	302°4.34 317°6.80	11°57.87 49.85 26°57.02 \$21°49.55	4°22.05 54.44 19°22.49 \$21°54.10	266°6.20 13.54 281°8.37 N13°13.64	322°33.81 21.96 337°35.99 \$10°21.85	Kochab 137°19.69 74°2.
13	332°9.27	41°56.17 49.25	34°22.92 53.77	296°10.55 13.75	352°38.18 21.74	Zuben'ubi 136°56.85 -16°8.
14	347° 11.73	56°55.32 48.95	49°23.35 53.44	311°12.72 13.86	7°40.37 21.63	Alphecca 126°4.43 26°37.
15	2°14.20	71°54.47 · · 48.64	64°23.79 · · 53.10	326°14.90 · · 13.97	22°42.55 · · 21.52	Antares 112°16.91 -26°29. Atria 107°12.11 -69°3.
16	$17^{\circ}16.66$	86°53.62 48.34	79°24.22 52.77	341°17.07 14.07	37°44.74 21.41	Atria 107°12.11 -69°3. Sabik 102°3.83 -15°45.
17	$32^{\circ}19.12$	101°52.77 48.03	94°24.66 52.43	356°19.24 14.18	52°46.92 21.30	Shaula 96°11.65 -37°7.
18	47°21.59	116°51.92 S21°47.72	109°25.09	11°21.42 N13°14.29	67°49.11 \$10°21.19	Rasalhague 95°59.46 12°32.
19	62°24.05	131°51.07 47.41	124°25.52 51.76	26°23.59 14.40	82°51.30 21.08	Eltanin 90°42.90 51°28.
20 21	77° 26.52 92° 28.98	146°50.22 47.10 161°49.37 • 46.79	139°25.96 51.42 154°26.39 •• 51.08	41°25.76 14.50 56°27.93 · · 14.61	97°53.48 20.97 112°55.67 • 20.86	Kaus Aust. 83°33.82 -34°22.
22	107° 31.44	176°48.52 46.48	169°26.83 50.74	71°30.11 14.72	127°57.86 20.75	Vega 80°34.08 38°48.
23	122°33.91	191°47.68 46.17	184°27.26 50.41	86°32.28 14.83	143°0.04 20.64	Nunki 75°49.00 -26°16. Altair 62°1.01 8°55.
Mor	pass. 14:51	ν-0.9' d-0.3' m-3.90	ν0.4' d-0.3' m1.32	ν2.2' d0.1' m-2.31	ν2.2' d-0.1' m0.99	Altair 62°1.01 8°55. Peacock 53°7.48 -56°39.
ivier.	pass. 14.31	<i>V</i> -0.9 <i>u</i> -0.3 III-3.90	νο.4 α-0.3 III1.32	ν2.2 d0.1 III-2.31	ν2.2 u -0.1 1110.99	Deneb 49°26.79 45°21.
						Enif 33°39.87 9°59.
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°34.30 -46°50.
0 1	137° 36.37 152° 38.84	206° 46.83 S21° 45.85 221° 45.98 45.54	199°27.70 S21°50.07 214°28.13 49.73	101°34.45 N13°14.94 116°36.62 15.04	158°2.23 \$10°20.53 173°4.41 20.42	Fomalhaut 15°15.66 -29°29.
2	167° 41.30	236° 45.13 45.22	229°28.57 49.39	131°38.79 15.15	188°6.60 20.31	Scheat 13°46.26 28°12. Markab 13°30.94 15°20.
3	182°43.77	251°44.29 · · 44.90	244°29.00 · · 49.05	146°40.96 · · 15.26	203°8.79 · · 20.20	Markab 13°30.94 15°20.
4	197°46.23	266°43.44 44.58	259°29.44 48.71	161°43.14 15.37	218° 10.97 20.09	Feb 06 Tue SHA Mer.pa
5	212°48.69	281°42.59 44.26	274°29.87 48.37	176°45.31 15.48	233°13.16 19.98	Venus 71°49.67 10:
6	227°51.16	296°41.75 S21°43.94	289°30.31 S 21°48.03	191°47.48 N13°15.59	248°15.34 \$10°19.87	Mars 63°28.86 10:
7	242°53.62	311°40.90 43.62	304°30.74 47.69	206°49.65 15.70	263°17.53 19.76	Jupiter 324°11.81 17:
8 9	257° 56.09 272° 58.55	326°40.05 43.30 341°39.21 • 42.97	319°31.18 47.34 334°31.61 • 47.00	221°51.82 15.80 236°53.99 · · 15.91	278° 19.71 19.65 293° 21.90 •• 19.54	Saturn 20°39.16 13:
10	288°1.02	356°38.36 42.65	349°32.05 46.66	251°56.15 16.02	308°24.09 19.43	Feb 07 Wed SHA Mer.pa
11	303°3.48	11°37.52 42.32	4°32.48 46.32	266°58.32 16.13	323°26.27 19.32	Venus 70°30.00 10:
12	318°5.94	26°36.67 S 21°41.99	19°32.92 S 21°45.97	282°0.49 N13°16.24	338°28.46 \$10°19.21	Mars 62°40.06 10:
13	333°8.41	41°35.83 41.66	34°33.35 45.63	297°2.66 16.35	353°30.64 19.10	Jupiter 324°5.02 17: Saturn 20°32.52 13:
14	348° 10.87	56°34.98 41.33	49°33.79 45.28	312°4.83 16.46	8°32.83 18.99	
15 16	3° 13.34	71°34.14 · · 41.00	64°34.23 · · 44.94	327°7.00 · · 16.57	23°35.01 · · 18.88	Feb 08 Thu SHA Mer.pa
16 17	18° 15.80 33° 18.26	86°33.29 40.67 101°32.45 40.33	79°34.66 44.59 94°35.10 44.25	342°9.16 16.68 357°11.33 16.79	38°37.20 18.77 53°39.38 18.66	Venus 69°10.45 10:
18	48° 20.73	116°31.61 \$21°40.00	109°35.54 S 21°43.90	12°13.50 N13°16.90	68°41.57 \$10°18.55	Mars 61°51.32 10: Jupiter 323°58.08 17:
19	63°23.19	131°30.76 39.66	124°35.97 43.56	27°15.66 17.01	83°43.75 18.44	Saturn 20°25.85 13:
20	78°25.66	146°29.92 39.33	139°36.41 43.21	42°17.83 17.12	98°45.94 18.33	
21	93° 28.12	161°29.08 · · 38.99	154°36.85 · · 42.86	57°20.00 · · 17.23	113°48.12 · · 18.22	Horizontal parallax
22	108° 30.59	176°28.23 38.65	169°37.28 42.51	72°22.16 17.34	128° 50.31 18.11	Venus: 0.1 Mars: 0.1
23	123°33.05	191°27.39 38.31	184°37.72 42.17	87°24.33 17.45	143°52.49 18.00	Iviais. U.1
Mer.	pass. 14:47	ν -0.8′ d -0.3′ m-3.90	u0.4′ d -0.3′ m1.31	$ u 2.2' \ d0.1' \ \text{m-}2.30$	$ u 2.2' \ d 0.1' \ \text{m} 0.99$	

1 11°30.54	h	Su	n			Moon		
1 191°30,54	Tue	GHA	Dec	GHA	ν	Dec	d	HP
2								58.2'
3								58.2'
								58.2 58.3'
Section Sect								58.3'
281 20.0 26	5							58.4'
Section Sect								58.4'
10 316°30.16								
11								58.5'
12 356°30.03 S15°41.18 46°13.32 3.9 S28°16.66 0.9 58.4 13 11°29.98 40.41 60°36.26 3.9 28°17.53 0.7 58.7 14 26°29.94 39.64 74°59.14 3.8 28°18.21 0.5 58.7 15 41°29.89 ··· 38.87 89°21.94 3.7 28°18.70 0.3 58.8 16 56°29.85 38.11 103°44.69 3.7 28°18.90 0.1 58.8 18 86°29.76 515°36.56 132°30.01 3.6 S28°19.10 -0.1 58.8 19 101°29.72 35.79 146°52.59 3.5 28°18.73 -0.5 58.1 19 101°29.64 ··· 34.25 175°37.59 3.4 28°17.59 -0.9 59.0 22 146°29.60 33.48 190°0.02 3.4 28°16.72 -1.1 59.0 23 161°29.56 32.70 204°22.41 3.3 28°15.66 -1.3 59.1 24 25 26°29.43 30.38 247°29.33 3.2 28°11.29 -1.9 59.2 25 26°29.43 30.38 247°29.33 3.2 28°11.29 -1.9 59.2 2 206°29.43 30.38 247°29.33 3.2 28°11.29 -1.9 59.2 3 21°29.39 ··· 29.61 261°51.57 3.2 28°9.44 -2.1 59.2 4 236°29.35 28.83 276°13.78 3.2 28°5.13 -2.5 59.3 5 251°29.31 28.66 290°35.96 3.2 28°5.13 -2.5 59.3 6 266°29.28 S15°2.26 319°20.26 31 28°0.03 -2.9 59.4 8 296°29.20 25.73 333°42.37 31 22°54.13 -3.3 59.8 19 311°29.16 ··· 24.95 388°4.47 31 22°54.13 -3.3 59.2 10 326°29.12 24.17 2°25.56 31 27°50.87 -3.5 59.5 11 341°29.09 23.39 16°48.63 31 27°54.13 -3.3 59.1 12 356°29.05 S15°22.61 31°10.70 31 S27°43.77 -3.9 59.6 15 41°28.84 ··· 20.27 74°16.88 31 27°27.83 -4.5 59.1 16 56°28.91 19.49 88°3.94 31 27°15.85 -4.5 59.1 17 71°28.87 18.71 103°1.01 31 27°27.15 -5.5 59.1 16 56°28.57 11.66 232°20.93 31 26°6.52 -5.5 59.1 16 56°28.57 11.66 232°20.93 31 26°6.52 -5.5 59.1 10 10°28.60 17.45 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48 11.48	10							58.6'
13								58.6'
15								58.6 58.7'
16								58.7'
18								58.8'
18								58.8'
10								58.9'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								58.9'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								59.0'
SD = 16.2'								59.0'
Wed GHA Dec GHA ν Dec d HP 0 176°29.51 515°31.93 218°44.75 3.3' 528°14.40 -1.5' 59.1 1 191°29.47 31.16 233°7.06 3.3' 28°11.29 -1.7' 59.2 2 206°29.43 30.38 247°29.33 3.2' 28°9.44 -2.1' 59.2 4 236°29.35 28.83 276°13.78 3.2' 28°9.44 -2.1' 59.2 5 251°29.31 22.0' 29.60 290°35.96 3.2' 28°5.13 -2.5' 59.3 6 266°29.22 515°27.28 304°58.12 3.1' 28°0.03 -2.9' 59.4 8 296°29.20 25.73 333°42.37 1.2' 27°5.18 -3.1' 59°5.18 -3.5' 59.5 9 311°29.16 - 24.95 348°4.47 3.1' 27°5.61 -3.5' 59.5 19.1 10 326°29.12 24.17 2°2.65 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>59.0 59.1'</td>								59.0 59.1'
Wed GHA Dec GHA ν Dec d HP 0 176°29.51 515°31.93 218°44.75 3.3' 28°12.94 -1.7' 59.2 1 191°29.47 31.16 233°7.06 3.3' 28°12.94 -1.7' 59.2 2 206°29.43 30.38 247°29.33 3.2' 28°7.13 -2.1' 59.2 4 236°29.35 28.83 276°13.78 3.2' 28°7.38 -2.3' 59.3 5 251°29.31 28.06 290°35.96 3.2' 28°5.13 -2.5' 59.3 6 266°29.28 515°27.28 304°58.12 3.1' 28°0.08 -2.7' 59.3 7 281°29.24 26.50 319°20.26 3.1' 27°5.18 -3.1' 59.9 9 311°29.16 -24.95 348°4.47 3.1' 27°5.18 -3.1' 59.9 10 326°29.12 24.17 2°26.56 3.1' 27°5.18 -3.5' 59.9								
1 1 191°29.47 31.16 233°7.06 3.3' \$28°14.40 -1.5' \$9.1 1 191°29.47 31.16 233°7.06 3.3' 28°12.94 -1.7' \$9.2 2 206°29.43 30.38 247°29.33 3.2' 28°12.94 -1.7' \$9.2 3 221°29.39 · 29.61 261°51.57 3.2' 28°9.44 -2.1' \$9.2 4 236°29.35 28.83 276°13.78 3.2' 28°7.38 -2.3' \$9.3 5 251°29.31 28.06 290°35.96 3.2' 28°5.13 -2.5' \$9.3 6 266°29.28 \$15°27.28 304°58.12 3.1' \$28°0.03 -2.9' \$9.4 7 281°29.24 26.50 319°20.26 3.1' 28°0.03 -2.9' \$9.4 9 311°29.16 · 24.95 348°4.47 3.1' 27°54.13 -3.3' \$9.3 10 326°29.12 24.17 2°26.56 3.1' 27°50.87 -3.5' \$9.3 11 341°29.09 23.39 16°48.63 3.1' 27°50.87 -3.5' \$9.3 12 356°29.05 \$15°22.61 31°10.70 3.1' \$27°4.42 -3.7' \$9.9 11 26°28.98 21.05 \$59°54.82 3.1' 27°35.66 -4.5' \$9.5 15 41°28.94 · 20.27 74°16.88 3.1' 27°31.60 -4.5' \$9.7 16 56°28.91 19.49 88°38.94 3.1' 27°27.15 -4.7' \$9.7 17 71°28.87 18.71 103°1.01 3.1' \$27°12.58 -5.3' \$9.8 19 101°28.80 17.15 110°23.08 3.1' \$27°17.83 -5.1' \$9.8 20 116°28.70 14.80 17.4' \$1.30°4.31 12.7°12.58 -5.3' \$9.8 21 131°28.73 · 15.58 160°29.38 3.1' 27°12.58 -5.3' \$9.8 22 166°28.57 11.66 232°20.29 3.3' 26°31.63 -6.0' \$0.9 3 221°28.54 * 10.87 246°42.56 3.3' 27°1.87 -5.7' \$9.9 4 236°28.51 10.09 261°4.86 3.3' 26°4.99 -6.8' \$0.0 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' \$0.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' \$0.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' \$0.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' \$0.1 1 341°28.03 4.5° 3.2' 26°56.52 -5.9' \$9.9 1 10°28.68 5.5° 5.5° 5.5° 5.5° 5.5° 5.5° 5.5° 5.5		JD — 10.2	u = -0.0°			∪ — 13.9°		
1 191°29.47 31.16 233°7.06 3.3' 28°12.94 -1.7' 59.2' 206°29.43 30.38 247°29.33 3.2' 28°11.29 -1.9' 59.2' 42°29.33 22°29.39 · 29.61 261°51.57 3.2' 28°9.44 -2.1' 59.2' 42°29.33 28.83 276°13.78 3.2' 28°7.38 -2.3' 59.3'								HP
2 206°29.43 30.38 247°29.33 3.2' 28°11.29 -1.9' 59.2 3 221°29.39 · 29.61 261°51.57 3.2' 28°9.44 -2.1' 59.2 4 236°29.35 28.83 276°13.78 3.2' 28°7.38 -2.3' 59.3 5 251°29.31 28.06 290°35.96 3.2' 28°5.13 -2.5' 59.3 6 266°29.28 515°27.28 304°58.12 3.1' 528°2.68 -2.7' 59.3 6 266°29.20 25.73 333°42.37 3.1' 27°57.18 -3.1' 59.4 9 311°29.16 · 24.95 348°4.47 3.1' 27°57.18 -3.1' 59.4 9 311°29.16 · 24.95 348°4.47 3.1' 27°54.13 -3.3' 59.4 10 326°29.12 24.17 2°26.56 3.1' 27°47.42 -3.7' 59.3 11 341°29.09 23.39 16°48.63 3.1' 27°47.42 -3.7' 59.5 12 356°29.05 515°22.61 31°10.70 3.1' 527°43.77 -3.9' 59.6 13 11°29.01 21.83 45°32.76 3.1' 27°35.86 -4.3' 59.6 15 44°28.94 · 20.27 74°16.88 3.1' 27°35.86 -4.3' 59.6 16 56°28.91 19.49 88°38.94 3.1' 27°31.60 -4.5' 59.7 17 71°28.87 18.71 103°1.01 3.1' 27°27.15 -4.7' 59.7 18 86°28.84 515°17.93 117°23.08 3.1' 527°17.63 -5.1' 59.8 20 116°28.77 16.36 146°7.27 3.1' 27°7.32 -5.5' 59.8 21 131°28.73 · 15.58 160°29.38 3.1' 27°1.87 -5.5' 59.8 22 146°28.70 14.80 174°51.52 3.2' 26°56.22 -5.9' 59.2 23 161°28.67 14.01 189°13.67 3.2' 26°80.37 -6.0' 59.9 SD = 16.2' d = -0.8' SD = 16.1' Thu GHA Dec GHA ν Dec d HP 0 176°28.64 515°13.23 203°35.85 3.2' 526°44.32 -6.2' 60.0 116°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.9 SD = 16.2' d = -0.8' SD = 16.1' Thu 3 GHA Dec GHA ν Dec d HP 0 176°28.64 515°13.23 203°35.85 3.2' 526°44.92 -6.8' 60.0 17.6°28.65 14.01 189°13.67 3.2' 26°50.37 -6.0' 69.2 3 161°28.67 14.01 289°49.57 3.4' 526°24.99 -6.8' 60.0 17.6°28.64 515°13.23 203°35.85 3.2' 526°44.92 -6.8' 60.0 17.6°28.65 51.5 8.51 28.94 9.57 3.4' 526°2.94 9.8' 60.0 189 311°28.36 -6.15 332°56.94 3.5' 525°56.50 -7.6' 60.2 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.0' 60.0'								59.1'
3 221°29.39 · · · 29.61								59.2' 59.2'
5								59.2'
6	4						-2.3'	59.3'
7 281°29.24 26.50 319°20.26 3.1' 28°0.03 -2.9' 59.4 8 296°29.20 25.73 333°42.37 3.1' 27°57.18 -3.1' 59.4 9 311°29.16 · 24.95 348°4.7 3.1' 27°54.13 -3.3' 59.6 10 326°29.12 24.17 2°26.56 3.1' 27°50.87 -3.5' 59.5 11 341°29.09 23.39 16°48.63 3.1' 27°47.42 -3.7' 59.5 12 356°29.05 S15°22.61 31°10.70 3.1' S27°43.77 -3.9' 59.6 13 11°29.01 21.83 45°32.76 3.1' 27°39.91 -4.1' 59.6 14 26°28.98 21.05 59°54.82 3.1' 27°35.86 -4.3' 59.6 15 41°28.94 · 20.27 74°16.88 3.1' 27°31.60 -4.5' 59.7 16 56°28.91 19.49 88°38.94 3.1' 27°27.15 -4.7' 59.7 17 71°28.87 18.71 103°1.01 3.1' 27°22.49 -4.9' 59.7 18 86°28.84 S15°17.93 117°23.08 3.1' 27°77.63 -5.1' 59.8 19 101°28.80 17.15 131°45.17 3.1' 27°12.58 -5.3' 59.8 20 116°28.77 16.36 146°7.27 3.1' 27°1.32 -5.5' 59.8 21 131°28.73 · 15.58 160°29.38 3.1' 27°1.87 -5.7' 59.9 22 146°28.70 14.80 174°51.52 3.2' 26°56.22 -5.9' 59.5 23 161°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.9 SD = 16.2' d = -0.8' SD = 16.1' Thu GHA Dec GHA ν Dec SD = 16.1' Thu 31°28.84 · 10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1 3 221°28.54 · 10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 515°8.51 289°49.57 3.4' 526°3.91 -7.4' 60.2 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 515°8.51 289°49.57 3.4' 526°3.91 -7.4' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°48.89 -7.8' 60.2 11 341°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 12 356°28.27 515°3.78 16°4.73 3.7' 525°16.58 -8.5' 60.3 13 11°28.04 1.91 1.41 59°13.00 3.9' 24°50.38 -9.1' 60.4 16 56°28.16 15°0.62 73°358 3.9' 24°41.28 -9.3' 60.4 17 71°28.13 14°59.83 87°58.81 4.0' 24°32.00 -9.5' 60.5 18 86°28.10 514°59.33 87°58.81 4.0' 24°32.00 -9.5' 60.5 19 101°28.08 58.24 116°44.87 4.1' 24°12.89 -9.8' 60.5 22 146°28.00 55.86 159°54.45 4.3' 23°325.6 -10.5' 60.6 22 146°28.00 55.86 159°54.45 4.3' 23°325.6 -10.5'								59.3'
8 296°29.20 25.73 333°42.37 3.1' 27°57.18 -3.1' 59.4 9 311°29.16 · 24.95 348°4.47 3.1' 27°57.18 -3.1' 59.4 10 326°29.12 24.17 2°26.56 3.1' 27°50.87 -3.5' 59.5' 11 341°29.09 23.39 16°48.63 3.1' 27°47.42 -3.7' 59.5' 12 356°29.05 515°22.61 31°10.70 3.1' 527°43.77 -3.9' 59.6' 13 11°29.01 21.83 45°32.76 3.1' 27°39.91 -4.1' 59.6' 14 26°28.98 21.05 59°54.82 3.1' 27°33.66 -4.3' 59.6' 15 41°28.94 · 20.27 74°16.88 3.1' 27°31.60 -4.5' 59.7' 16 56°28.91 19.49 88°38.94 3.1' 27°27.15 -4.7' 59.7' 17 71°28.87 18.71 103°1.01 3.1' 27°22.49 -4.9' 59.7' 18 86°28.48 515°17.93 117°23.08 3.1' 527°17.63 -5.1' 59.8' 19 101°28.80 17.15 131°45.17 3.1' 27°12.58 -5.3' 59.8' 20 116°28.77 16.36 146°7.27 3.1' 27°12.58 -5.3' 59.8' 21 131°28.73 · 15.58 160°29.38 3.1' 27°1.87 -5.7' 59.8' 22 146°28.70 14.80 174′51.52 3.2' 26°56.22 -5.9' 59.5' 23 161°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.5' SD = 16.2′ d = -0.8′ SD = 16.1′ Thu GHA Dec GHA ν Dec GHA ν Dec GHA γ								59.3' 59.4'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								59.4
11 341°29.09 23.39 16°48.63 3.1' 27°47.42 -3.7' 59.5' 12 356°29.05 515°22.61 31°10.70 3.1' 527°43.77 -3.9' 59.6' 13 11°29.01 21.83 45°32.76 3.1' 27°39.91 -4.1' 59.6' 14 26°28.98 21.05 59°54.82 3.1' 27°35.86 -4.3' 59.6' 15 41°28.94 ··20.27 74°16.88 3.1' 27°31.60 -4.5' 59.7' 16 56°28.91 19.49 88°38.94 3.1' 27°27.15 -4.7' 59.7' 17 71°28.87 18.71 103°1.01 3.1' 27°27.49 -4.9' 59.7' 18 86°28.84 515°17.93 117°23.08 3.1' 27°12.58 -5.3' 59.8' 19 101°28.80 17.15 131°45.17 3.1' 27°12.58 -5.3' 59.8' 20 116°28.77 16.36 146°7.27 3.1' 27°12.58 -5.3' 59.8' 21 131°28.73 ··15.58 160°29.38 3.1' 27°1.87 -5.7' 59.5' 22 146°28.70 14.80 174°51.52 3.2' 26°56.22 -5.9' 59.8' 23 161°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.5' SD = 16.2' d = -0.8' SD = 16.1' Thu GHA Dec GHA ν Dec d HP 0 176°28.64 515°13.23 203°35.85 3.2' 526°44.32 -6.2' 60.0' 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0' 3 221°28.54 ··10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1' 4 236°28.51 10.09 261°4.86 3.3' 26°24.99 -6.8' 60.1' 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1' 6 266°28.45 515°8.51 289°49.57 3.4' 526°3.91 -7.4' 60.2' 8 296°28.39 6.94 318°34.44 3.5' 25°56.50 -7.6' 60.2' 8 296°28.39 6.94 318°34.44 3.5' 25°54.89 -7.8' 60.3' 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3' 11 341°28.30 4.57 1°42.08 3.6' 25°33.11 -8.2' 60.3' 11 341°28.30 4.57 1°42.08 3.6' 25°43.91 -7.8' 60.1' 12 356°28.27 515°3.78 16°4.73 3.7' 525°16.58 -8.5' 60.4' 13 31°28.94 1.41 59°13.00 3.9' 24°50.38 -9.1' 60.4' 14 26°28.21 2.20 44°50.19 3.8' 24°59.30 -8.9' 60.4' 15 41°28.19 ··1.41 59°13.00 3.9' 24°50.38 -9.1' 60.4' 16 56°28.16 15°0.62 73°35.88 3.9' 24°41.28 9 -9.8' 60.5' 17 1°28.13 14°59.83 87°58.81 4.0' 24°32.00 -9.5' 60.5' 18 86°28.10 514°59.03 102°21.81 4.1' 524°22.53 -9.6' 60.5' 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6' 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6' 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6' 23 161°27.98 55.07 174°17.78 4.4' 23°32.55 -10.5' 60.6'								59.5'
12 356°29.05 S15°22.61 31°10.70 3.1' S27°43.77 -3.9' 59.6 13 11°29.01 21.83 45°32.76 3.1' 27°39.91 -4.1' 59.6 14 26°28.98 21.05 59°54.82 3.1' 27°35.86 -4.3' 59.6 15 41°28.94 · · · 20.27 74°16.88 3.1' 27°31.60 -4.5' 59.7 16 56°28.91 19.49 88°38.94 3.1' 27°27.15 -4.7' 59.7 17 71°28.87 18.71 103°1.01 3.1' 27°22.49 -4.9' 59.7 18 86°28.84 S15°17.93 117°23.08 3.1' S27°17.63 -5.1' 59.7 19 101°28.80 17.15 131°45.17 3.1' 27°12.58 -5.3' 59.8 20 116°28.77 16.36 146°7.27 3.1' 27°7.32 -5.5' 59.8 21 131°28.73 · · 15.58 160°29.38 3.1' 27°1.87 -5.7' 59.9 22 146°28.70 14.80 174°51.52 3.2' 26°56.22 -5.9' 59.9 23 161°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.9 SD = 16.2' d = -0.8' SD = 16.1' Thu GHA Dec GHA ν Dec GHA ν Dec d HP 0 176°28.64 S15°13.23 203°35.85 3.2' S26°44.32 -6.2' 60.0' 60.0' 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0' 3 221°28.54 · · 10.87 246°42.56 3.3' 26°38.07 -6.4' 60.0' 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0' 3 221°28.84 9.30 275°27.19 3.4' S26°3.91 -7.4' 60.2' 551°28.48 9.30 275°27.19 3.4' S26°3.91 -7.4' 60.2' 6 266°28.45 S15°8.51 289°49.57 3.4' S26°3.91 -7.4' 60.2' 521°28.49 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.1' 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.1' 10 326°28.33 5.36 347°19.48 3.6' 25°43.91 -7.4' 60.2' 11 341°28.30 4.57 1°42.08 3.6' 25°43.91 -7.8' 60.1' 2 356°28.27 S15°3.78 16°4.73 3.7' S25°16.58 -8.5' 60.4' 11 341°28.30 4.57 1°42.08 3.6' 25°43.91 -8.9' 60.4' 12 356°28.21 2.20 44°5.019 3.8' 24°59.30 -8.9' 60.4' 14 26°28.21 2.20 44°5.019 3.8' 24°59.30 -8.9' 60.4' 15 41°28.19 · · · · · · · · · · · · · · · · · · ·								59.5'
13								59.5'
15								59.6'
16								59.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								59.7'
18 86°28.84 S15°17.93 117°23.08 3.1' S27°17.63 -5.1' 59.8' 19 101°28.80 17.15 131°45.17 3.1' 27°12.58 -5.3' 59.8' 20 116°28.77 16.36 146°7.27 3.1' 27°7.32 -5.5' 59.8' 21 131°28.73 · 15.58 160°29.38 3.1' 27°1.87 -5.7' 59.5' 22 146°28.70 14.80 174°51.52 3.2' 26°56.22 -5.9' 59.8' 23 161°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.5' S9.8' 23 161°28.67 14.01 189°13.67 3.2' 26°50.37 -6.0' 59.5' S9.8' 25 16.2' d = -0.8' SD = 16.1' Thu GHA Dec GHA ν Dec GHA ν Dec GHA ο 176°28.64 515°13.23 203°35.85 3.2' S26°44.32 -6.2' 60.0' 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0' 3 221°28.54 · 10.87 246°42.56 3.3' 26°31.63 -6.6' 60.0' 3 221°28.54 · 10.87 246°42.56 3.3' 26°31.61 -7.0' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 S15°8.51 289°49.57 3.4' S26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3 11 341°28.30 4.57 1°42.08 3.6' 25°33.11 -8.2' 60.3 11 341°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 14 26°28.15 15°3.78 16°4.73 3.7' S25°16.58 -8.5' 60.5 13 11°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 14°28.19 · 1.41 59°13.00 3.9' 24°50.38 -9.1' 60.4 16°56°28.16 15°0.62 73°35.88 3.9' 24°41.28 -9.3' 60.4 16°4.73 3.7' S25°16.58 -8.5' 60.5 15°4.19 3.8' 24°59.30 -8.9' 60.4 16°4.73 3.7' 528°13.1 1°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 16°4.73 3.7' 528°13.1 1°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 16°4.73 3.7' 528°14.10 -8.0' 60.3 11 31°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 16°4.73 3.7' 528°14.10 -8.0' 60.5 11 31°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 16°4.73 3.7' 528°14.10 -8.0' 60.5 11 31°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 16°4.73 3.7' 528°14.10 -8.0' 60.5 11 6°4.73 3.7' 528°14.10 -8.0' 60.5 11 6°4.73 3.7' 528°14.10 -8.0' 60.6 11 6°4.73 3.7' 528°14.10 -8.0' 60.6 11 6°4.73 3.7' 528°14.10 -8.0' 60.6 11 6°4.73 3.7' 528°14.10 -8.0' 60.6 11 6°4.73 3.7' 528°14.10 -8.0' 60.6 11 6°4.73 3.7' 528°1								59.7'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				117°23.08	3.1'			59.8'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								59.8'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								59.9'
Thu GHA Dec GHA ν Dec d HP 0 176°28.64 \$15°13.23 203°35.85 3.2' \$26°44.32 -6.2' 60.0 1 191°28.60 12.45 217°58.06 3.2' 26°38.07 -6.4' 60.0 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0 3 221°28.54 · 10.87 246°42.56 3.3' 26°31.63 -6.6' 60.0 4 236°28.51 10.09 261°4.86 3.3' 26°11.13 -7.2' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.2 6 266°28.45 \$15°8.51 289°49.57 3.4' \$26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.	23	161°28.67	14.01	189°13.67	3.2'	$26^{\circ}50.37$	-6.0'	59.9'
0 176°28.64 S15°13.23 203°35.85 3.2' S26°44.32 -6.2' 60.0 1 191°28.60 12.45 217°58.06 3.2' 26°38.07 -6.4' 60.0 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0 3 221°28.54 · · 10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1 4 236°28.51 10.09 261°4.86 3.3' 26°18.16 -7.0' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 S15°8.51 289°49.57 3.4' S26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.27 S15°3.78 16°4.73		SD = 16.2'	d = -0.8'		S	D = 16.1'		
0 176°28.64 S15°13.23 203°35.85 3.2' S26°44.32 -6.2' 60.0 1 191°28.60 12.45 217°58.06 3.2' 26°38.07 -6.4' 60.0 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0 3 221°28.54 · · 10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1 4 236°28.51 10.09 261°4.86 3.3' 26°18.16 -7.0' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 S15°8.51 289°49.57 3.4' S26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.27 S15°3.78 16°4.73								
1 191°28.60 12.45 217°58.06 3.2' 26°38.07 -6.4' 60.0 2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0 3 221°28.54 · · 10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1 4 236°28.51 10.09 261°4.86 3.3' 26°18.16 -7.0' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 S15°8.51 289°49.57 3.4' S26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.23 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3 11 341°28.24 2.99 30°27.43 3.8'								
2 206°28.57 11.66 232°20.29 3.3' 26°31.63 -6.6' 60.0 3 221°28.54 · · 10.87 246°42.56 3.3' 26°24.99 -6.8' 60.1 4 236°28.51 10.09 261°4.86 3.3' 26°18.16 -7.0' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 S15°8.51 289°49.57 3.4' 526°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3 11 341°28.20 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 12 356°28.27 S15°3.78 16°4.73 3.7								60.0
4 236°28.51 10.09 261°4.86 3.3' 26°18.16 -7.0' 60.1 5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 \$15°8.51 289°49.57 3.4' \$26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.2 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.2 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 12 356°28.27 \$15°3.78 16°4.73 3.7' \$25°16.58 -8.5' 60.3 13 11°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 14 26°28.21 2.20 44°50.19 3.8'					3.3'			60.0'
5 251°28.48 9.30 275°27.19 3.4' 26°11.13 -7.2' 60.1 6 266°28.45 \$15°8.51 289°49.57 3.4' \$26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 12 356°28.27 \$15°3.78 16°4.73 3.7' \$25°16.58 -8.5' 60.3 13 11°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 14 26°28.21 2.20 44°50.19 3.8' 24°59.30 -8.9' 60.4 15 41°28.19 1.14 59°13.00 3.9'								60.1'
6 266°28.45 \$15°8.51 289°49.57 3.4' \$26°3.91 -7.4' 60.2 7 281°28.42 7.73 304°11.98 3.5' 25°56.50 -7.6' 60.2 8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 12 356°28.27 \$15°3.78 16°4.73 3.7' \$25°8.03 -8.7' 60.4 13 11°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 14 26°28.21 2.20 44°50.19 3.8' 24°59.30 -8.9' 60.4 15 41°28.19 1.41 59°13.00 3.9' 24°50.38 -9.1'								60.1
8 296°28.39 6.94 318°34.44 3.5' 25°48.89 -7.8' 60.2 9 311°28.36 · · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3 12 356°28.27 S15°3.78 16°4.73 3.7' S25°16.58 -8.5' 60.3 13 11°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4 14 26°28.21 2.20 44°50.19 3.8' 24°59.30 -8.9' 60.4 15 41°28.19 · · 1.41 59°13.00 3.9' 24°50.38 -9.1' 60.4 16 56°28.16 15°0.62 73°35.88 3.9' 24°41.28 -9.3' 60.4 17 71°28.13 14°59.83 87°58.81 4.0' 24°32.00 -9.5' 60.5 18 86°28.10 514°59.03 102°21.81		266°28.45		289°49.57		S26°3.91		60.2
9 311°28.36 · · 6.15 332°56.94 3.5' 25°41.10 -8.0' 60.3' 10 326°28.33 5.36 347°19.48 3.6' 25°33.11 -8.2' 60.3' 11 341°28.30 4.57 1°42.08 3.6' 25°24.94 -8.4' 60.3' 12 356°28.27 S15°3.78 16°4.73 3.7' S25°16.58 -8.5' 60.3' 13 11°28.24 2.99 30°27.43 3.8' 25°8.03 -8.7' 60.4' 14 26°28.21 2.20 44°50.19 3.8' 24°59.30 -8.9' 60.4' 15 41°28.19 · 1.41 59°13.00 3.9' 24°50.38 -9.1' 60.4' 16 56°28.16 15°0.62 73°35.88 3.9' 24°41.28 -9.3' 60.4' 17 71°28.13 14°59.83 87°58.81 4.0' 24°32.00 -9.5' 60.5' 18 86°28.10 S14°59.03 102°21.81 4.1' 524°22.53 -9.6' 60.5' 19 101°28.08 58.24 116°44.87								60.2'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								60.2'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								60.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		341°28.30	4.57	1°42.08	3.6'	$25^{\circ}24.94$		60.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								60.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								60.4'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								60.4'
18 86°28.10 \$14°59.03 102°21.81 4.1' \$24°22.53 -9.6' 60.5 19 101°28.08 58.24 116°44.87 4.1' 24°12.89 -9.8' 60.5 20 116°28.05 57.45 131°7.99 4.2' 24°3.07 -10.0' 60.6 21 131°28.03 • 56.65 145°31.19 4.3' 23°53.08 -10.2' 60.6 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6 23 161°27.98 55.07 174°17.78 4.4' 23°32.56 -10.5' 60.6		56°28.16	15°0.62	73°35.88	3.9'	24°41.28	-9.3'	60.4'
19 101°28.08 58.24 116°44.87 4.1' 24°12.89 -9.8' 60.5 20 116°28.05 57.45 131°7.99 4.2' 24°3.07 -10.0' 60.6 21 131°28.03 · 56.65 145°31.19 4.3' 23°53.08 -10.2' 60.6 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6 23 161°27.98 55.07 174°17.78 4.4' 23°32.56 -10.5' 60.6								60.5
20 116°28.05 57.45 131°7.99 4.2' 24°3.07 -10.0' 60.6 21 131°28.03 · · · 56.65 145°31.19 4.3' 23°53.08 -10.2' 60.6 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6 23 161°27.98 55.07 174°17.78 4.4' 23°32.56 -10.5' 60.6								60.5'
21 131°28.03 ·· 56.65 145°31.19 4.3' 23°53.08 -10.2' 60.6 22 146°28.00 55.86 159°54.45 4.3' 23°42.91 -10.3' 60.6 23 161°27.98 55.07 174°17.78 4.4' 23°32.56 -10.5' 60.6								60.6
23 161°27.98 55.07 174°17.78 4.4' 23°32.56 -10.5' 60.6		131°28.03		145°31.19		23°53.08		60.6
								60.6
SD = 16.2' d = -0.8' $SD = 16.4'$	23			174°17.78			-10.5'	60.6'
		SD = 16.2'	d = -0.8'		S	D = 16.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	06:49	08:14	09:46	14:43	16:16	17:41
N 70°	06:44	07:59	09:16	15:13	16:31	17:46
68°	06:39	07:47	08:54	15:35	16:43	17:51
66°	06:35	07:37	08:37	15:53	16:52	17:55
64°	06:31	07:28	08:22	16:07	17:01	17:58
62°	06:28	07:21	08:11	16:18	17:08	18:01
60°	06:25	07:15	08:00	16:29	17:14	18:04
N 58°	06:22	07:09	07:52	16:37	17:20	18:07
56°	06:20	07:04	07:44	16:45	17:25	18:09
54°	06:17	06:59	07:37	16:52	17:30	18:12
52°	06:15	06:55	07:31	16:58	17:34	18:14
50°	06:13	06:51	07:25	17:04	17:38	18:16
45°	06:08	06:42	07:13	17:16	17:46	18:21
N 40°	06:03	06:35	07:03	17:26	17:54	18:26
35°	05:58	06:28	06:54	17:34	18:00	18:31
30°	05:54	06:22	06:47	17:42	18:07	18:35
20°	05:44	06:11	06:33	17:55	18:18	18:44
N 10°	05:35	06:00	06:22	18:07	18:28	18:53
0°	05:24	05:49	06:11	18:18	18:39	19:04
S 10°	05:12	05:37	05:59	18:29	18:50	19:16
20°	04:57	05:24	05:47	18:41	19:04	19:31
30°	04:38	05:08	05:33	18:54	19:20	19:50
35°	04:25	04:58	05:25	19:03	19:30	20:02
40°	04:10	04:46	05:16	19:12	19:41	20:17
45°	03:52	04:32	05:05	19:23	19:55	20:35
S 50°	03:27	04:14	04:51	19:36	20:12	20:59
52°	03:15	04:06	04:45	19:42	20:21	21:12
54°	03:00	03:56	04:38	19:49	20:30	21:26
56°	02:43	03:45	04:30	19:56	20:41	21:43
58°	02:21	03:32	04:22	20:05	20:54	22:04
S 60°	01:51	03:17	04:11	20:15	21:08	22:32

Lat.		Moonris	e		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°			10:13			11:44
62°			09:11			12:46
60°	07:19	08:16	08:36	10:13	11:27	13:20
N 58°	06:40	07:40	08:11	10:53	12:04	13:45
56°	06:13	07:13	07:51	11:20	12:30	14:04
54°	05:51	06:52	07:34	11:42	12:51	14:21
52°	05:33	06:35	07:19	12:00	13:08	14:35
50°	05:18	06:20	07:06	12:15	13:23	14:47
45°	04:47	05:50	06:40	12:46	13:53	15:12
N 40°	04:24	05:26	06:19	13:10	14:16	15:32
35°	04:04	05:07	06:02	13:29	14:35	15:49
30°	03:47	04:50	05:47	13:46	14:52	16:03
20°	03:19	04:22	05:21	14:15	15:19	16:28
N 10°	02:55	03:57	04:59	14:39	15:43	16:48
0°	02:33	03:35	04:38	15:02	16:05	17:08
S 10°	02:10	03:12	04:17	15:25	16:27	17:27
20°	01:46	02:48	03:55	15:49	16:50	17:47
30°	01:18	02:20	03:29	16:17	17:17	18:11
35°	01:02	02:03	03:13	16:34	17:33	18:24
40°	00:43	01:43	02:55	16:54	17:52	18:40
45°	00:20	01:20	02:34	17:18	18:14	18:59
S 50°		00:49	02:06	17:48	18:42	19:22
52°		00:34	01:53	18:03	18:56	19:33
54°		00:17	01:37	18:21	19:12	19:45
56°	23:56		01:19	18:42	19:30	19:59
58°	23:29		00:57	19:09	19:53	20:16
S 60°	22:51		00:27	19:46	20:23	20:36

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	21-6%	
06	13:58	14:00	12:14	08:47	21:18		
07	14:02	14:04	12:14	09:50	22:21		
08	14:05	14:07	12:14	10:53	23:24		

February 09, 10, 11 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	138° 35.51	206°26.55 S 21°37.97	199°38.16	102°26.49 N13°17.56	158°54.68 S 10°17.89	
1	$153^{\circ}37.98$	221°25.71 37.63	214°38.59 41.47	117°28.66 17.67	173°56.86 17.78	Alpheratz 357°35.82 29°13.41 Ankaa 353°8.15 -42°10.76
2	168°40.44	236°24.86 37.28	229°39.03 41.12	132°30.82 17.78	188° 59.05 17.67	Schedar 349°32.28 56°40.31
3	183°42.91	251°24.02 · · 36.94	244°39.47 · · 40.77	147°32.99 · · 17.89	204°1.23 · · 17.56	Diphda 348°48.24 -17°51.46
4	198° 45.37	266°23.18 36.59 281°22.34 36.24	259°39.91 40.42	162°35.15 18.00	219°3.42 17.45	Achernar 335°20.95 -57°7.17
5 6	213° 47.83 228° 50.30	281°22.34 36.24 296°21.50 \$21°35.90	274°40.34 40.07 289°40.78 \$21°39.72	177°37.32 18.11 192°39.48 N13°18.22	234°5.60 17.34 249°7.79 \$10°17.23	Hamal 327°52.14 23°34.60
7	243°52.76	311°20.66 35.55	304°41.22 39.37	207°41.64 18.33	264°9.97 17.12	Polaris 314°25.53 89°22.27
8	258° 55.23	326°19.82 35.20	319°41.66 39.02	222°43.81 18.44	279°12.16 17.01	Acamar 315°12.35 -40°12.75
9	273°57.69	341°18.98 · · 34.84	334°42.10 · · 38.66	237°45.97 · · 18.55	294°14.34 · · 16.90	Menkar 314°6.94 4°10.98 Mirfak 308°29.30 49°56.98
10	$289^{\circ}0.16$	356°18.14 34.49	349°42.53 38.31	252°48.13 18.66	309° 16.53 16.79	Aldebaran 290°40.35 16°33.46
11	304°2.62	11°17.30 34.14	4°42.97 37.96	267°50.29 18.77	324°18.71 16.68	Rigel 281°4.41 -8°10.54
12	319°5.08	26°16.46 \$21°33.78	19°43.41	282°52.46 N13°18.88	339°20.90 \$10°16.57	Capella 280°22.75 46°1.46
13 14	334°7.55 349°10.01	41°15.62 33.43 56°14.78 33.07	34°43.85 37.25 49°44.29 36.90	297°54.62 18.99 312°56.78 19.11	354°23.08 16.46 9°25.27 16.34	Bellatrix 278°23.49 6°22.24
15	4° 12.48	71°13.94 · · 32.71	64°44.73 · · 36.54	327°58.94 · · 19.22	24°27.45 · · 16.23	Elnath 278°2.60 28°37.71
16	19° 14.94	86°13.11 32.35	79°45.17 36.19	343°1.10 19.33	39°29.64 16.12	Alnilam 275°38.29 -1°11.27
17	$34^{\circ}17.40$	101°12.27 31.99	94°45.60 35.83	358°3.26 19.44	54°31.82 16.01	Betelgeuse 270°52.67 7°24.65 Canopus 263°52.33 -52°42.67
18	$49^{\circ}19.87$	116°11.43 S 21°31.63	109°46.04 S 21°35.48	13°5.42 N13°19.55	69°34.00 \$10°15.90	Sirius 258°26.63 -16°45.06
19	64°22.33	131°10.59 31.27	124°46.48 35.12	28°7.58 19.66	84°36.19 15.79	Adhara 255°6.14 -29°0.41
20	79° 24.80	146°9.76 30.90	139°46.92 34.76	43°9.74 19.77	99°38.37 15.68	Procyon 244°51.31 5°9.73
21 22	94° 27.26 109° 29.72	161°8.92 · · 30.54 176°8.08 30.17	154°47.36 · · 34.41 169°47.80 34.05	58°11.90 · · 19.89 73°14.06 20.00	114° 40.56 · · 15.57 129° 42.74	Pollux 243°17.87 27°58.06
23	109 29.72 124° 32.19	191°7.25 29.81	184°48.24 33.69	88°16.22 20.11	144°44.93 15.35	Avior 234°14.43 -59°35.24
						Suhail 222°46.43 -43°31.81
Mer.	pass. 14:43	ν-0.8' d-0.3' m-3.90	ν0.4' d-0.3' m1.31	ν2.2' d0.1' m-2.30	$\nu 2.2' \ d$ -0.1' m0.99	Miaplacidus 221°37.53 -69°48.92
						Alphard 217°48.16 -8°45.84 Regulus 207°34.91 11°50.88
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.27 61°37.10
0	139°34.65	206°6.41 \$21°29.44	199°48.68 S 21°33.33	103°18.38 N13°20.22	159°47.11 \$10°15.24	Denebola 182°25.44 14°26.11
1	154° 37.12	221°5.57 29.07	214°49.12 32.97	118°20.54 20.33	174°49.30 15.13	Gienah 175°44.12 -17°40.55
2	169° 39.58	236° 4.74 28.70 251° 3.90 · · · 28.33	229°49.56 32.61	133°22.70 20.44	189°51.48 15.02	Acrux 173°0.51 -63°13.76
3 4	184° 42.05 199° 44.51	251°3.90 · · 28.33 266°3.07 27.95	244°50.00 · · 32.25 259°50.44 31.90	148°24.86 · · 20.56 163°27.02 20.67	204°53.66 · · 14.91 219°55.85 14.80	Gacrux 171°52.13 -57°14.71
5	214° 46.97	281°2.23 27.58	274°50.88 31.53	178°29.17 20.78	234°58.03 14.69	Alioth 166°13.26 55°49.46
6	229° 49.44	296°1.40 S21°27.20	289°51.32 S 21°31.17	193°31.33 N13°20.89	250°0.22 \$10°14.58	Spica 158°22.94 -11°17.26 Alkaid 152°52.39 49°11.27
7	$244^{\circ}51.90$	311°0.56 26.83	304°51.76 30.81	208°33.49 21.01	265°2.40 14.47	Alkaid 152°52.39 49°11.27 Hadar 148°36.91 -60°29.11
8	259° 54.37	325°59.73 26.45	319°52.20 30.45	223°35.64 21.12	280°4.58 14.36	Menkent 147°58.40 -36°29.20
9	274°56.83	340°58.90 · · 26.07	334°52.64 · · 30.09	238°37.80 · · 21.23	295°6.77 · · 14.25	Arcturus 145°48.50 19°3.20
10	289° 59.29	355°58.06 25.69	349°53.08 29.73	253°39.96 21.34	310°8.95 14.13	Rigil Kent. 139°41.24 -60°55.85
11 12	305°1.76 320°4.22	10°57.23 25.31 25°56.40 \$21°24.93	4°53.52 29.36 19°53.97 \$21°29.00	268°42.11 21.46 283°44.27 N13°21.57	325°11.14 14.02 340°13.32 \$10°13.91	Kochab 137°19.61 74°2.99
13	335° 6.69	40°55.56 24.55	34°54.41 28.64	298°46.43 21.68	355°15.50 13.80	Zuben'ubi 136°56.82 -16°8.53
14	350°9.15	55°54.73 24.16	49°54.85 28.27	313°48.58 21.79	10°17.69 13.69	Alphecca 126°4.40 26°37.74
15	$5^{\circ}11.61$	70°53.90 · · 23.78	64°55.29 · · 27.91	328°50.74 · · 21.91	25°19.87 · · 13.58	Antares 112°16.88 -26°29.09 Atria 107°12.04 -69°3.99
16	$20^{\circ}14.08$	85°53.07 23.39	79°55.73 27.54	343°52.89 22.02	40°22.05 13.47	Sabik 102°3.80 -15°45.32
17	35° 16.54	100°52.24 23.01	94°56.17 27.18	358°55.05 22.13	55°24.24 13.36	Shaula 96°11.62 -37°7.20
18	50° 19.01 65° 21.47	115°51.41	109°56.62 \$21°26.81	13°57.20 N13°22.25 28°59.35 22.36	70°26.42 \$10°13.25 85°28.60 13.14	Rasalhague 95°59.43 12°32.35
19 20	80°23.94	130°50.57 22.23 145°49.74 21.84	124°57.06 26.45 139°57.50 26.08	28°59.35 22.36 44°1.51 22.47	85°28.60 13.14 100°30.79 13.03	Eltanin 90°42.87 51°28.81
21	95° 26.40	160°48.91 · · 21.45	154°57.94 · · 25.71	59°3.66 · · 22.59	115°32.97 · · 12.92	Kaus Aust. 83°33.79 -34°22.36
22	110°28.86	175°48.08 21.05	169°58.38 25.35	74°5.81 22.70	130°35.16 12.81	Vega 80°34.05 38°48.08 Nunki 75°48.98 -26°16.04
23	$125^{\circ}31.33$	190°47.25 20.66	184°58.83 24.98	89°7.97 22.81	145°37.34 12.70	Altair 62°0.99 8°55.75
Mer	pass. 14:39	ν-0.8' d-0.4' m-3.90	ν0.4' d-0.4' m1.31	ν2.2' d0.1' m-2.29	ν2.2' d-0.1' m0.99	Peacock 53°7.46 -56°39.47
	Pass. 14.55					Deneb 49°26.78 45°21.82
	CIIA	CUA	CUA D	CIIA D	CUA D	Enif 33°39.86 9°58.99
Sun 0	GHA 140°33.79	GHA Dec 205° 46.42 S 21° 20.27	GHA Dec 199°59.27 S 21°24.61	GHA Dec 104°10.12 N13°22.93	GHA Dec 160°39.52 \$10°12.58	Al Na'ir 27°34.29 -46°50.82
1	155° 36.26	200° 45.60 19.87	214°59.71 24.24	119°12.27 23.04	175°41.71 12.47	Fomalhaut 15°15.66 -29°29.87
2	170° 38.72	235°44.77 19.47	230°0.15 23.87	134°14.42 23.16	190°43.89 12.36	Scheat 13°46.26 28°12.76 Markab 13°30.94 15°20.00
3	$185^{\circ}41.18$	250°43.94 · · 19.07	245°0.60 · · 23.51	149°16.58 · · 23.27	205°46.07 · · 12.25	
4	200° 43.65	265°43.11 18.67	260°1.04 23.14	164°18.73 23.38	220°48.26 12.14	Feb 09 Fri SHA Mer.pass
5	215° 46.11	280°42.28 18.27	275°1.48 22.77	179°20.88 23.50	235°50.44 12.03	Venus 67°51.03 10:15
6	230° 48.58 245° 51.04	295°41.45 S21°17.87 310°40.63 17.47	290°1.93 S21°22.40 305°2.37 22.02	194°23.03 N13°23.61 209°25.18 23.73	250°52.62 \$10°11.92 265°54.81 11.81	Mars 61°2.64 10:41 Jupiter 323°50.98 17:08
7 8	260° 53.50	310 40.63 17.47 325°39.80 17.07	305°2.37 22.02 320°2.81 21.65	209°25.18 23.73 224°27.33 23.84	280° 56.99 11.70	Saturn 20°19.17 13:22
9	275° 55.97	340°38.97 · · 16.66	335°3.26 · · 21.28	239°29.48 · · 23.95	295°59.17 · · 11.59	
10	290°58.43	355°38.15 16.26	350°3.70 20.91	254°31.63 24.07	311°1.35 11.48	Feb 10 Sat SHA Mer.pass
11	306°0.90	10° 37.32 15.85	5°4.14 20.54	269°33.78 24.18	326°3.54 11.36	Venus 66°31.76 10:16 Mars 60°14.03 10:40
12	321°3.36	25°36.49 \$21°15.44	20°4.59 S21°20.16	284°35.93 N13°24.30	341°5.72 \$10°11.25	Jupiter 323°43.73 17:04
13	336° 5.82	40°35.67 15.03	35°5.03 19.79	299°38.08 24.41	356°7.90 11.14	Saturn 20°12.46 13:19
14 15	351°8.29 6°10.75	55°34.84 14.62 70°34.02 · · 14.21	50°5.48 19.42 65°5.92 · · 19.04	314°40.23 24.53 329°42.38 •• 24.64	11°10.09 11.03 26°12.27 · · 10.92	
16	21° 13.22	85°33.19 13.80	80°6.37 18.67	344°44.53 24.76	41°14.45 10.81	Feb 11 Sun SHA Mer.pass Venus 65°12.63 10:17
17	36° 15.68	100°32.37 13.38	95°6.81 18.29	359°46.68 24.87	56°16.64 10.70	Mars 59°25.48 10:40
18	51° 18.14	115°31.54 S 21°12.97	110°7.26 S 21°17.92	14°48.82 N13°24.99	71°18.82 S 10°10.59	Jupiter 323°36.33 17:01
19	66°20.61	130°30.72 12.55	125°7.70 17.54	29°50.97 25.10	86°21.00 10.48	Saturn 20° 5.73 13:15
20	81°23.07	145°29.90 12.14	140°8.15 17.17	44°53.12 25.22	101°23.18 10.37	Horizontal parallax
21 22	96° 25.54 111° 28.00	160°29.07 · · 11.72 175°28.25	155°8.59 · · 16.79 170°9.04 16.41	59°55.27 · · 25.33 74°57.41 25.45	116°25.37 ·· 10.25 131°27.55 10.14	Venus: 0.1
23	111 28.00 126°30.46	175 28.25 11.30 190°27.43 10.88	170 9.04 16.41 185° 9.48 16.04	89°59.56 25.56	131°27.55 10.14 146°29.73 10.03	Mars: 0.1
wier.	pass. 14:35	ν-0.8' d-0.4' m-3.90	ν0.4' d-0.4' m1.31	ν2.2′ d0.1′ m-2.28	ν2.2' d-0.1' m0.99	

–	011-010 =	+0.0055 3€€	<u> </u>	-011	— +09.100.	3 300	
h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	$176^{\circ}27.95$	S14°54.27	$188^{\circ}41.18$	4.5'	S23°22.05	-10.7'	60.6'
1	191°27.93	53.47	203°4.66	4.6'	23°11.36	-10.9'	60.7'
2	206°27.90	52.68	217° 28.21	4.6'	23°0.51	-11.0'	60.7'
3 4	221°27.88 236°27.86	· · 51.88 51.09	231°51.84 246°15.54	4.7' 4.8'	22°49.49 22°38.30	-11.2' -11.3'	60.7' 60.7'
5	250 27.80 251°27.83	50.29	260° 39.32	4.0 4.9'	22°26.95	-11.5'	60.8
6	266°27.81	S14°49.49	275°3.18	4.9'	S22°15.44	-11.7'	60.8'
7	281°27.79	48.69	289°27.12	5.0'	22° 3.77	-11.8'	60.8'
8	296°27.77	47.89	303°51.15	5.1'	21°51.94	-12.0'	60.8'
9	311°27.75	• • 47.10	318° 15.25	5.2'	21°39.96	-12.1'	60.8'
10 11	326°27.73 341°27.70	46.30 45.50	332°39.43 347°3.70	5.3' 5.4'	21°27.82 21°15.52	-12.3'	60.9'
12	341 27.70 356°27.68	45.50 \$14°44.70	1°28.06	5.4' 5.4'	521°3.08	-12.4' -12.6'	60.9' 60.9'
13	11°27.66	43.90	15°52.50	5.5'	20°50.49	-12.7'	60.9'
14	26°27.64	43.09	30° 17.02	5.6'	20°37.75	-12.9'	60.9'
15	41°27.62	• • 42.29	44°41.63	5.7'	$20^{\circ}24.86$	-13.0'	60.9'
16	56°27.61	41.49	59°6.32	5.8'	20°11.83	-13.2'	61.0'
17 18	71°27.59 86°27.57	40.69 \$14°39.89	73°31.11 87°55.98	5.9' 6.0'	19°58.67 \$19°45.36	-13.3' -13.4'	61.0' 61.0'
18	101°27.55	39.89	102°20.93	6.0'	19°31.91	-13.4 -13.6'	61.0'
20	116°27.53	38.28	116° 45.98	6.1	19°18.33	-13.7'	61.0'
21	131°27.52	• • 37.47	131°11.11	6.2'	19°4.62	-13.8'	61.0'
22	146°27.50	36.67	145°36.33	6.3'	18°50.77	-14.0'	61.0'
23	161°27.48	35.86	160°1.64	6.4'	18°36.80	-14.1'	61.0'
	SD = 16.2'	d = -0.8'		SI	O = 16.5'		
C-+	GHA	Da -	CUA		D	,J	HP
Sat 0	GHA 176°27.47	Dec \$14°35.06	GHA 174° 27.04	u 6.5'	Dec \$18°22.70	d -14.2'	НР 61.1'
1	191°27.45	34.25	188° 52.53	6.6'	18° 8.47	-14.3'	61.1'
2	206°27.43	33.45	$203^{\circ}18.11$	6.7'	$17^{\circ}54.13$	-14.5'	61.1'
3	221°27.42	• • 32.64	217°43.77	6.8'	17°39.66	-14.6'	61.1'
4	236°27.40 251°27.39	31.83	232°9.52 246°35.37	6.8'	17°25.07 17°10.37	-14.7'	61.1'
5 6	251°27.39 266°27.37	31.03 \$14°30.22	246° 35.37 261° 1.29	6.9' 7.0'	\$16°55.56	-14.8' -14.9'	61.1' 61.1'
7	281°27.36	29.41	275°27.31	7.1	16°40.63	-15.0'	61.1'
8	296° 27.35	28.60	289°53.42	7.2'	16°25.59	-15.1'	61.1'
9	311°27.33	• • 27.79	$304^{\circ}19.61$	7.3'	$16^{\circ}10.45$	-15.2'	61.1'
10	326°27.32	26.98	318°45.89	7.4'	15°55.20	-15.4'	61.1'
11 12	341°27.31 356°27.30	26.17 \$14°25.36	333° 12.25 347° 38.71	7.5' 7.5'	15°39.85 \$15°24.40	-15.5' -15.6'	61.1' 61.1'
13	11°27.28	24.55	2°5.24	7.6'	15°8.85	-15.6'	61.1
14	26°27.27	23.74	$16^{\circ}31.87$	7.7'	14°53.20	-15.7'	61.1'
15	41°27.26	• • 22.93	30°58.57	7.8'	14°37.46	-15.8'	61.2'
16	56°27.25 71°27.24	22.12	45° 25.36 59° 52.24	7.9'	14°21.62 14°5.70	-15.9'	61.2'
17 18	86° 27.23	21.30 \$14°20.49	74° 19.19	8.0' 8.0'	S13°49.69	-16.0' -16.1'	61.2' 61.2'
19	101°27.22		88°46.23	8.1'	13°33.60		61.2'
20	$116^{\circ}27.21$	18.86	103°13.35	8.2'	13°17.42	-16.3'	61.2'
21	131°27.20	• • 18.05	117°40.56	8.3'	13° 1.16	-16.3'	61.2'
22	146°27.19	17.23	132°7.84	8.4'	12°44.82 12°28.41	-16.4'	61.2'
23	161°27.18	16.42	146°35.20	8.4'		-16.5'	61.2'
	SD = 16.2'	d = -0.8'		SI	O = 16.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	$176^{\circ}27.17$	S14°15.60	161°2.64	8.5'	S 12°11.92	-16.6'	61.1'
1	191°27.17	14.79	175°30.15	8.6'	11°55.36	-16.6'	61.1'
2	206° 27.16 221° 27.15	13.97 •• 13.15	189° 57.74 204° 25.41	8.7'	11°38.74 11°22.04	-16.7'	61.1' 61.1'
3 4	221°27.15 236°27.14	· · 13.15 12.34	204°25.41 218°53.16	8.7' 8.8'	11°22.04 11°5.28	-16.8' -16.8'	61.1' 61.1'
5	251°27.14	11.52	233°20.97	8.9'	10°48.46	-16.9	61.1
6	266°27.13	\$14°10.70	247°48.86	9.0'	S10°31.57	-16.9	61.1'
7	281°27.13	9.88	262°16.82	9.0'	10°14.63	-17.0'	61.1'
8	296°27.12	9.06	276°44.86	9.1'	09°57.63	-17.1'	61.1'
9 10	311°27.12 326°27.11	· · 8.25 7.43	291°12.96 305°41.13	9.2' 9.2'	09°40.58 09°23.47	-17.1' -17.2'	61.1' 61.1'
10	326 27.11 341°27.11	7.43 6.61	305 41.13 320°9.37	9.2 9.3'	09 23.47 09°6.32	-17.2' -17.2'	61.1
12	356°27.10	\$14° 5.79	334° 37.67	9.4	S08°49.11	-17.2	61.1
13	11°27.10	4.97	349°6.04	9.4'	08°31.86	-17.3'	61.1'
14	26°27.09	4.14	3°34.48	9.5'	08°14.57	-17.3'	61.1'
15 16	41°27.09 56°27.09	· · 3.32 2.50	18°2.97 32°31.53	9.6' 9.6'	07°57.24 07°39.87	-17.4' -17.4'	61.0' 61.0'
16	71°27.09	2.50 1.68	47°0.16	9.6	07°39.87 07°22.46	-17.4' -17.4'	61.0'
18	86°27.08	\$14°0.86	61°28.84	9.7'	S07°5.02	-17.5'	61.0'
19	101°27.08	14°0.03	75° 57.58	9.8'	06°47.54	-17.5'	61.0'
20	116°27.08	13°59.21	90°26.37	9.9'	06°30.03	-17.5'	61.0'
21 22	131°27.08 146°27.08	· · 58.38 57.56	104°55.23 119°24.13	9.9' 10.0'	06°12.50 05°54.94	-17.6' -17.6'	61.0' 61.0'
23	146 27.08 161°27.08	57.50 56.74	119 24.13 133°53.10	10.0'	05 54.94 05°37.35	-17.6'	60.9'
	SD = 16.2'	d = -0.8'			D = 16.7'		
	3D = 10.2	<i>u</i> = -0.δ		31	J = 10.7°		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	06:37	08:00	09:27	15:03	16:30	17:53
N 70°	06:33	07:47	09:01	15:29	16:43	17:57
68°	06:29	07:36	08:41	15:48	16:53	18:00
66°	06:26	07:28	08:26	16:04	17:02	18:03
64°	06:23	07:20	08:13	16:17	17:09	18:06
62°	06:21	07:14	08:02	16:27	17:16	18:09
60°	06:18	07:08	07:53	16:36	17:22	18:11
N 58°	06:16	07:03	07:45	16:44	17:27	18:13
56°	06:14	06:58	07:38	16:52	17:31	18:15
54°	06:12	06:54	07:31	16:58	17:35	18:17
52°	06:10	06:50	07:26	17:04	17:39	18:19
50°	06:08	06:46	07:20	17:09	17:43	18:21
45°	06:04	06:38	07:09	17:20	17:50	18:25
N 40°	06:00	06:32	07:00	17:29	17:57	18:29
35°	05:56	06:25	06:52	17:37	18:03	18:33
30°	05:52	06:20	06:45	17:44	18:09	18:37
20°	05:43	06:09	06:32	17:56	18:19	18:45
N 10°	05:34	06:00	06:21	18:07	18:29	18:54
0°	05:25	05:49	06:11	18:18	18:39	19:04
S 10°	05:13	05:38	06:00	18:28	18:50	19:15
20°	04:59	05:26	05:49	18:39	19:02	19:29
30°	04:40	05:11	05:36	18:52	19:17	19:47
35°	04:29	05:01	05:28	19:00	19:27	19:59
40°	04:15	04:50	05:19	19:08	19:37	20:13
45°	03:57	04:37	05:09	19:18	19:50	20:30
S 50°	03:34	04:20	04:57	19:31	20:07	20:53
52°	03:23	04:12	04:51	19:36	20:15	21:04
54°	03:09	04:03	04:44	19:43	20:23	21:17
56°	02:53	03:53	04:37	19:50	20:33	21:33
58°	02:34	03:41	04:29	19:58	20:45	21:52
S 60°	02:08	03:27	04:20	20:07	20:59	22:16

Lat.		Moonris	e		Moonset	;
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°		10:51	09:43		15:21	18:24
N 70°		10:14	09:28		15:56	18:35
68°	10:57	09:48	09:17	13:11	16:21	18:44
66°	10:01	09:27	09:07	14:05	16:39	18:52
64°	09:28	09:11	08:59	14:38	16:54	18:58
62°	09:03	08:57	08:52	15:01	17:07	19:03
60°	08:43	08:45	08:45	15:20	17:17	19:08
N 58°	08:26	08:35	08:40	15:36	17:26	19:12
56°	08:12	08:26	08:35	15:49	17:34	19:15
54°	08:00	08:18	08:30	16:00	17:41	19:18
52°	07:49	08:11	08:26	16:11	17:47	19:21
50°	07:40	08:04	08:23	16:19	17:53	19:24
45°	07:19	07:50	08:15	16:38	18:05	19:29
N 40°	07:03	07:38	80:80	16:54	18:15	19:34
35°	06:49	07:28	08:02	17:06	18:23	19:38
30°	06:36	07:19	07:57	17:17	18:31	19:41
20°	06:15	07:04	07:48	17:36	18:43	19:47
N 10°	05:57	06:51	07:40	17:53	18:54	19:53
0°	05:40	06:38	07:33	18:08	19:04	19:57
S 10°	05:22	06:25	07:25	18:23	19:14	20:02
20°	05:04	06:12	07:17	18:39	19:25	20:07
30°	04:42	05:56	07:08	18:57	19:37	20:13
35°	04:29	05:47	07:03	19:07	19:44	20:16
40°	04:15	05:36	06:57	19:19	19:52	20:20
45°	03:57	05:24	06:50	19:33	20:01	20:24
S 50°	03:36	05:09	06:41	19:50	20:12	20:29
52°	03:25	05:02	06:37	19:58	20:16	20:31
54°	03:13	04:54	06:33	20:07	20:22	20:33
56°	03:00	04:45	06:28	20:17	20:28	20:36
58°	02:44	04:35	06:22	20:28	20:35	20:39
S 60°	02:25	04:23	06:16	20:41	20:42	20:42

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-2%	
09	14:08	14:09	12:14	11:54	-:-		
10	14:10	14:11	12:14	12:51	00:23		
11	14:11	14:12	12:14	13:45	01:19		

February 12, 13, 14 UT (Mon., Tue., Wed.)

	h	Aries	Ver	nus	Mars	Jupiter	Saturn		Stars	
Color	Mon .	GHA	GHΔ	Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
1 1976 19.0 200 200 200 200 19.0 200 200 19.0 200 19.0 200 19.0 200 19.0 200 19.0 200 200 19.										
1 18 19 19 19 19 19 19 19 19 19 19 19 19 19										I
1. 1. 1. 1. 1. 1. 1. 1.								1		
19th Access 19th Acces	3	186°40.32	250°24.14	• • 9.19	245°11.26 · · 14.52	2 150°8.14 · · 26.02	206°38.46 · · 9.59			I
Section Column		201°42.79	$265^{\circ}23.32$	8.76	260°11.71 14.1	5 165°10.29 26.14	221°40.64 9.48			
8 201520 1 307100 307100 307130 1 100 1 207127 1 30730 6 5087 219 1 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4										
8 261-2264 3281-2004 7.00 2371-149 12-24 27-210 70 7-27 200-515-5 8-20 7-20 7-20 7-20 7-20 7-20 7-20 7-20 7								1		
9 2075511 349°1922 - 0.02 335°1394 12.02 240°21.01 20.072 24 3115037.4 392.1 20.003 110 201507.5 35°139.0 21.003 395°139.0 21.003 3115037.4 31.005.0 201503 110 201507.0 201503 2								Acamar	$315^{\circ}12.37$	-40°12.75
10 2971-757 3871 8-0 6.18 3971-43 6.18 3971-43 6.18 3971-43 7.70								1		
19 307-93								1		
13 137 100	11							1		
Section Sect										
15 27 23 70 24 27 28 27 24 27 27 28 28 28 28 28 28										
221 122 132 8 133 9 133 9 137 0 100 1267 133 9 157 20 9.18 0 100 1267 135 11 158 130 1267 135 11 158 130 132 9 133 9 137 20 9.18 0 132 137 138 138 131 9 157 20 9.18 0 132 137 137 138 138 131 9 157 20 9.18 0 132 132 132 132 132 132 132 132 132 132								Elnath	$278^{\circ}2.62$	
17 18 19 19 19 19 19 19 19								1		
18								_		
Adhara 25% 1.50	18	52° 17.28	$115^{\circ}11.86$	S21°2.69		9 15°40.30 N13°27.77	72°11.20 S 10°7.92			
20								1		
Pollux 243 17.8 27*89.07 27*27.14 10*2*8.05 10*2*7.14 10*2*8.05 10*2*7.15 10*2*1.05 10*2*7.15 10*2*1.05 10*2*7.15 10*2*1.05 10*2*7.15 10*2*1.05 10*2*7.15 10*2*1.05 10*2*7.1										
Mer. pass. 14.31								1	243°17.88	
Tue GHA GHA Dec GHA DE								Avior	$234^{\circ}14.45$	-59°35.25
The GHA CHA CHA CHA CHA CHA CHA CHA								1		
GHA	Mer.p	ass. 14:31	ν -0.8′ d-0.	.4′ m-3.90	ν 0.4′ d-0.4′ m1.31	ν2.1′ d0.1′ m-2.28	ν2.2' d-0.1' m0.99			
Time GHA										
142-3207 142-3207	Tue									
2 172°3699 4 290°425 3 1912 290°215 5 5.70 138°57.43 28.70 192°28.65 7.03 180°39.46 290°4.26 290°4.26 4 2914 290°4.09 290°3.04 6 290°4.26 290°4.26 4 2914 290°4.09 290°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 4 192°3.09 6 200°3.09 6 20										
3 187*39.46								Gienah	$175^{\circ}44.11$	-17°40.56
202*41.92 205*37.1 95.22 205*22.45 4.92 166*1.70 28.94 222*33.02 6.80 6.60 521*35.20 1.91*27.77 6.6 232*46.85 295*2.08 5.97*7.31 290*23.35 521*4.15 190*5.98 183*2.91.7 225*2.33.02 6.60 6.60 6.60 6.60 6.60 6.60 6.60 6										
5 217°4439 280°289 5777 275°2290 4 53 181°3.84 29.05 227°35.20 6.99 7 247°49.31 310°1.27 56.86 305°23.80 3.76 211°81.2 29.29 287°39.56 6.47 8 262°51.76 325°0.46 56.40 305°23.80 3.76 211°81.2 29.29 287°39.56 6.47 9 277°54.24 399°59.64 55.94 395°24.70 .2.97 241°12.40 .2.95.2 297°43.93 .6.25 10 262°56.71 3947°58.33 55.49 350°25.15 2.58 256°11.45 29.64 31.2°46.11 6.13 11 307°59.17 9°80.02 55.03 5°25.06 2.19 271°16.67 29.76 327°48.29 6.02 12 333°16.10 397′56.04 51.11 35°26.50 1.14 301°20.95 2.99 357°52.65 5.00 13 338°4.10 397′56.04 51.11 35°26.50 1.14 301°20.95 2.99 357°52.65 5.00 15 8°90.3 69°54.78 5.318 66°27.40 .0.02 331°25.22 30.23 27°57.02 .5.88 16 237°1.14 684.55 97 5.27 1 360°26.95 5.10 316°25.73 6 30.55 42°59.20 5.47 17 381°13.95 99°53.16 5.225 98°72.83 20°79.98 11°29.49 30.47 58°1.38 5.59 18 381°1.64 2114°23.35 520°51.78 110°28.75 50.94 416°3.16 3113°30.99 373°3.56 510°5.24 19 68°18.88 129°51.54 51.31 128°29.20 59.04 153.37,6 30.70 86°5.74 51.31 19 381°1.25 144°50.75 5.08 18 158°30.10 58.25 61°38.04 30.41 118°1.10 1.41 4.84 19 882.21 137°32.15 144°50.75 5.08 18 158°30.10 58.25 61°38.04 30.41 118°1.10 1.41 4.84 19 882.21 137°32.15 144°50.75 5.08 1815°30.10 58.25 61°38.04 30.11 188°33.13 20 244°4.51 5.00°4.84 19 882.21 137°32.15 144°50.75 5.08 1815°30.10 58.25 61°38.04 30.11 188°31.30 1.08 188°4.05 20°44.51 5.00°4.84 19 882.31 144°35.74 2.90 4.40 4.40°3.35 5.50 4.40 4.50 3.11 188°31.30 2.90°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 4.40 3.00°4.40 4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.40 4.40 3.00°4.								1		
222**46.85										
7 247-49.31 310-12.7 5.686 305-23.80 3.76 211-61.2 29.29 267-30.50 6.47 14 6.3	6	232°46.85					252°37.38 S 10°6.58			
8 262"51.78 325"0.46				56.86						
10 292°8671 334°88.83 55.49 380′225.15 2.88 286′14.54 29.66 312°46.11 6.13 6.13 6.13 6.13 6.13 6.13 6.13										I
11 307°5917 9'58002 55:03 59'525.60 2.19 27'1'16.67 29.76 327'848.99 6.02 Kochab 137'19.54 74'2.29 12 328'14.0 39'56.40 54:11 35'26.50 1.41 30'20.95 2.99 357'52.65 5.00 14 3338'4.10 39'56.40 54:11 35'26.50 1.41 30'20.95 2.99 357'52.65 5.00 15 8°9.03 69'54.78 5.318 65'27.40 0.062 31'25.22 30.23 27'57.02 5.58 Arris 10'21.09 84'95.39 52.71 80'27.85 21'0.23 346'27.36 30.35 42'59.00 5.47 16 23'14.9 84'53.97 52.71 80'27.85 21'0.23 346'27.36 30.35 42'59.00 5.47 18 53'13.95 99'53.16 52.25 95'28.30 20'99.83 1'29.49 30.47 58'13.8 5.35 18 53'16.42 114'52.35 520'51.81 10'28.75 520'59.44 16'31.63 N13'30.59 73'3.56 510'5.24 19 66'18.88 129'51.54 51.31 125'92.00 59.04 31'33.76 130.07 88'5.74 5.32 21 98'23.31 159'49.93 5.03 155'30.10 58.25 61'38.04 30.94 118'10.10 4.91 122'113'6.38 174'49.12 49.90 170'30.55 5.786 76'40.17 31.06 133'10.10 133'								Arcturus	145°48.48	19°3.20
13 338*1.63 24*97.21 \$20*54.57 20*26.05 \$21*1.80 286*1.81 N3*2*9.88 342*9.047 \$10*9.91 13*0*5.06* 1.11 36*56.80 1								Rigil Kent.		
13 338*4.10 39*66.40 54.11 38*26.50 1.41 301*29.95 29.99 35*7*82.65 5.80 14 333*6.56 54*55.95 53.64 50*26.95 1.01 316*23.08 30.11 12*54.83 5.69 15 8*9.03 60*64.78 5.318 66*27.40 0.62 331*25.22 30.23 27*57.02 5.58 16 22*11.40 84*39.37 52.71 80*27.85 21*0.23 331*25.22 30.23 27*57.02 5.58 18 58*13.09 9*33.16 52.25 9*28.30 20*9.93 1*29.49 30.47 58*1.38 5.35 18 58*16.42 114*52.35 520*51.78 110*28.75 \$20*69.44 116*31.63 0.10*30.59 73*3.56 510*5.24 19*62.35 520*51.78 110*28.75 \$20*69.44 116*31.63 0.10*37.92 5.02 28 38*21.35 14*50.73 50.85 140*29.65 5.86.5 46*35.90 30.82 103*7.92 5.02 29 48*23.61 159*49.93 5.03 155*30.10 58.25 61*38.04 0.30.94 118*0.10 4.91 22 113*26.28 174*49.12 49.90 170*30.55 57.86 76*40.17 31.06 133*12.29 4.80 Nunki 75*48.06 20*28*14.27 \$2.00.44* m.3.39 \$2.12*40.14* m.3.20 \$2.12*40.14* m.2.27 \$2.2*2*0.14* m.0.99 \$2.5*5.02 \$4.00.44* m.3.30 \$2.12*40.14* m.2.27 \$2.2*2*0.14* m.0.99 \$2.5*5.02 \$4.00.44* m.3.30 \$2.12*40.14* m.2.27 \$2.2*2*0.14* m.0.99 \$2.5*5.02 \$4.00.44* m.3.30 \$2.00*31.68 \$2.00*33.26 \$5.00*33.26 \$2.00*33.26 \$5.00*33.26 \$2.00*33.26 \$5.00*33.26 \$2.00*33.26 \$5.00*33.26 \$2.00*33.26 \$5.00*33.26 \$2.0								1		
14 353°6.56 54°5.59 53.64 50°2.69 5 1.01 316°2.308 30.11 12°54.83 5.69 15 87.02 5.58 16 23°11.40 84°53.97 52.11 80°27.85 21°0.23 346°27.36 30.35 42°59.20 5.47 183°3.39 59°3.16 52.25 59°2.83 20°25.83 1°29.49 30.47 88°5.34 5.35 58 140°29.39 1°29.49 30.47 88°3.38 5.35 58 140°29.39 1°29.49 30.47 88°5.74 5.13 18°3.31 150°4.39 1°29.49 30.47 88°5.74 5.13 18°3.31 150°4.39 1.50°3.35 50.85 140°29.65 58.65 61°3.30 30.20°3.36 140°3.31 18°3.37 18°										
15 8 9,03 69 94,78 53,18 65 27,40 0.02 331 28 27 57 20 58 30 35 42 59 20 5.48 31 37 38 13,95 99 93,16 52,25 59 58 52 50 58 10 29 30 30 35 42 59 52 50 58 10 29 30 30 32 37 53 55 55 52 40 31 33 37 38 13,95 37 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 32 38 38										
16 23°11.49 84°53.97 52.71 80°27.85 21°0.23 81°29.49 30.47 85°1.38 5.35 1.39 1.39 69°53.16 52.51 95°28.30 20°59.83 1°29.49 30.47 85°1.38 5.35 1.39 1.39 1.39 1.39 1.39 1.39 1.39 1.39	15									
18 53°16.42 114°52.35 \$20°51.78 110°28.75 \$20°59.44 16°31.63 N13°30.59 73°3.56 \$10°5.24 Rasihague 19 68°18.88 129°61.54 51.31 125°29.20 59.04 31°33.76 30.70 88°5.74 5.13 126°29.55 81.65 140°29.65 86.65 46°35.90 30.82 103°7.92 5.02 113°26.28 174°49.12 49.00 170°30.55 57.68 76°40.17 31.06 133°12.29 4.80 Number 19 69°15.04 188°33.77 34°22.36 Number 19 69°18.02 13°26.28 174°49.12 49.00 170°30.55 57.66 76°40.17 31.06 133°12.29 4.80 Number 19 69°16.04 Number 19 69°16.00 Number 19 60°16.00										
19 68°18.88 129°\$1.54 51.31 125°29.20 59.04 31°33.76 30.70 88°5.74 5.13 120°8.81 40°0.73 50.85 140°9.26 58.65 46°38.04 30.82 103°7.92 5.02 103								Shaula	$96^{\circ}11.60$	-37°7.21
20 83°21.35 144°50.73 50.85 140°29.65 58.65 46°38.90 30.82 103°7.92 5.02 113°26.28 174°49.12 49.90 170°30.55 57.86 76°40.17 31.06 133°12.29 4.80 Nunki 75°48.96 26°16.04 Nunki 16°16.05 26°16.04								_		
22 138°2.6.28 174°49.12 49.90 170°30.55 57.86 61°38.04 30.94 118°10.10 4.91 4.91 249.90 38°48.07 23 128°28.74 189°48.31 49.43 185°31.00 57.46 91°42.30 31.18 148°14.47 4.68										
22 113°26.28 174°49.12 49.90 170°30.55 57.86 76°40.17 31.06 133°12.29 4.80 Mer.pass. 14:27										I
Mer.pass. 14:27 \(\nu \)-0.8' \(d \)-0.4' \(m \)-3.89 \(\nu \)-0.4' \(d \)-0.4' \(m \)-1.30 \(\nu \)-2.1' \(d \)-1' \(m \)-2.27 \(\nu \)-2.2' \(d \)-0.1' \(m \)-0.99 \(\nu \)-1.6 \(\nu \)	22			49.90				_		
Mer.pass. 14:27 \$\nu-0.8' \ d-0.4' \ m-3.89\$ \$\nu.0.4' \ d-0.4' \ m1.30\$ \$\nu.2.1' \ d0.1' \ m-2.27\$ \$\nu.2.2' \ d-0.1' \ m0.99\$ Peacock \$53'7.44 \ -56'39.45 \ 21.80 Wed GHA Dec GHA Scheat GHA Dec GHA Scheat GHA	23	128°28.74	189°48.31	49.43	185°31.00 57.40	5 91°42.30 31.18	148°14.47 4.68			
Wed GHA GHA Dec GHA Al Nair 27°3.28 4.24 6.23°3.67 21°8 48.75 21°6.75 31.41 178°18.83 4.46 5.66 29°2.98.6 6.23°3.69 4.24 4.90°4.82.67 4.9°4.82.68 4.9°6.73.37 5.50.8 181°55.11 31.89 238°2.75.5 4.01 Venus 6°35.88 10°19 8 263°5.99.2 324°4.106 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 50°2.78 31.31	Mer.p	ass. 14:27	ν -0.8' d-0	.4′ m-3.89	ν 0.4' d-0.4' m1.30	$\nu 2.1' \ d0.1' \ \text{m-}2.27$	ν 2.2' d-0.1' m0.99	1		
Wed GHA GHA Dec GHA Pose GHA Dec GHA Dec Hall 3°31.30 163°1665 510°4.57 Fomalhaut 15°15.66 29°29.86 20°29.98 6.0 21°8'35.30 21°8'45.89 48.01 230°32.36 56.27 136°48.71 31.53 193°21.01 4.35 Markab 13°30.90 24°52.81 13°6.62 75.47 166°52.97 31.77 223°25.37 4.13 4.06 20°4°4.26 4.06 46.58 276°33.72 55.08 181°55.11 31.89 238°27.55 4.01 4.08 4.08 56°3.68 10:19 6 233°45.99 294°42.67 520°46.10 290°34.17 520°54.68 196°57.24 N13°32.01 238°3.10 3.90 3.90 3.00 3.00 3.00										
0 143°31.20 204°47.51 \$20°48.96 200°31.46 \$20°57.07 106°44.44 \$113°31.30 163°16.65 \$10°4.57 \$115°3.67 219°46.70 48.48 215°31.91 56.67 121°46.57 31.41 178°18.83 4.46 \$51.33 193°21.01 4.35	Wed	GHΔ	GHA	Dec	GHA Dec	GHA Dec	GHA Dec			
1 158°33.67 219°46.70 48.48 215°31.91 56.67 121°46.57 31.41 178°18.83 4.46 217°36.13 234°45.89 48.01 230°32.36 56.27 136°48.71 31.53 193°21.01 4.35 13°46.27 23°12.75 136°38.60 249°45.09 4.47.53 245°32.81 55.87 151°50.84 31.65 208°23.19 4.24 4.24 4.28 47.06 260°33.26 55.47 166°52.97 31.77 223°25.37 4.13 4.35 13°30.95 15°20.00										
2 173°36.13 234°45.89 48.01 230°32.36 56.27 136°48.71 31.53 193°21.01 4.35 3 188°38.60 249°45.09 · 47.53 245°32.81 · 55.87 151°50.84 · 31.65 208°23.19 · 4.24 4 203°41.06 264°44.28 47.06 260°33.26 55.47 166°52.97 31.77 223°25.37 4.13 5 218°43.52 270°43.48 46.58 275°33.72 55.08 181°55.11 31.89 238°27.55 4.01 6 233°45.99 294°42.67 S20°46.10 290°34.17 S20°54.68 196°57.24 N13°32.01 253°29.74 S10°3.90 7 248°48.45 300°41.87 45.62 305°34.62 54.28 211°59.37 32.13 268°31.92 3.79 8 263°50.92 324°41.06 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 9 278°53.38 330°40.26 · 44.65 335°35.58 · 53.48 242°3.64 · 32.37 298°36.28 · 3.57 10 293°55.84 354°39.46 44.17 355°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 S20°43.20 20°36.89 \$20°52.27 287°10.03 N13°32.73 343°42.82 \$10°3.23 13 339°3.24 39°37.05 44.71 35°37.34 51.87 302°12.16 32.85 358°45.00 3.12 14 354°5.70 54°36.25 42.22 550°37.79 51.47 317°14.29 32.97 138°47.18 3.01 15 9°8.16 69°35.44 · 41.73 65°38.25 · 51.07 332°16.42 · 33.08 28°49.37 · 2.90 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$50°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 19 69°18.02 120°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 199°22.95 155°30.64 · 38.78 155°40.97 · 48.64 62°29.20 · 33.80 119°2.45 · 2.22 22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 31 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140°40.27 2.34 48.04 140										I
3 188°38.60 249°45.09 · 47.53 245°32.81 · 55.87 151°50.84 · 31.65 208°23.19 · · 4.24 203°41.06 264°44.28 4 .06 260°33.26 55.47 166°52.97 31.77 223°25.37 4.13 5 218°43.52 279°43.48 46.58 275°33.72 55.08 181°55.11 31.89 238°27.55 4.01 6 233°45.99 294°42.67 520°46.10 290°34.17 520°54.68 196°57.24 N13°32.01 253°29.74 510°3.90 7 248°48.45 309°41.87 45.62 305°34.62 54.28 211°59.37 32.13 268°31.92 3.79 8 263°50.92 324°41.06 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 9 278°53.38 339°40.26 · · 44.65 335°35.53 · · 53.48 242°3.64 · · 32.37 298°36.28 · · 3.57 10 293°55.84 354°39.46 44.17 350°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 520°43.20 20°36.89 520°52.27 287°10.03 N13°32.73 343°42.82 510°3.23 13 339°3.24 39°37.05 42.71 35°37.34 51.87 302°12.16 32.85 588°45.00 3.12 14 354°5.70 54°36.25 42.22 50°37.79 51.47 317°14.29 32.97 13°47.18 3.01 15 9°8.16 69°35.44 · · · · · · · · · · · · · · · · · ·								1		
5 218°43.52 279°43.48 46.58 275°33.72 55.08 181°55.11 31.89 238°27.55 4.01 6 233°45.99 294°42.67 \$20°46.10 290°34.17 \$20°54.68 196°57.24 \$N13°32.01 253°29.74 \$510°3.90 7 248°48.45 309°41.87 45.62 305°34.62 54.28 211°59.37 32.13 268°31.92 3.79 8 263°50.92 324°41.06 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 9 278°53.38 339°40.26 · 44.65 335°35.53 · 53.48 242°3.64 · 32.37 298°36.28 · 3.57 10 293°55.84 354°39.46 44.17 350°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 \$20°43.20 20°36.89 \$20°52.27 287°10.03 \$N13°32.73 343°42.82 \$10°3.23 349°42.82 \$10°3.23 313°38.46 3.45 14 354°5.70 54°36.25 42.22 50°37.79 51.47 317°14.29 32.97 13°47.18 3.01 15 9°8.16 69°35.44 · 41.73 65°38.25 · 51.07 332°16.42 · 33.08 28°49.37 · 2.90 16 24°10.63 84°34.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 348°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 \$N13°33.44 73°55.91 \$10°2.56 340°40.26 110°39.61 \$20°49.86 17°22.81 \$N13°33.44 73°55.91 \$10°2.56 340°40.27 2.34 39°7.08 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 40°20.48 144°31.44 39.27 140°40.52 49.05 40°20.48 140°40.48 20.48 140°40.48 20.48 140°40.48 20.48										
6 233°45.99 294°42.67 \$20°46.10 290°34.17 \$20°54.68 196°57.24 N13°32.01 253°29.74 \$10°3.90 7 248°48.45 309°41.87 45.62 305°34.62 54.28 211°59.37 32.13 268°31.92 3.79 8 263°50.92 324°41.06 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 9 278°53.38 339°40.26 · 44.65 335°35.53 · 53.48 242°3.64 · 32.37 298°36.28 · . 3.57 10 293°55.84 354°39.46 44.17 350°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 \$20°43.20 20°36.89 \$20°52.27 287°10.03 N13°32.73 343°42.82 \$10°3.23 13 339°3.24 39°37.05 42.71 35°37.34 51.87 302°12.16 32.85 358°45.00 3.12 14 354°5.70 54°36.25 42.22 50°37.79 51.47 317°14.29 32.97 13°47.18 3.01 15 9°8.16 69°35.44 · · · · · · · · · · · · · · · · · ·										
7 248°48.45 309°41.87 45.62 305°34.62 54.28 211°59.37 32.13 268°31.92 3.79 8 263°50.92 324°41.06 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 9 278°53.38 339°40.26 · 44.65 335°35.53 · 53.48 242°3.64 · 32.37 298°36.28 · 3.57 10 293°55.84 354°39.46 44.17 350°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 \$20°43.20 20°36.89 \$20°52.27 287°10.03 N13°32.73 343°42.82 \$10°3.23 13 339°3.24 39°37.05 42.71 35°37.34 51.87 302°12.16 32.85 358°45.00 3.12 14 354°5.70 54°36.25 42.22 50°37.79 51.47 317°14.29 32.97 13°47.18 3.01 15 9°8.16 69°35.44 · 41.73 65°38.25 · 51.07 332°16.42 · 33.08 28°49.37 · 2.90 16 24°10.63 84°34.64 41.24 88°38.70 50.67 347°18.55 33.20 43°51.55 2.78 17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · 38.78 155°40.97 · 48.64 62°29.20 · 33.80 119°2.45 · 2.22 21 14°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00										
8 263°50.92 324°41.06 45.13 320°35.07 53.88 227°1.50 32.25 283°34.10 3.68 9 278°53.38 339°40.26 · 44.65 335°35.53 · 53.48 242°3.64 · 32.37 298°36.28 · 3.57 10 293°55.84 354°39.46 44.17 350°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 \$20°43.20 20°36.89 \$20°52.27 287°10.03 N13°32.73 343°42.82 \$10°3.23 13 339°3.24 39°37.05 42.71 35°37.34 51.87 302°12.16 32.85 358°45.00 3.12 14 354°5.70 54°36.25 42.22 50°37.79 51.47 317°14.29 32.97 13°47.18 3.01 15 9°8.16 69°35.44 · 41.73 65°38.25 · 51.07 332°16.42 · 33.08 28°49.37 · 2.90 16 24°10.63 84°34.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · 38.78 155°40.97 · 48.64 62°29.20 · 33.80 119°2.45 · 2.22 21 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 40°6.81 2.00 Saturn 19°58.99 13:12 Saturn 19°58.99 13:12 ShA Mer.pass Saturn 19°58.99 13:12 ShA Mer.pass Saturn 19°58.99 13:12 Feb 13 Tue Venus 62°34.90 10:20 Mars 57°48.59 10:38 Jupiter 323°21.08 16:54 Saturn 19°58.99 13:12								1		
10 293°55.84 354°39.46 44.17 350°35.98 53.08 257°5.77 32.49 313°38.46 3.45 11 308°58.31 9°38.65 43.68 5°36.43 52.68 272°7.90 32.61 328°40.64 3.34 12 324°0.77 24°37.85 520°43.20 20°36.89 \$20°52.27 287°10.03 N13°32.73 343°42.82 \$10°3.23 13 339°3.24 39°37.05 42.71 35°37.34 51.87 302°12.16 32.85 358°45.00 3.12 15 9°8.16 69°35.44 · · 41.73 65°38.25 · · 51.07 332°16.42 · · 33.08 28°49.37 · · 2.90 16 24°10.63 84°34.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · · 38.78 155°40.97 · · 48.64 62°29.20 · · 33.80 119°2.45 · · 2.22 21 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 10 293°55.84 34.64 44.17 350°35.98 53.08 226°5.77 3 2.61 328°40.64 3.34 10 293°58.40 40.64 3.34 10 308°58.31 9°38.65 43.68 5°30.43 2.00 3.22 10 308°58.31 9°38.65 43.68 5°30.43 2.00 3.12 20 308°40.64 3.34 20 408°40.65 42.71 35°37.34 51.87 302°12.16 32.85 388°45.00 3.12 20 308°40.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · · 38.78 155°40.97 · · · 48.64 62°29.20 · · 33.80 119°2.45 · · · 2.22 22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 10 293°52.77 13°48.59 10:38 10 308°40.64 3.34 10 40°40.52 49.05 47°27.07 33.68 104°0.27 2.34 10 408°40.52 49.05 40.06 49.45 32°24.94 33.56 88°58.09 2.45 10 508°40.40 40.50										
10 293 *5.84	9	278°53.38	$339^{\circ}40.26$	• • 44.65	335°35.53 · · 53.48	3 242°3.64 · · 32.37	298°36.28 · · 3.57	Fob 13 Tue	CHV	Mer pass
11 306 58.31 9 38.05 43.68 5 36.43 52.68 272 7.90 32.61 328 40.04 3.34 1.34 1.34 1.34 1.34 1.34 1.34 1.3										
12 324 0.77 24 37.85 520 43.20 20 36.89 520 52.72 287 10.03 N13 32.73 343 42.82 510 3.23 13 339 3.24 39 37.05 42.71 35 37.34 51.87 302 12.16 32.85 358 45.00 3.12 14 354 5.70 54 36.25 42.22 50 37.79 51.47 317 14.29 32.97 13 47.18 3.01 15 9 8.16 69 35.44 · · 41.73 65 38.25 · · · 51.07 332 16.42 · · · 33.08 28 49.37 · · · 2.90 16 24 10.63 84 34.64 41.24 80 38.70 50.67 347 18.55 33.20 43 51.55 2.78 18 54 15.56 114 33.04 520 40.26 110 39.61 50 20 49.86 17 22.81 N13 33.44 73 55.91 510 2.56 19 69 18.02 129 32.24 39.77 125 40.06 49.45 32 24.94 33.56 88 58.09 2.45 20 84 20.48 144 31.44 39.27 140 40.52 49.05 47 27.07 33.68 104 0.27 2.34 21 99 22.95 159 30.64 · · 38.78 155 40.97 · · · 48.64 62 29.20 · · · 33.80 119 2.45 · · · 2.22 114 25.41 174 29.84 38.28 170 41.42 48.24 77 31.33 33.92 134 4.63 2.11 23 129 27.88 189 29.04 37.78 185 41.88 47.83 92 33.46 34.04 149 6.81 2.00										
14 354°5.70 54°36.25 42.22 50°37.79 51.47 317°14.29 32.97 13°47.18 3.01 15 9°8.16 69°35.44 · · 41.73 65°38.25 · · 51.07 332°16.42 · · 33.08 28°49.37 · · 2.90 16 24°10.63 84°34.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 19 60°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · · 38.78 155°40.97 · · 48.64 62°29.20 · · 33.80 119°2.45 · · 2.22 22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Saturn 19°52.22 13:08 Feb 14 Wed SHA Mer.pass Venus 61°16.30 10:21 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°52.22 13:08 Saturn 19°52.22 13:08 Feb 14 Wed SHA Mer.pass Venus 61°16.30 10:21 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°52.22 13:08 Saturn 19°52.22 13:08 Venus 61°16.30 10:21 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°52.22 13:08 Saturn 19°52.22 13:08 Venus 19°52.22 13:08 Saturn 19°52.22 13:08 Venus 20°20 13:08 Saturn 19°52.22 13								Jupiter	$323^{\circ}21.08$	
15 9°8.16 69°35.44 · · · 41.73 65°38.25 · · · 51.07 332°16.42 · · · 33.08 28°49.37 · · · 2.90 16 24°10.63 84°34.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 18 54°15.56 114°33.04 520°40.26 110°39.61 520°49.86 17°22.81 N13°33.44 73°55.91 510°2.56 19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · · 38.78 155°40.97 · · · 48.64 62°29.20 · · · 33.80 119°2.45 · · · 2.22 21 14°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Feb 14 Wed SHA Mer.pass Venus 61°16.30 10:21 Nars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Horizontal parallax Venus: 0.1 Mars: 0.1								Saturn	19°52.22	13:08
16 24°10.63 84°34.64 41.24 80°38.70 50.67 347°18.55 33.20 43°51.55 2.78 Venus 61°16.30 10:21 17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 Mars 57°0.25 10:38 18 54°15.56 114°33.04 \$20°40.26 110°39.61 \$20°49.86 17°22.81 N13°33.44 73°55.91 \$10°2.56 19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · 38.78 155°40.97 · 48.64 62°29.20 · 33.80 119°2.45 · 2.22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars: 0.1								Feb 14 Wed	SHA	Mer.pass
17 39°13.09 99°33.84 40.75 95°39.15 50.26 2°20.68 33.32 58°53.73 2.67 18 54°15.56 114°33.04 520°40.26 110°39.61 520°49.86 17°22.81 N13°33.44 73°55.91 510°2.56 19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · 38.78 155°40.97 · 48.64 62°29.20 · 33.80 119°2.45 · 2.22 21 14°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars 57°0.25 10:38 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Horizontal parallax Venus: 0.1 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Horizontal parallax Venus: 0.1 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Horizontal parallax Venus: 0.1 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Saturn 19°45.45 13:05 Mars 57°0.25 10:38 Jupiter 323°13.24 16:51 Saturn 19°45.45 13:05 Satur										
19 69°18.02 129°32.24 39.77 125°40.06 49.45 32°24.94 33.56 88°58.09 2.45 20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · 38.78 155°40.97 · 48.64 62°29.20 · 33.80 119°2.45 · 2.22 22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars: 0.1								Mars	57°0.25	
20 84°20.48 144°31.44 39.27 140°40.52 49.05 47°27.07 33.68 104°0.27 2.34 21 99°22.95 159°30.64 · · 38.78 155°40.97 · · 48.64 62°29.20 · · 33.80 119°2.45 · · 2.22 22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars: 0.1										
21 99°22.95 159°30.64 · · 38.78 155°40.97 · · 48.64 62°29.20 · · 38.80 119°2.45 · · 2.22 Horizontal parallax 22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 Venus: 0.1 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars: 0.1								Saturn	19°45.45	13:05
22 114°25.41 174°29.84 38.28 170°41.42 48.24 77°31.33 33.92 134°4.63 2.11 Venus: 0.1 23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars: 0.1								Horizon	tal parallax	
23 129°27.88 189°29.04 37.78 185°41.88 47.83 92°33.46 34.04 149°6.81 2.00 Mars: 0.1									-	0.1
Mer.pass. 14:24 ν -0.8′ d -0.5′ m-3.89 ν 0.5′ d -0.4′ m1.30 ν 2.1′ d 0.1′ m-2.27 ν 2.2′ d -0.1′ m0.98									Mars:	0.1
	Mer.p	ass. 14:24	ν-0.8′ d-0	.5′ m-3.89	ν0.5' d-0.4' m1.30	ν2.1′ d0.1′ m-2.27	ν2.2' d-0.1' m0.98			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.08	S13°55.91	$148^{\circ}22.11$	10.1'	S05°19.74	-17.6'	60.9'
1	191°27.08	55.08	162°51.18	10.1'	05°2.11	-17.6'	60.9'
2 3	206°27.08 221°27.08	54.26 •• 53.43	177°20.29 191°49.46	10.2' 10.2'	04° 44.47 04° 26.80	-17.7' -17.7'	60.9' 60.9'
4	236°27.08	52.61	206° 18.67	10.2	04°9.13	-17.7'	60.9'
5	251°27.08	51.78	$220^{\circ}47.92$	10.3'	$03^{\circ}51.44$	-17.7'	60.8'
6	266°27.08	\$13°50.95	235° 17.23	10.3'	503°33.74	-17.7'	60.8'
7 8	281°27.09 296°27.09	50.12 49.29	249° 46.57 264° 15.96	10.4' 10.4'	03°16.03 02°58.31	-17.7' -17.7'	60.8' 60.8'
9	311°27.09	• • 48.47	278° 45.39	10.5'	02°40.60	-17.7'	60.8'
10	326°27.09	47.64	293° 14.86	10.5'	02°22.88	-17.7'	60.7'
11	341°27.10 356°27.10	46.81 \$13°45.98	307°44.37 322°13.92	10.5'	02°5.15 \$01°47.43	-17.7'	60.7'
12 13	11°27.11	45.15	322 13.92 336°43.50	10.6' 10.6'	01°29.72	-17.7' -17.7'	60.7' 60.7'
14	26°27.11	44.32	351° 13.11	10.6'	01°12.01	-17.7'	60.7'
15	41°27.12	• • 43.48	5°42.76	10.7'	00°54.30	-17.7'	60.6'
16	56°27.12 71°27.13	42.65 41.82	20° 12.44 34° 42.15	10.7' 10.7'	00°36.61 00°18.92	-17.7'	60.6'
17 18	86°27.13	41.82 \$13°40.99	49° 11.89	10.7	500°1.25	-17.7' -17.7'	60.6' 60.6'
19	101°27.14	40.16	63°41.66	10.8'	N00° 16.41	17.6'	60.5
20	116°27.15	39.32	78° 11.46	10.8'	00°34.05	17.6'	60.5'
21	131°27.15	• • 38.49	92°41.28	10.8'	00°51.67	17.6'	60.5'
22 23	146°27.16 161°27.17	37.66 36.82	107°11.12 121°40.99	10.9' 10.9'	01°9.27 01°26.85	17.6' 17.6'	60.5' 60.4'
	SD = 16.2'	d = -0.8'			O = 16.6'		
	JD — 10.2	u — -0.0		اد	J — 10.0°		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.18	\$13°35.99	136° 10.88	10.9'	N01°44.41 02°1.94	17.5'	60.4'
1 2	191°27.18 206°27.19	35.15 34.32	150° 40.79 165° 10.71	10.9' 10.9'	02°1.94 02°19.44	17.5' 17.5'	60.4' 60.4'
3	221°27.20	• • 33.48	179° 40.66	11.0'	02°36.92	17.4	60.3
4	236°27.21	32.64	$194^{\circ}10.62$	11.0'	$02^{\circ}54.36$	17.4'	60.3'
5	251°27.22	31.81	208° 40.60	11.0'	03°11.78	17.4	60.3'
6 7	266°27.23 281°27.24	\$13°30.97 30.13	223° 10.59 237° 40.59	11.0' 11.0'	N03°29.16 03°46.50	17.3' 17.3'	60.3' 60.2'
8	296°27.25	29.30	252° 10.60	11.0'	04°3.81	17.3	60.2'
9	311°27.26	• • 28.46	$266^{\circ}40.63$	11.0'	$04^{\circ}21.07$	17.2'	60.2'
10	326°27.27	27.62	281° 10.66	11.0'	04°38.30	17.2'	60.1'
11 12	341°27.28 356°27.30	26.78 \$13°25.94	295° 40.70 310° 10.74	11.0' 11.1'	04°55.48 N05°12.62	17.1' 17.1'	60.1' 60.1'
13	11°27.31	25.10	324°40.80	11.1'	05°29.72	17.1	60.1
14	26°27.32	24.26	$339^{\circ}10.85$	11.1'	05°46.77	17.0'	60.0'
15	41°27.33	• • 23.42	353°40.91	11.1'	06°3.77	16.9	60.0'
16 17	56°27.35 71°27.36	22.58 21.74	8° 10.96 22° 41.02	11.1' 11.1'	06°20.71 06°37.61	16.9' 16.8'	60.0' 59.9'
18	86°27.37	S13°20.90	37°11.08	11.1'	N06°54.46	16.8'	59.9'
19	101°27.39	20.06	51°41.13	11.1'	07°11.24	16.7'	59.9'
20	116°27.40 131°27.42	19.21 •• 18.37	66° 11.18 80° 41.23		07°27.98 07°44.65	16.7' 16.6'	59.8' 59.8'
21 22	131 27.42 146°27.43	17.53	95°11.27	11.0' 11.0'	07 44.05 08°1.27	16.6'	59.8'
23	161°27.45	16.69	109°41.30	11.0'	08° 17.82	16.5'	59.7'
	SD = 16.2'	d = -0.8'		SI	D = 16.5'		
Wed	GHA	D	GHA		Dec	d	HP
oved 0	176°27.46	Dec \$13° 15.84	124°11.32	u 11.0'	N08° 34.31	16.4'	пР 59.7'
1	191°27.48	15.00	138°41.34	11.0'	$08^{\circ}50.74$	16.4	59.7'
2	206°27.50	14.15	153° 11.34	11.0'	09°7.10	16.3'	59.7'
3 4	221°27.51 236°27.53	· · 13.31 12.46	167° 41.34 182° 11.32	11.0' 11.0'	09°23.40 09°39.63	16.2' 16.2'	59.6' 59.6'
4 5	251°27.55	12.46	182 11.32 196°41.28	11.0'	09 39.63 09°55.78	16.2	59.6'
6	266°27.57	S13° 10.77	211°11.23	10.9'	N10°11.87	16.0'	59.5'
7	281°27.59	9.92	225°41.17	10.9'	10°27.89	15.9'	59.5'
8 9	296°27.60 311°27.62	9.08 •• 8.23	240°11.09 254°40.99	10.9' 10.9'	10°43.83 10°59.69	15.9' 15.8'	59.5' 59.4'
10	311 27.62 326°27.64	7.38	269° 10.87	10.9'	10°59.69 11°15.48	15.8	59.4' 59.4'
11	341°27.66	6.54	283°40.73	10.8'	11°31.19	15.6'	59.3
12	356°27.68	S13°5.69	298° 10.58	10.8'	N11°46.82	15.6'	59.3'
13	11°27.70 26°27.72	4.84 3.99	312° 40.39 327° 10.19	10.8' 10.8'	12°2.37 12°17.84	15.5' 15.4'	59.3' 59.2'
14 15	26°27.72 41°27.74	3.99 · · 3.14	327°10.19 341°39.96	10.8	12° 17.84 12° 33.22	15.4° 15.3'	59.2' 59.2'
16	56°27.76	2.29	$356^{\circ}9.71$	10.7'	$12^{\circ}48.52$	15.2'	59.2'
17	71°27.78	1.44	10°39.43	10.7'	13°3.74	15.1'	59.1'
18 19	86°27.81 101°27.83	\$13°0.59 12°59.74	25°9.13 39°38.80	10.7' 10.6'	N13° 18.86 13° 33.90	15.0' 14.9'	59.1' 59.1'
19 20	101°27.83 116°27.85	12°59.74 58.89	39°38.80 54°8.44	10.6'	13°33.90 13°48.85	14.9' 14.9'	59.1° 59.0'
21	131°27.87	• 58.04	68° 38.05	10.6'	14°3.71	14.8'	59.0'
22	146°27.90	57.19	83°7.63	10.5'	14° 18.47	14.7'	59.0'
23	161°27.92	56.33	97°37.18	10.5'	14°33.14	14.6'	58.9'
	SD = 16.2'	d = -0.8'		SI	D = 16.3'		

1 -4	Twi	light	C	S	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	06:25	07:46	09:08	15:22	16:44	18:05
N 70°	06:22	07:35	08:46	15:44	16:55	18:08
68°	06:20	07:26	08:29	16:01	17:04	18:10
66°	06:17	07:18	08:15	16:15	17:12	18:12
64°	06:15	07:11	08:03	16:26	17:18	18:14
62°	06:13	07:06	07:53	16:36	17:24	18:16
60°	06:12	07:01	07:45	16:44	17:29	18:18
N 58°	06:10	06:56	07:38	16:52	17:33	18:20
56°	06:08	06:52	07:31	16:58	17:37	18:21
54°	06:07	06:48	07:25	17:04	17:41	18:23
52°	06:05	06:45	07:20	17:09	17:44	18:24
50°	06:04	06:42	07:15	17:14	17:48	18:26
45°	06:00	06:34	07:05	17:24	17:55	18:29
N 40°	05:56	06:28	06:56	17:33	18:01	18:33
35°	05:53	06:23	06:49	17:40	18:06	18:36
30°	05:49	06:18	06:42	17:47	18:11	18:39
20°	05:42	06:08	06:31	17:58	18:21	18:47
N 10°	05:34	05:59	06:20	18:08	18:30	18:55
0°	05:25	05:50	06:11	18:18	18:39	19:04
S 10°	05:14	05:39	06:01	18:27	18:49	19:14
20°	05:01	05:28	05:50	18:38	19:00	19:27
30°	04:43	05:13	05:38	18:50	19:15	19:44
35°	04:32	05:04	05:31	18:57	19:23	19:55
40°	04:19	04:54	05:23	19:05	19:33	20:08
45°	04:03	04:42	05:14	19:14	19:46	20:25
S 50°	03:41	04:26	05:02	19:25	20:01	20:46
52°	03:30	04:19	04:57	19:31	20:08	20:56
54°	03:18	04:10	04:51	19:36	20:16	21:08
56°	03:03	04:01	04:44	19:43	20:26	21:23
58°	02:46	03:50	04:37	19:50	20:36	21:40
S 60°	02:23	03:37	04:28	19:59	20:49	22:01

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	09:00	08:22	07:40	20:57	23:28	
N 70°	08:57	08:28	07:56	20:56	23:15	
68°	08:53	08:32	08:09	20:56	23:04	
66°	08:51	08:36	08:20	20:55	22:56	
64°	08:49	08:39	08:29	20:54	22:48	
62°	08:47	08:42	08:37	20:54	22:42	
60°	08:45	08:44	08:44	20:53	22:37	
N 58°	08:43	08:47	08:50	20:53	22:32	
56°	08:42	08:49	08:55	20:53	22:28	
54°	08:41	08:50	09:00	20:52	22:24	23:55
52°	08:40	08:52	09:05	20:52	22:21	23:49
50°	08:39	08:53	09:09	20:52	22:18	23:43
45°	08:36	08:57	09:18	20:51	22:11	23:30
N 40°	08:34	08:59	09:25	20:51	22:06	23:20
35°	08:33	09:02	09:31	20:50	22:01	23:11
30°	08:31	09:04	09:37	20:50	21:57	23:03
20°	08:29	09:08	09:47	20:49	21:50	22:50
N 10°	08:27	09:11	09:56	20:49	21:44	22:39
0°	08:24	09:14	10:04	20:48	21:38	22:28
S 10°	08:22	09:18	10:12	20:48	21:32	22:17
20°	08:20	09:21	10:21	20:47	21:26	22:06
30°	08:18	09:25	10:32	20:46	21:19	21:53
35°	08:16	09:28	10:38	20:46	21:15	21:45
40°	08:15	09:30	10:45	20:45	21:10	21:37
45°	08:13	09:33	10:53	20:45	21:05	21:27
S 50°	08:10	09:37	11:03	20:44	20:59	21:15
52°	08:09	09:39	11:07	20:44	20:56	21:10
54°	08:08	09:41	11:12	20:43	20:53	21:04
56°	08:07	09:43	11:18	20:43	20:50	20:57
58°	08:06	09:45	11:24	20:42	20:46	20:50
S 60°	08:04	09:48	11:31	20:42	20:41	20:41

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.	
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-22%
12	14:12	14:12	12:14	14:36	02:11	
13	14:11	14:11	12:14	15:26	03:01	
14	14:10	14:09	12:14	16:16	03:51	

February 15, 16, 17 UT (Thu., Fri., Sat.)

h	Aries	Venus	S	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	144° 30.34		20°37.28	200°42.33	S20°47.43	107°35.59	N13°34.17	164°8.99	S10°1.89	A		
1	$159^{\circ}32.81$	219°27.45	36.78	215°42.79	47.02	122°37.72	34.29	$179^{\circ}11.17$	1.78	Alpheratz	357°35.84 353°8.17	29°13.39 -42°10.74
2	174°35.27	234°26.65	36.28	230°43.24	46.61	137°39.84	34.41	194°13.35	1.66	Ankaa Schedar	353 8.17 349°32.32	-42 10.74 56°40.29
3	189° 37.73		35.78	245°43.70	• • 46.21	152°41.97	• • 34.53	209° 15.53	• • 1.55	Diphda	348°48.26	-17°51.46
4	204° 40.20	264°25.05	35.28	260°44.15	45.80	167°44.10	34.65	224°17.72	1.44	Achernar	335°21.00	-57°7.16
5 6	219° 42.66 234° 45.13	279°24.26 294°23.46 S 2	34.77 20°34.27	275°44.61 290°45.07	45.39 \$20°44.98	182°46.23 197°48.35	34.77 N13°34.89	239°19.90 254°22.08	1.33 \$10°1.22	Hamal	$327^{\circ}52.17$	23°34.59
7	249° 47.59	309°22.66	33.76	305°45.52	44.57	212°50.48	35.01	269°24.26	1.10	Polaris	314°28.62	89°22.26
8	264° 50.05	324°21.87	33.25	320°45.98	44.17	227°52.61	35.13	284° 26.44	0.99	Acamar	315°12.39	-40°12.75
9	279°52.52	339°21.07 ·	• 32.75	335°46.43	• • 43.76	242°54.73	• • 35.25	299°28.62	• • 0.88	Menkar Mirfak	314°6.97 308°29.35	4°10.97 49°56.97
10	294° 54.98	354°20.28	32.24	350°46.89	43.35	257°56.86	35.37	314°30.80	0.77	Aldebaran	290°40.38	16°33.46
11	309°57.45	9°19.48	31.73	5°47.35	42.94	272°58.98	35.49	329° 32.98	0.66	Rigel	281° 4.44	-8°10.55
12	324° 59.91		20°31.22	20°47.80	\$20°42.52	288°1.11	N13°35.61	344°35.16	S10° 0.54	Capella	280°22.78	46°1.46
13 14	340°2.37 355°4.84	39° 17.90 54° 17.10	30.70 30.19	35°48.26 50°48.71	42.11 41.70	303°3.23 318°5.36	35.74 35.86	359°37.34 14°39.52	0.43 0.32	Bellatrix	278°23.52	6°22.24
15	10°7.30		29.67	65°49.17	• • 41.29	333°7.48	35.98	29°41.70	. 0.32	Elnath	278° 2.63	28°37.71
16	25°9.77	84° 15.52	29.16	80°49.63	40.88	348°9.61	36.10	44°43.88	0.09	Alnilam	275°38.31	-1°11.28
17	$40^{\circ}12.23$	99°14.72	28.64	95°50.09	40.47	3°11.73	36.22	59°46.06	$09^{\circ}59.98$	Betelgeuse Canopus	270°52.70 263°52.37	7°24.64 -52°42.69
18	55° 14.70		20°28.12	110°50.54	S20°40.05	18°13.86	N13°36.34	74°48.24	S09°59.87	Sirius	203 52.57 258°26.65	-32 42.09 -16°45.08
19	70° 17.16	129°13.14	27.61	125°51.00	39.64	33°15.98	36.46	89°50.42	59.76	Adhara	255°6.16	-29°0.43
20	85° 19.62	144°12.35	27.09	140°51.46	39.23	48°18.10	36.59	104°52.60	59.65	Procyon	244°51.33	5°9.73
21 22	100°22.09 115°24.55	159°11.56 · 174°10.77	26.57 26.04	155°51.91 170°52.37	· · 38.81 38.40	63°20.23 78°22.35	· · 36.71 36.83	119°54.78 134°56.96	•• 59.53 59.42	Pollux	243°17.88	$27^{\circ}58.07$
23	130° 27.02	189°9.98	25.52	185°52.83	37.98	93°24.47	36.95	149° 59.14	59.42	Avior	234°14.46	-59°35.27
										Suhail	222°46.43	-43°31.84
Mer.	pass. 14:20	ν -0.8' d-0.5'	m-3.89	ν 0.5' d -0	.4′ m1.30	ν 2.1′ d0.	.1′ m-2.26	ν 2.2′ d-0	.1′ m0.98	Miaplacidus Alphard	221°37.55 217°48.16	-69°48.96 -8°45.86
										Regulus	217 46.10 207°34.90	-6 45.60 11°50.87
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.24	61°37.12
0	145°29.48		20°25.00	200°53.29	\$20°37.57	108°26.59	N13°37.07	165°1.32	S09°59.20	Denebola	182°25.42	14°26.11
1	160°31.94	219°8.40	24.47	215°53.75	37.15	123°28.72	37.19	180°3.50	59.09	Gienah	$175^{\circ}44.10$	-17°40.57
2 3	175°34.41 190°36.87	234°7.61 249°6.82	23.95 · · 23.42	230°54.21 245°54.66	36.73 · · 36.32	138°30.84 153°32.96	37.32 · · 37.44	195°5.68 210°7.86	58.97 •• 58.86	Acrux	173°0.45	-63°13.80
4	205° 39.34	264°6.03	22.89	260°55.12	35.90	168°35.08	37.56	225°10.04	58.75	Gacrux	171°52.08	-57°14.74
5	220°41.80	279°5.24	22.36	275°55.58	35.48	183°37.20	37.68	240°12.22	58.64	Alioth	166°13.21	55°49.48
6	235°44.26	294°4.46 S 2	20°21.83	290°56.04	S20°35.07	198°39.32	N13°37.81	255°14.40	S09°58.52	Spica Alkaid	158°22.91 152°52.34	-11°17.28 49°11.27
7	$250^{\circ}46.73$	309°3.67	21.30	$305^{\circ}56.50$	34.65	213°41.45	37.93	$270^{\circ}16.58$	58.41	Hadar	148°36.84	-60°29.13
8	265°49.19	324°2.88	20.77	320°56.96	34.23	228°43.57	38.05	285° 18.76	58.30	Menkent	147°58.35	-36°29.22
9	280°51.66		20.23	335°57.42	• • 33.81	243°45.69	• • 38.17	300° 20.94	• • 58.19	Arcturus	$145^{\circ}48.46$	19°3.20
10 11	295°54.12 310°56.59	354°1.31 9°0.52	19.70 19.16	350°57.88 5°58.34	33.39 32.97	258°47.81 273°49.93	38.30 38.42	315°23.12 330°25.30	58.07 57.96	Rigil Kent.	139°41.17	-60°55.87
12	325° 59.05		20°18.63	20°58.80	\$2.97 \$20°32.55	273 49.93 288°52.05	N13°38.54	345° 27.48	57.90 S09°57.85	Kochab	137°19.49	74°2.99
13	341°1.51	38°58.95	18.09	35°59.26	32.13	303°54.16	38.66	0°29.66	57.74	Zuben'ubi	136°56.77	-16°8.54
14	356°3.98	53°58.17	17.55	50°59.72	31.71	318°56.28	38.79	15°31.84	57.63	Alphecca Antares	126°4.36 112°16.83	26°37.73 -26°29.10
15	11°6.44	68°57.39 ·	17.01	$66^{\circ}0.18$	• • 31.29	333°58.40	• • 38.91	30°34.02	•• 57.51	Antares	107°11.94	-69°3.99
16	26°8.91	83°56.60	16.47	81°0.64	30.87	349°0.52	39.03	45°36.20	57.40	Sabik	102°3.76	-15°45.33
17	41° 11.37 56° 13.83	98°55.82	15.93	96°1.10	30.45	4°2.64	39.15	60°38.38	57.29	Shaula	$96^{\circ}11.57$	-37°7.20
18 19	71° 16.30	113°55.04 S 2 128°54.25	20°15.39 14.84	111° 1.56 126° 2.02	\$20°30.02 29.60	19°4.76 34°6.88	N13°39.28 39.40	75°40.56 90°42.74	\$09°57.18 57.06	Rasalhague	95°59.40	12°32.34
20	86° 18.76	143°53.47	14.30	141°2.48	29.18	49°8.99	39.52	105° 44.92	56.95	Eltanin	90°42.82	51°28.79
21	101°21.23		13.75	156°2.94	28.76	64°11.11	• • 39.65	120°47.10	• • 56.84	Kaus Aust. Vega	83°33.75 80°34.02	-34°22.36 38°48.06
22	$116^{\circ}23.69$	173°51.91	13.21	171°3.40	28.33	79°13.23	39.77	135°49.28	56.73	Nunki		-26°16.04
23	$131^{\circ}26.16$	188°51.13	12.66	186°3.86	27.91	94°15.34	39.89	150°51.46	56.61	Altair	62° 0.97	8°55.74
Mer.	pass. 14:16	ν -0.8' d-0.5'	m-3.89	ν 0.5' d-0	.4′ m1.30	$\nu 2.1' d0.$.1′ m-2.25	ν 2.2' d-0	.1′ m0.98	Peacock	53°7.42	-56°39.45
	F									Deneb	49°26.77	45°21.79
Sat	GHA	GHA	Doc	GHA	Dos	GHA	Doc	GHA	Dec	Enif	33°39.85	9°58.98
Sat 0	GПА 146°28.62	203°50.34 S 2	Dec 20°12.11	201° 4.32	Dec \$20°27.48	ина 109°17.46	Dec N13° 40.02	165° 53.64	S09°56.50	Al Na'ir	27°34.28	-46°50.79
1	161°31.08	218°49.56	11.56	216° 4.78	27.06	124°19.58	40.14	180° 55.82	56.39	Fomalhaut Scheat	15°15.66 13°46.27	-29°29.85 28°12.74
2	$176^{\circ}33.55$	233°48.78	11.01	231°5.25	26.63	139°21.69	40.26	195°58.00	56.28	Markab	13°30.95	15°19.99
3	191°36.01		10.46	246°5.71	• • 26.21	154°23.81	• • 40.39	211°0.18	• • 56.16			
4	206°38.48	263° 47.23	9.90	261°6.17	25.78	169°25.93	40.51	226°2.36	56.05	Feb 15 Thu	SHA 50° 57 00	Mer.pass
5 6	221°40.94 236°43.40	278° 46.45 293° 45.67	9.35 \$20°8.80	276° 6.63 291° 7.09	25.36 \$20°24.93	184°28.04 199°30.16	40.64 N13° 40.76	241°4.54 256°6.72	55.94 S09°55.83	Venus Mars	59°57.90 56°11.99	10:23 10:37
7	251° 45.87	308° 44.89	8.24	306° 7.56	24.50	214°32.27	40.88	250 0.72 271°8.90	55.71	Jupiter	323° 5.25	16:47
8	266° 48.33	323°44.11	7.68	321°8.02	24.07	229°34.39	41.01	286°11.08	55.60	Saturn	19°38.65	13:02
9	281°50.80		• • 7.12	336°8.48	• • 23.65	244°36.50	• • 41.13	301°13.26	• • 55.49	Feb 16 Fri	SHA	
10	296° 53.26	353°42.56	6.57	351°8.94	23.22	259°38.62	41.26	$316^{\circ}15.43$	55.38	Venus	58°39.71	Mer.pass 10:24
11	311°55.73	8°41.78	6.01	6°9.41	22.79	274°40.73	41.38	331°17.61	55.26	Mars	55°23.81	10:24
12 13	326°58.19 342°0.65	23°41.00 38°40.23	\$20° 5.44 4.88	21°9.87 36°10.33	\$20°22.36 21.93	289°42.84 304°44.96	N13°41.50 41.63	346°19.79 1°21.97	\$09°55.15 55.04	Jupiter		16:44
13 14	342°0.65 357°3.12	53° 39.45	4.88 4.32	51° 10.80	21.93	304 44.96 319°47.07	41.63 41.75	1°21.97 16°24.15	55.04 54.93	Saturn	19°31.84	12:58
15	12°5.58		• 3.75	66°11.26	•• 21.07	334°49.18	• • 41.88	31° 26.33	• • 54.81	Feb 17 Sat	SHA	Mer.pass
16	27°8.05	83°37.90	3.19	81°11.72	20.64	349°51.30	42.00	46° 28.51	54.70	Venus	57°21.73	10:25
17	$42^{\circ}10.51$	98°37.13	2.62	96°12.19	20.21	4°53.41	42.13	61°30.69	54.59	Mars	54°35.70	10:35
18	57° 12.97		S20°2.06		S20°19.78	19°55.52	N13° 42.25	76°32.87	S09°54.48		322°48.84	16:40
19	72° 15.44	128°35.58	1.49	126°13.11	19.35	34°57.63	42.38	91°35.05	54.36	Saturn	19°25.02	12:55
20 21	87° 17.90 102° 20.37	143°34.81 158°34.04	0.92 20°0.35	141°13.58 156°14.04	18.91 •• 18.48	49°59.75 65°1.86	42.50 •• 42.62	106°37.23 121°39.41	54.25 •• 54.14	Horizor	ıtal parallax	
22	117° 22.83		20 0.33 19°59.78	171°14.51	18.05	80°3.97	42.02	136° 41.59	54.03		Venus:	0.1
23	132° 25.30	188°32.49	59.20	186°14.97	17.61	95°6.08	42.87	151°43.77	53.91		Mars:	0.1
Mar	pass. 14:12	ν-0.8' d-0.5'	m-3 80	ν0.5/ d.0	.4′ m1.29		.1′ m-2.25	ν2.2′ d-0	1′ m0 02			
	P455. 17.12	ν σ.σ α-σ.σ		- 0.5 u-0				- Z.Z U-U	0.30			

	Su	n			Moon		
าน	GHA	Dec	GHA	ν	Dec	d	НР
	176°27.94	S12°55.48	$112^{\circ}6.70$	10.5'	N14°47.72	14.5'	58.9
	191°27.97	54.63	126°36.18	10.5'	15°2.20	14.4'	58.9
	206°27.99	53.77	141°5.63	10.4'	15° 16.58	14.3'	58.8
	221°28.02	• • 52.92	155°35.05	10.4	15°30.87	14.2'	58.8
	236°28.04	52.07	170°4.44	10.3'	15° 45.05	14.1'	58.8
	251°28.07	51.21	184°33.79	10.3	15°59.14	14.0'	58.7
	266°28.09	S12°50.36	199°3.10	10.3	N16° 13.12	13.9'	58.7
	281°28.12	49.50	213°32.38	10.3	16° 27.00	13.8'	58.6
	296°28.15	48.65	213 32.36 228°1.62	10.2'	16° 40.77	13.7	58.6
	311°28.17	. 47.79	242°30.82	10.2'	16°54.44	13.6'	58.6
	326°28.20		256° 59.99	10.2	10 54.44 17°8.00	13.5	58.5
)	320 28.20 341°28.23	46.94 46.08	250 59.99 271°29.12		17 8.00 17°21.45		
L				10.1'		13.3'	58.5
2	356°28.25	\$12°45.22	285°58.20	10.0'	N17°34.80	13.2'	58.5
3	11°28.28	44.36	300°27.25	10.0'	17°48.03	13.1'	58.4
ŀ	26°28.31	43.51	314°56.26	10.0'	18°1.16	13.0'	58.4
5	41°28.34	• • 42.65	329°25.22	9.9'	18° 14.17	12.9'	58.4
5	56°28.37	41.79	343°54.15	9.9'	18°27.07	12.8'	58.3
7	71°28.40	40.93	358°23.03	9.8'	18°39.85	12.7'	58.3
3	86°28.43	S12°40.07	12°51.87	9.8'	$N18^{\circ}52.52$	12.6'	58.3
)	101°28.46	39.21	27°20.67	9.8'	19°5.07	12.4'	58.2
)	116°28.49	38.35	41°49.43	9.7'	19° 17.51	12.3'	58.2
	131°28.52	• • 37.49	56° 18.14	9.7'	19°29.82	12.2'	58.3
2	146°28.55	36.63	70°46.81	9.6'	19°42.02	12.1'	58.
- }	161°28.58	35.77	85° 15.44	9.6'	19°54.09	12.0'	58.
						12.0	30
	SD = 16.2'	d = -0.9'		SI	O = 16.1'		
i	GHA	Dec	GHA	ν	Dec	d	HF
	176°28.61	S12°34.91	99°44.02	9.5'	N20°6.05	11.8'	58.0
	191°28.64	34.05	$114^{\circ}12.56$	9.5'	$20^{\circ}17.88$	11.7'	58.0
	206°28.68	33.19	128°41.06	9.5'	20°29.59	11.6'	58.0
	221°28.71	• • 32.33	143°9.51	9.4'	20°41.17	11.5'	57.9
	236°28.74	31.46	157° 37.92	9.4'	20°52.63	11.3'	57.9
	251°28.77	30.60	172°6.28	9.3'	21°3.96	11.2'	57.9
	266°28.81	S12°29.74	186°34.60	9.3'	N21°15.16	11.1'	57.8
	281°28.84	28.87	201°2.88	9.2'	21°26.24	10.9'	57.8
	296°28.88		201 2.00 215°31.11	9.2' 9.2'	21° 37.19		
		28.01				10.8'	57.8
	311°28.91	• • 27.15	229°59.29	9.1'	21°48.00	10.7'	57.7
)	326°28.94	26.28	244°27.43	9.1'	21°58.69	10.6'	57.7
L	341°28.98	25.42	258°55.53	9.1'	22°9.24	10.4'	57.
2	356°29.02	S12°24.55	273°23.59	9.0'	$N22^{\circ}19.66$	10.3'	57.6
3	11°29.05	23.69	287°51.60	9.0'	22°29.95	10.2'	57.6
1	26°29.09	22.82	302° 19.56	8.9'	22°40.10	10.0'	57.6
5	41°29.12	• • 21.95	316°47.48	8.9'	22°50.12	9.9'	57.5
5	56°29.16	21.09	331°15.36	8.8'	23°0.00	9.7'	57.5
7	71°29.20	20.22	345°43.20	8.8'	23°9.74	9.6'	57.5
3	86°29.23	S12° 19.35	0°10.99	8.8'	N23° 19.35	9.5'	57.4
)	101°29.27		14°38.75	8.7'	23°28.82	9.3'	57.4
)	116°29.31	17.62	29°6.46	8.7'	23°38.15	9.2'	57.4
Ĺ	131°29.35	. 16.75	43°34.12	8.6'	23°47.34	9.0'	57.3
2	146°29.39	15.88	58°1.75	8.6'	23°56.38	8.9'	57.3
3	161°29.43	15.01	72°29.34	8.5'	24°5.29	8.8'	57.3
	SD = 16.2'	d = -0.9'		SI	D = 15.8'		
t	GHA	Dec	GHA	ν	Dec	d	HF
	176°29.46	S12° 14.14	86°56.89	8.5'	N24°14.05	8.6'	57.2
	191°29.50	13.27	101°24.39	8.5'	24°22.68	8.5'	57.2
						8.3'	57.2
	206°29.54	12.40	115°51.86	8.4'	24°31.15	0.5	
	206°29.54 221°29.58		115°51.86 130°19.29	8.4' 8.4'	24°31.15 24°39.49		57
	221°29.58	• • 11.53	130° 19.29	8.4'	24°39.49	8.2'	
	221°29.58 236°29.62	· · 11.53 10.66	130° 19.29 144° 46.68	8.4' 8.4'	24°39.49 24°47.68	8.2' 8.0'	57.
	221°29.58 236°29.62 251°29.66	· · 11.53 10.66 9.79	130° 19.29 144° 46.68 159° 14.04	8.4' 8.4' 8.3'	24° 39.49 24° 47.68 24° 55.72	8.2' 8.0' 7.9'	57.1 57.1
	221°29.58 236°29.62 251°29.66 266°29.71	·· 11.53 10.66 9.79 \$12°8.92	130° 19.29 144° 46.68 159° 14.04 173° 41.36	8.4' 8.4' 8.3' 8.3'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62	8.2' 8.0' 7.9' 7.8'	57.1 57.1 57.0
	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75	· · 11.53 10.66 9.79 \$12°8.92 8.05	130°19.29 144°46.68 159°14.04 173°41.36 188°8.64	8.4' 8.4' 8.3' 8.3' 8.2'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37	8.2' 8.0' 7.9' 7.8' 7.6'	57.1 57.1 57.0 57.0
	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79	11.53 10.66 9.79 \$12°8.92 8.05 7.18	130°19.29 144°46.68 159°14.04 173°41.36 188°8.64 202°35.89	8.4' 8.4' 8.3' 8.3' 8.2' 8.2'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97	8.2' 8.0' 7.9' 7.8' 7.6' 7.5'	57.3 57.3 57.0 57.0
	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83	11.53 10.66 9.79 \$12°8.92 8.05 7.18	130°19.29 144°46.68 159°14.04 173°41.36 188°8.64 202°35.89 217°3.10	8.4' 8.4' 8.3' 8.3' 8.2' 8.2' 8.2'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3'	57.1 57.1 57.0 57.0 57.0 56.9
)	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43	130°19.29 144°46.68 159°14.04 173°41.36 188°8.64 202°35.89 217°3.10 231°30.28	8.4' 8.4' 8.3' 8.3' 8.2' 8.2' 8.2' 8.1'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2'	57.3 57.3 57.0 57.0 57.0 56.9
) L	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43	8.4' 8.4' 8.3' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0'	57.3 57.3 57.0 57.0 57.0 56.9 56.9
) L	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43	130°19.29 144°46.68 159°14.04 173°41.36 188°8.64 202°35.89 217°3.10 231°30.28	8.4' 8.4' 8.3' 8.3' 8.2' 8.2' 8.2' 8.1'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2'	57.3 57.3 57.0 57.0 57.0 56.9 56.9
)	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63	8.4' 8.4' 8.3' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0'	57.0 57.0 57.0 57.0 57.0 56.9 56.9 56.9
) 	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56 \$12°3.68	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54	8.4' 8.4' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1' 8.1'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0' 6.9'	57 57 57 57 56 56 56 56 56
) 	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05	11.53 10.66 9.79 512° 8.92 8.05 7.18 • 6.30 5.43 4.56 512° 3.68 2.81 1.94	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68	8.4' 8.4' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1' 8.1' 8.1'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76 26° 1.46	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0' 6.9' 6.7' 6.6'	57.0 57.0 57.0 57.0 56.9 56.9 56.9 56.8 56.8
) 1 2 3 4 5	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09	11.53 10.66 9.79 \$12°8.92 8.05 7.18 6.30 5.43 4.56 \$12°3.68 2.81 1.94 1.06	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71	8.4' 8.4' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76 26° 1.46 26° 8.02	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0' 6.9' 6.7' 6.6' 6.4'	57.1 57.0 57.0 57.0 56.9 56.9 56.9 56.8 56.8 56.8
) L 2 3 4 5	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56 \$12°3.68 2.81 1.94 • 1.06 12°0.19	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70	8.4' 8.4' 8.3' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76 26° 1.46 26° 8.02 26° 14.43	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0' 6.9' 6.6' 6.4' 6.3'	57.1 57.0 57.0 57.0 56.9 56.9 56.8 56.8 56.8 56.3
) 1 2 3 4 5 7	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56 \$12°3.68 2.81 1.94 • 1.06 12°0.19 11°59.31	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.63 303° 45.71 318° 12.70 332° 39.68	8.4' 8.4' 8.3' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76 26° 1.46 26° 8.02 26° 14.43 26° 20.68	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.2' 7.0' 6.9' 6.7' 6.6' 6.4' 6.3' 6.1'	57.1 57.1 57.0 57.0 56.9 56.9 56.9 56.8 56.8 56.6 56.6
) 1 2 3 4 5 5 7	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18 86°30.22	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56 \$12°3.68 2.81 1.94 • 1.06 12°0.19 11°59.31 \$11°58.44	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70 332° 39.68 347° 6.62	8.4' 8.4' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 25° 54.76 26° 1.46 26° 8.02 26° 14.43 26° 20.68 N26° 26.78	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0' 6.9' 6.6' 6.4' 6.3' 6.1' 5.9'	57.1 57.1 57.0 57.0 56.9 56.9 56.8 56.8 56.1 56.1 56.1
) 1 2 3 4 5 5 7 3	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18 86°30.22 101°30.27	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56 \$12°3.68 2.81 1.94 • 1.06 12°0.19 11°59.31 \$11°58.44 57.56	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70 332° 39.68 347° 6.62 1° 33.54	8.4' 8.4' 8.3' 8.2' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0' 7.9' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 26° 1.46 26° 8.02 26° 14.43 26° 20.68 N26° 26.78 26° 32.73	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.3' 7.2' 7.0' 6.9' 6.7' 6.6' 6.4' 6.3' 6.1' 5.9' 5.8'	57.1 57.0 57.0 57.0 56.9 56.9 56.8 56.7 56.7 56.7 56.6
) 1 2 3 1 5 5 7 3 8 9	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18 86°30.22 101°30.27 116°30.31	11.53 10.66 9.79 \$12°8.92 8.05 7.18 • 6.30 5.43 4.56 \$12°3.68 2.81 1.94 • 1.06 12°0.19 11°59.31 \$11°58.44 57.56 56.69	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70 332° 39.68 347° 6.62 1° 33.54 16° 0.43	8.4' 8.3' 8.3' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0' 7.9' 7.9' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 26° 1.46 26° 8.02 26° 14.43 26° 20.68 N26° 26.78 26° 32.73 26° 38.52	8.2' 8.0' 7.9' 7.8' 7.6' 7.3' 7.2' 7.0' 6.9' 6.7' 6.6' 6.4' 6.3' 5.9' 5.8'	57 57 57 57 57 56 56 56 56 56 56 56 56 56 56 56 56 56 56
) 1 2 3 4 5 5 6 7 7 8 9 9	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18 86°30.22 101°30.27 116°30.31 131°30.36	11.53 10.66 9.79 \$12°8.92 8.05 7.18 1.630 5.43 4.56 \$12°3.68 2.81 1.94 1.06 12°0.19 11°59.31 \$11°58.44 57.56 56.69 55.81	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70 322° 39.68 347° 6.62 1° 33.54 16° 0.43 30° 27.31	8.4' 8.4' 8.3' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0' 7.9' 7.9' 7.9' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 26° 1.46 26° 8.02 26° 14.43 26° 20.68 N26° 26.78 26° 32.73 26° 32.73 26° 38.52 26° 44.16	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.2' 7.0' 6.9' 6.7' 6.6' 6.3' 6.1' 5.8' 5.6' 5.5'	57 57 57 57 56 56 56 56 56 56 56 56 56 56 56 56 56
) 1 2 3 3 4 5 6 6 7 7 3 9 9 9	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18 86°30.22 101°30.27 116°30.31 131°30.36 146°30.40	11.53 10.66 9.79 \$12°8.92 8.05 7.18 1.66 5.43 4.56 \$12°3.68 2.81 1.94 1.06 12°0.19 11°59.31 \$11°58.44 57.56 56.69 55.81 54.93	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70 332° 39.68 347° 6.62 1° 33.54 16° 0.43 30° 27.31 44° 54.16	8.4' 8.4' 8.3' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 7.9' 7.9' 7.9' 7.9' 7.9' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 26° 1.46 26° 8.02 26° 14.43 26° 20.68 N26° 26.78 26° 32.73 26° 32.73 26° 38.52 26° 44.16 26° 49.65	8.2' 8.0' 7.9' 7.8' 7.5' 7.3' 7.2' 7.0' 6.9' 6.6' 6.4' 6.3' 6.1' 5.9' 5.6' 5.5' 5.5'	57.1.57.1.57.1.57.1.57.1.57.1.57.1.57.1
) 1 2 3 4 5 5 6 7 7 8 9 9	221°29.58 236°29.62 251°29.66 266°29.71 281°29.75 296°29.79 311°29.83 326°29.87 341°29.92 356°29.96 11°30.00 26°30.05 41°30.09 56°30.13 71°30.18 86°30.22 101°30.27 116°30.31 131°30.36	11.53 10.66 9.79 \$12°8.92 8.05 7.18 1.630 5.43 4.56 \$12°3.68 2.81 1.94 1.06 12°0.19 11°59.31 \$11°58.44 57.56 56.69 55.81	130° 19.29 144° 46.68 159° 14.04 173° 41.36 188° 8.64 202° 35.89 217° 3.10 231° 30.28 245° 57.43 260° 24.54 274° 51.63 289° 18.68 303° 45.71 318° 12.70 322° 39.68 347° 6.62 1° 33.54 16° 0.43 30° 27.31	8.4' 8.4' 8.3' 8.2' 8.2' 8.1' 8.1' 8.1' 8.0' 8.0' 7.9' 7.9' 7.9' 7.9'	24° 39.49 24° 47.68 24° 55.72 N25° 3.62 25° 11.37 25° 18.97 25° 26.43 25° 33.73 25° 40.89 N25° 47.90 26° 1.46 26° 8.02 26° 14.43 26° 20.68 N26° 26.78 26° 32.73 26° 32.73 26° 38.52 26° 44.16	8.2' 8.0' 7.9' 7.8' 7.6' 7.5' 7.2' 7.0' 6.9' 6.7' 6.6' 6.3' 6.1' 5.8' 5.6' 5.5'	57.1.57.0.57.0.57.0.57.0.557.0.557.0.557.0.556.0

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	06:12	07:32	08:51	15:39	16:58	18:18
N 70°	06:11	07:23	08:31	15:58	17:07	18:19
68°	06:10	07:15	08:16	16:13	17:15	18:20
66°	06:08	07:08	08:04	16:26	17:21	18:22
64°	06:07	07:02	07:53	16:36	17:27	18:23
62°	06:06	06:58	07:44	16:45	17:32	18:24
60°	06:04	06:53	07:37	16:52	17:36	18:25
N 58°	06:03	06:49	07:30	16:59	17:40	18:26
56°	06:02	06:46	07:24	17:05	17:44	18:27
54°	06:01	06:42	07:19	17:10	17:47	18:28
52°	06:00	06:39	07:14	17:15	17:50	18:29
50°	05:59	06:36	07:10	17:19	17:52	18:30
45°	05:56	06:30	07:00	17:28	17:59	18:33
N 40°	05:53	06:25	06:52	17:36	18:04	18:36
35°	05:50	06:20	06:46	17:43	18:09	18:39
30°	05:47	06:15	06:40	17:49	18:13	18:42
20°	05:41	06:06	06:29	17:59	18:22	18:48
N 10°	05:33	05:58	06:20	18:09	18:30	18:55
0°	05:25	05:50	06:11	18:17	18:39	19:03
S 10°	05:15	05:40	06:02	18:26	18:48	19:13
20°	05:02	05:29	05:52	18:36	18:59	19:25
30°	04:46	05:16	05:41	18:47	19:12	19:41
35°	04:36	05:08	05:34	18:53	19:20	19:51
40°	04:23	04:58	05:27	19:01	19:29	20:04
45°	04:08	04:46	05:18	19:09	19:41	20:19
S 50°	03:48	04:32	05:07	19:20	19:55	20:39
52°	03:38	04:25	05:02	19:25	20:02	20:49
54°	03:26	04:17	04:57	19:30	20:09	21:00
56°	03:13	04:09	04:51	19:36	20:18	21:13
58°	02:57	03:59	04:44	19:43	20:28	21:28
S 60°	02:37	03:47	04:36	19:50	20:39	21:47

Lat.		Moonris	е		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	06:31			02:24		
N 70°	07:11			01:46		
68°	07:39	06:39		01:20	04:09	
66°	08:01	07:30		01:00	03:18	
64°	08:18	08:03	07:32	00:44	02:47	05:09
62°	08:32	08:27	08:21	00:31	02:24	04:21
60°	08:44	08:46	08:52	00:20	02:05	03:51
N 58°	08:55	09:02	09:15	00:11	01:50	03:28
56°	09:04	09:16	09:34	00:03	01:37	03:09
54°	09:12	09:28	09:50		01:26	02:54
52°	09:20	09:39	10:04		01:16	02:40
50°	09:26	09:48	10:16		01:07	02:29
45°	09:41	10:08	10:42		00:49	02:04
N 40°	09:53	10:24	11:02		00:33	01:45
35°	10:03	10:38	11:19		00:21	01:29
30°	10:12	10:50	11:33		00:10	01:15
20°	10:28	11:11	11:58	23:51	•• ••	00:51
N 10°	10:41	11:29	12:20	23:34		00:31
0°	10:54	11:47	12:40	23:19		00:12
S 10°	11:08	12:04	13:01	23:04	23:53	
20°	11:22	12:22	13:23	22:48	23:33	
30°	11:38	12:44	13:48	22:29	23:10	23:56
35°	11:48	12:57	14:04	22:19	22:56	23:40
40°	11:59	13:11	14:21	22:06	22:41	23:22
45°	12:11	13:29	14:43	21:52	22:22	23:00
S 50°	12:27	13:51	15:10	21:34	21:59	22:32
52°	12:35	14:01	15:23	21:26	21:48	22:18
54°	12:43	14:13	15:38	21:17	21:36	22:03
56°	12:53	14:27	15:56	21:07	21:21	21:44
58°	13:03	14:43	16:18	20:55	21:05	21:22
S 60°	13:16	15:02	16:47	20:42	20:45	20:53

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	33-54%	
15	14:08	14:07	12:14	17:07	04:41		
16	14:06	14:04	12:14	17:59	05:33		
17	14:02	14:00	12:14	18:54	06:26		

February 18, 19, 20 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	147°27.76	203°31.72 \$19°58.63	201°15.44 \$20°17.18	110°8.19 N13°43.00	166°45.95 \$09°53.80	
1	$162^{\circ}30.22$	218° 30.95 58.06	216°15.90 16.75	125°10.30 43.12	181°48.12 53.69	Alpheratz 357°35.84 29°13.38 Ankaa 353°8.18 -42°10.73
2	177°32.69	233°30.18 57.48	231°16.37 16.31	140°12.41 43.25	196°50.30 53.58	Ankaa 353°8.18 -42°10.73 Schedar 349°32.33 56°40.28
3	192°35.15	248°29.41 · · 56.90	246°16.83 · · 15.88	155°14.52 · · 43.37	211°52.48 · · 53.46	Diphda 348°48.26 -17°51.45
4	207°37.62	263°28.64 56.33	261°17.30 15.44	170°16.63 43.50	226° 54.66 53.35	Achernar 335°21.02 -57°7.15
5 6	222° 40.08 237° 42.54	278° 27.87 55.75 293° 27.10 \$19° 55.17	276°17.76 15.01 291°18.23 \$20°14.57	185°18.74 43.63 200°20.85 N13°43.75	241°56.84 53.24 256°59.02 \$09°53.13	Hamal 327°52.18 23°34.59
7	252° 45.01	308°26.33 54.59	306°18.69 14.14	215°22.96 43.88	272°1.20 53.01	Polaris 314°29.84 89°22.26
8	267° 47.47	323°25.56 54.01	321°19.16 13.70	230°25.07 44.00	287°3.38 52.90	Acamar 315°12.40 -40°12.75
9	282°49.94	338°24.80 · · 53.42	336°19.63 · · 13.26	245°27.18 · · 44.13	302°5.56 · · 52.79	Menkar 314° 6.97 4° 10.97 Mirfak 308° 29.36 49° 56.97
10	297°52.40	353°24.03 52.84	351°20.09 12.82	260°29.29 44.25	317°7.74 52.67	Aldebaran 290°40.39 16°33.46
11	312°54.87 327°57.33	8°23.26 52.26	6°20.56 12.39	275°31.40 44.38	332°9.91 52.56 347°12.09 \$09°52.45	Rigel 281°4.45 -8°10.55
12 13	342° 59.79	23°22.49 \$19°51.67 38°21.73 51.08	21°21.02 \$20°11.95 36°21.49 11.51	290°33.50 N13°44.50 305°35.61 44.63	347°12.09 \$09°52.45 2°14.27 52.34	Capella 280°22.79 46°1.46
14	358°2.26	53°20.96 50.50	51°21.96 11.07	320°37.72 44.76	17°16.45 52.22	Bellatrix 278°23.53 6°22.23
15	13°4.72	68°20.20 · · 49.91	66°22.42 · · 10.63	335°39.83 · · 44.88	32°18.63 · · 52.11	Elnath 278°2.64 28°37.71
16	28°7.19	83°19.43 49.32	81°22.89 10.19	350°41.93 45.01	47°20.81 52.00	Alnilam 275°38.32 -1°11.28 Betelgeuse 270°52.70 7°24.64
17	43°9.65	98°18.67 48.73	96°23.36 9.75	5°44.04 45.13	62°22.99 51.89	Canopus 263°52.39 -52°42.70
18	58° 12.11	113°17.90 S19°48.14	111°23.83	20°46.15 N13°45.26	77°25.17 S09°51.77	Sirius 258°26.65 -16°45.09
19 20	73° 14.58 88° 17.04	128°17.14 47.54 143°16.37 46.95	126°24.29 8.87 141°24.76 8.43	35°48.25 45.39 50°50.36 45.51	92°27.35 51.66 107°29.52 51.55	Adhara 255°6.17 -29°0.44
21	103° 19.51	158°15.61 · · 46.36	156°25.23 · · 7.99	65°52.47 · · 45.64	122°31.70 · · 51.43	Procyon 244°51.33 5°9.72
22	118°21.97	173°14.85 45.76	171°25.70 7.55	80°54.57 45.76	137°33.88 51.32	Pollux 243°17.88 27°58.07
23	133°24.44	188°14.09 45.16	186°26.16 7.10	95°56.68 45.89	152° 36.06 51.21	Avior 234°14.47 -59°35.29 Suhail 222°46.43 -43°31.86
Merr	pass. 14:08	ν-0.8' d-0.6' m-3.89	ν0.5' d-0.4' m1.29	ν2.1' d0.1' m-2.24	ν2.2' d-0.1' m0.98	Miaplacidus 221°37.56 -69°48.98
		- 0.0 u-0.0 III-3.09	ν σ.σ α-σ.π III1.23	ν Δ.1 UU.1 III-Δ.Δ 4	ν Δ.Δ. U-U.1 IIIU.90	Alphard 217°48.15 -8°45.87
	CIIA	CUA D	CUA D	CUA D	CIIA D	Regulus 207°34.89 11°50.87
Mon 0	GHA 148° 26.90	GHA Dec 203°13.32 \$19°44.57	GHA Dec 201°26.63 \$20°6.66	GHA Dec 110°58.78 N13°46.02	GHA Dec 167°38.24 \$09°51.10	Dubhe 193°41.22 61°37.13
1	163°29.36	218°12.56 43.97	216°27.10 6.22	126°0.89 46.14	182°40.42 50.98	Denebola 182°25.40 14°26.10
2	178° 31.83	233°11.80 43.37	231°27.57 5.78	141°2.99 46.27	197°42.60 50.87	Gienah 175°44.08 -17°40.58
3	193°34.29	248°11.04 · · 42.77	246°28.04 · · 5.33	156°5.10 · · 46.40	212°44.78 · · 50.76	Acrux 173°0.42 -63°13.81 Gacrux 171°52.05 -57°14.76
4	208°36.76	263°10.28 42.17	261°28.51 4.89	171°7.20 46.52	227°46.95 50.64	Alioth 166°13.18 55°49.48
5	223°39.22	278° 9.52 41.56	276°28.98 4.44	186°9.31 46.65	242°49.13 50.53	Spica 158°22.88 -11°17.29
6 7	238° 41.68 253° 44.15	293°8.76 S19°40.96 308°8.00 40.36	291°29.44 \$20°4.00 306°29.91 3.55	201°11.41 N13°46.78 216°13.51 46.90	257°51.31 S09°50.42 272°53.49 50.31	Alkaid 152°52.31 49°11.27
8	268° 46.61	308°8.00 40.36 323°7.24 39.75	306°29.91 3.55 321°30.38 3.11	216°13.51 46.90 231°15.62 47.03	272°53.49 50.31 287°55.67 50.19	Hadar 148°36.79 -60°29.15
9	283° 49.08	338°6.49 · · 39.14	336°30.85 · · 2.66	246°17.72 · · 47.16	302°57.85 · · 50.08	Menkent 147°58.32 -36°29.23
10	298°51.54	353°5.73 38.54	351°31.32 2.22	261°19.82 47.28	318°0.03 49.97	Arcturus 145°48.44 19°3.19 Rigil Kent. 139°41.12 -60°55.88
11	$313^{\circ}54.01$	8°4.97 37.93	6°31.79 1.77	276°21.93 47.41	333°2.20 49.85	Kochab 137°19.43 74°2.99
12	328° 56.47	23°4.21 \$19°37.32	21°32.26 \$20°1.32	291°24.03 N13°47.54	348°4.38 S09°49.74	Zuben'ubi 136°56.75 -16°8.55
13	343°58.93	38°3.46 36.71	36°32.73 0.87	306°26.13 47.67	3°6.56 49.63	Alphecca 126°4.33 26°37.73
14 15	359°1.40 14°3.86	53°2.70 36.10 68°1.94 · · 35.48	51°33.20 0.43 66°33.67 19°59.98	321°28.23 47.79 336°30.34 •• 47.92	18°8.74 49.52 33°10.92 •• 49.40	Antares 112°16.80 -26°29.10
16	29°6.33	83°1.19 34.87	81°34.14 19°59.53	351°32.44 48.05	48°13.10 49.29	Atria 107°11.87 -69°3.98
17	44°8.79	98°0.43 34.26	96°34.61 59.08	6°34.54 48.18	63°15.28 49.18	Sabik 102°3.74 -15°45.33 Shaula 96°11.54 -37°7.20
18	59°11.25	112°59.68 S 19°33.64	111°35.08 \$19°58.63	21°36.64 N13°48.30	78°17.45 S 09°49.06	Shaula 96°11.54 -37°7.20 Rasalhague 95°59.37 12°32.33
19	74° 13.72	127°58.93 33.02	126°35.55 58.18	36°38.74 48.43	93° 19.63 48.95	Eltanin 90°42.79 51°28.78
20	89° 16.18	142°58.17 32.41	141°36.03 57.73	51°40.84 48.56	108°21.81 48.84	Kaus Aust. 83°33.72 -34°22.36
21 22	104° 18.65 119° 21.11	157°57.42 · · 31.79 172°56.67 31.17	156°36.50 · · 57.28 171°36.97 56.83	66°42.94 · · 48.69 81°45.04 48.81	123°23.99 · · 48.73 138°26.17 48.61	Vega 80°33.99 38°48.05
23	134° 23.58	187°55.91 30.55	186°37.44 56.38	96°47.14 48.94	153° 28.35 48.50	Nunki 75°48.92 -26°16.03
						Altair 62°0.95 8°55.73
Mer.p	pass. 14:04	ν-0.8' d-0.6' m-3.89	ν0.5' d-0.4' m1.29	ν2.1' d0.1' m-2.24	ν2.2' d-0.1' m0.98	Peacock 53°7.40 -56°39.43 Deneb 49°26.75 45°21.77
						Enif 33°39.84 9°58.98
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°34.27 -46°50.78
0 1	149° 26.04 164° 28.50	202°55.16 \$19°29.93 217°54.41 29.30	201°37.91 \$19°55.93 216°38.38 55.48	111°49.24 N13°49.07 126°51.34 49.20	168°30.52 \$09°48.39 183°32.70 48.27	Fomalhaut 15°15.66 -29°29.85
2	104 26.50 179°30.97	217°54.41 29.30 232°53.66 28.68	231°38.86 55.02	126°51.34 49.20 141°53.44 49.32	183°32.70 48.27 198°34.88 48.16	Scheat 13°46.27 28°12.73
3	194° 33.43	247°52.91 · · 28.06	246°39.33 · · 54.57	156°55.54 · · 49.45	213°37.06 · · 48.05	Markab 13°30.94 15°19.99
4	209°35.90	262°52.16 27.43	261°39.80 54.12	171°57.64 49.58	228°39.24 47.94	Feb 18 Sun SHA Mer.pass
5	224°38.36	277°51.41 26.80	276°40.27 53.67	186°59.74 49.71	243°41.42 47.82	Venus 56° 3.96 10:26
6	239° 40.83	292°50.66 \$19°26.18	291°40.74 \$19°53.21	202°1.84 N13°49.84	258°43.59 S09°47.71	Mars 53°47.68 10:35
7	254° 43.29	307°49.91 25.55	306°41.22 52.76	217°3.93 49.97	273°45.77 47.60	Jupiter 322°40.43 16:37 Saturn 19°18.19 12:51
8 9	269° 45.75 284° 48.22	322°49.16 24.92 337°48.41 •• 24.29	321°41.69 52.30 336°42.16 •• 51.85	232°6.03 50.09 247°8.13 • 50.22	288°47.95 47.48 303°50.13 • 47.37	
10	299°50.68	352°47.66 23.66	351°42.64 51.39	262°10.23 50.35	318° 52.31 47.26	Feb 19 Mon SHA Mer.pass
11	314°53.15	7°46.92 23.03	6°43.11 50.94	277°12.33 50.48	333° 54.49 47.14	Venus 54°46.42 10:28
12	329°55.61	22°46.17 \$19°22.39	21°43.58 S 19°50.48	292°14.42 N13°50.61	348°56.66 S09°47.03	Mars 52°59.73 10:34 Jupiter 322°31.88 16:34
13	344°58.07	37°45.42 21.76	36°44.06 50.03	307°16.52 50.74	3°58.84 46.92	Saturn 19°11.34 12:48
14 15	0°0.54 15°3.00	52°44.68 21.12 67°43.93 · · 20.49	51°44.53 49.57 66°45.00 •• 49.11	322°18.62 50.86 337°20.71 · · 50.99	19°1.02 46.81 34°3.20 • 46.69	
15 16	30°5.47	82°43.18 19.85	81°45.48 48.66	352°22.81 51.12	49°5.38 46.58	Feb 20 Tue SHA Mer.pass Venus 53°29.12 10:29
17	45°7.93	97°42.44 19.21	96°45.95 48.20	7°24.90 51.25	64°7.56 46.47	Mars 52°11.87 10:33
18	60° 10.39	112°41.69 \$19°18.57	111°46.43 \$19°47.74	22°27.00 N13°51.38	79°9.73 S09°46.35	Jupiter 322°23.20 16:30
19	75° 12.86	127° 40.95 17.93	126°46.90 47.28	37°29.10 51.51	94°11.91 46.24	Saturn 19°4.49 12:44
20	90°15.32	142°40.21 17.29	141°47.38 46.82	52°31.19 51.64	109°14.09 46.13	Horizontal parallax
21 22	105° 17.79 120° 20.25	157°39.46 · · 16.65 172°38.72 16.01	156°47.85 · · 46.36 171°48.33 45.90	67°33.29 · · 51.77 82°35.38 51.90	124°16.27 · · 46.01 139°18.45 45.90	Venus: 0.1
23	120 20.25 135°22.72	187° 37.98 15.36	186°48.80 45.44	97°37.48 52.02	154°20.62 45.79	Mars: 0.1
ivier.p	pass. 14:00	ν-0.8′ d-0.6′ m-3.89	ν0.5′ d-0.5′ m1.29	ν2.1' d0.1' m-2.23	ν2.2' d-0.1' m0.98	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.50	S11°53.18	73°47.80	7.8'	$N27^{\circ}0.16$	5.0'	56.5'
1	191°30.54	52.30	88°14.59	7.8'	27°5.18 27°10.05	4.9'	56.4
2	206°30.59 221°30.64	51.42 •• 50.55	102°41.37 117°8.13	7.8' 7.7'	27°10.05 27°14.77	4.7' 4.6'	56.4' 56.4'
4	236°30.69	49.67	131°34.87	7.7'	27°19.32	4.4'	56.3'
5	251°30.74	48.79	146°1.60	7.7'	27°23.72	4.2'	56.3'
6 7	266°30.78 281°30.83	S11°47.91 47.03	160°28.32 174°55.03	7.7' 7.7'	N27°27.97 27°32.06	4.1' 3.9'	56.3' 56.3'
8	296°30.88	46.15	189°21.73	7.7'	27°35.99	3.8'	56.2
9	311°30.93	• • 45.27	203°48.42	7.7'	27°39.77	3.6'	56.2'
10	326°30.98	44.39 43.51	218°15.10	7.7'	27°43.39	3.5'	56.2' 56.1'
11 12	341°31.03 356°31.08	43.51 \$11°42.63	232°41.78 247°8.46	7.7' 7.7'	27°46.85 N27°50.15	3.3' 3.1'	56.1
13	11°31.13	41.75	261°35.13	7.7'	27°53.30	3.0'	56.1'
14	26°31.18	40.86	276°1.80	7.7'	27°56.29	2.8'	56.1'
15 16	41°31.23 56°31.29	· · 39.98 39.10	290°28.47 304°55.14	7.7' 7.7'	27°59.13 28°1.81	2.7' 2.5'	56.0' 56.0'
17	71°31.34	38.22	319°21.82	7.7'	28°4.33	2.4	56.0'
18	86°31.39	S11°37.33	333°48.50	7.7'	N28°6.69	2.2'	56.0'
19	101°31.44 116°31.50	36.45	348°15.19 2°41.88	7.7'	28°8.90 28°10.95	2.0'	55.9'
20 21	116°31.50 131°31.55	35.57 •• 34.68	2°41.88 17°8.58	7.7' 7.7'	28° 10.95 28° 12.84	1.9' 1.7'	55.9' 55.9'
22	146°31.60	33.80	31°35.29	7.7'	28°14.58	1.6'	55.9'
23	161°31.66	32.91	46°2.02	7.7'	28°16.16	1.4'	55.8'
	SD = 16.2'	d = -0.9'		SD	= 15.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	176°31.71	S11°32.03	60°28.76	7.8'	N28°17.58	1.3'	55.8'
1	191°31.76	31.14	74°55.51	7.8'	28°18.85	1.1'	55.8'
2	206°31.82 221°31.87	30.26 •• 29.37	89°22.28 103°49.06	7.8' 7.8'	28°19.96 28°20.91	1.0' 0.8'	55.8' 55.7'
3 4	236°31.93	28.49	103 49.00 118°15.87	7.8'	28°21.71	0.6	55.7'
5	251°31.98	27.60	132°42.70	7.8'	28°22.36	0.5'	55.7'
6	266°32.04	S11°26.71	147° 9.54	7.9'	N28°22.85	0.3'	55.7'
7 8	281°32.10 296°32.15	25.83 24.94	161°36.42 176°3.31	7.9' 7.9'	28°23.18 28°23.36	0.2' 0.0'	55.6' 55.6'
9	311°32.21	• • 24.05	190°30.24	8.0'	28°23.39	-0.1	55.6'
10	326°32.27	23.16	204°57.19	8.0'	28°23.26	-0.3'	55.6'
11	341°32.32 356°32.38	22.27 \$11°21.39	219°24.17 233°51.18	8.0' 8.0'	28°22.98 N28°22.55	-0.4'	55.5'
12 13	356 32.38 11°32.44	20.50	233°51.18 248°18.23	8.0	28°21.96	-0.6' -0.7'	55.5' 55.5'
14	26°32.50	19.61	262°45.30	8.1'	28°21.22	-0.9'	55.5'
15	41°32.56	• • 18.72	277°12.42	8.1'	28°20.34	-1.0'	55.4'
16 17	56°32.61 71°32.67	17.83 16.94	291°39.57 306°6.75	8.2' 8.2'	28°19.29 28°18.10	-1.2' -1.3'	55.4' 55.4'
18	86°32.73	S11°16.05	320° 33.98	8.3'	N28°16.76	-1.5'	55.4
19	101°32.79	15.16	$335^{\circ}1.25$	8.3'	$28^{\circ}15.27$	-1.6'	55.4'
20	116°32.85	14.27	349°28.56	8.4' 8.4'	28°13.63 28°11.84		55.3'
21 22	131°32.91 146°32.97	· · 13.38 12.48	3°55.91 18°23.31	8.4 8.4'	28°11.84 28°9.90	-1.9' -2.1'	55.3' 55.3'
23	161°33.03	11.59	32°50.75	8.5'	28°7.81	-2.2'	55.3'
	SD = 16.2'	d = -0.9'		SD	= 15.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	176°33.09	S11°10.70	47°18.24	8.5'	N28°5.58	-2.4'	55.3'
1	191°33.16	9.81	61°45.78	8.6'	28°3.20	-2.5'	55.2'
2	206°33.22 221°33.28	8.91 •• 8.02	76°13.37 90°41.01	8.6' 8.7'	28°0.68 27°58.01	-2.7' -2.8'	55.2' 55.2'
4	221 33.28 236°33.34	7.13	90 41.01 105°8.70	8.7' 8.7'	27°55.20	-2.8 -3.0'	55.2'
5	251°33.41	6.23	119°36.44	8.8'	27°52.24	-3.1'	55.1'
6	266°33.47 281°33.53	S11°5.34 4.45	134° 4.24 148° 32.10	8.9' 8.9'	N27°49.14 27°45.90	-3.2' -3.4'	55.1' 55.1'
7 8	281°33.53 296°33.59	4.45 3.55	148°32.10 163°0.01	8.9° 9.0'	27°45.90 27°42.51	-3.4° -3.5'	55.1' 55.1'
9	311°33.66	• • 2.66	177°27.98	9.0'	27°38.99	-3.7'	55.1'
10	326°33.72	1.76	191°56.01	9.1'	27°35.32	-3.8'	55.1'
11 12	341°33.79 356°33.85	0.87 \$10°59.97	206°24.09 220°52.24	9.1' 9.2'	27°31.52 N27°27.58	-3.9' -4.1'	55.0' 55.0'
13	11°33.92	10°59.97	235°20.46	9.2	27°23.50	-4.1 -4.2'	55.0'
14	26°33.98	58.18	249°48.73	9.3'	$27^{\circ}19.28$	-4.4'	55.0'
15 16	41°34.05 56°34.11	· · 57.28 56.38	264°17.07 278°45.47	9.4' 9.5'	27°14.93 27°10.44	-4.5' -4.6'	55.0' 54.9'
16 17	56°34.11 71°34.18	56.38 55.49	278°45.47 293°13.94	9.5° 9.5'	27°10.44 27°5.81	-4.6' -4.8'	54.9'
18	86°34.25	S10°54.59	307°42.47	9.6'	N27°1.06	-4.9'	54.9'
19	101°34.31	53.69	322°11.08	9.7'	26°56.17	-5.0'	54.9'
20 21	116°34.38 131°34.45	52.79 •• 51.89	336°39.75 351°8.49	9.7' 9.8'	26°51.14 26°45.99	-5.2' -5.3'	54.9' 54.9'
22	146°34.51	51.00	5°37.30	9.9'	26°40.71	-5.4'	54.8'
23	161°34.58	50.10	20°6.18	10.0'	26°35.30	-5.5'	54.8'
	SD = 16.2'	d = -0.9'		SD	= 15.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:59	07:18	08:34	15:56	17:11	18:31
N 70°	05:59	07:10	08:17	16:12	17:19	18:30
68°	05:59	07:04	08:03	16:26	17:26	18:31
66°	05:59	06:58	07:52	16:37	17:31	18:31
64°	05:58	06:53	07:43	16:46	17:36	18:31
62°	05:58	06:49	07:35	16:53	17:40	18:31
60°	05:57	06:45	07:29	17:00	17:43	18:32
N 58°	05:56	06:42	07:23	17:06	17:47	18:32
56°	05:56	06:39	07:17	17:11	17:50	18:33
54°	05:55	06:36	07:12	17:16	17:52	18:34
52°	05:54	06:34	07:08	17:20	17:55	18:34
50°	05:54	06:31	07:04	17:24	17:57	18:35
45°	05:51	06:26	06:56	17:33	18:03	18:37
N 40°	05:49	06:21	06:48	17:40	18:07	18:39
35°	05:47	06:17	06:42	17:46	18:12	18:41
30°	05:44	06:12	06:37	17:51	18:16	18:44
20°	05:39	06:05	06:27	18:01	18:23	18:49
N 10°	05:32	05:57	06:19	18:09	18:31	18:55
0°	05:25	05:49	06:10	18:17	18:38	19:03
S 10°	05:16	05:41	06:02	18:25	18:47	19:12
20°	05:04	05:31	05:53	18:34	18:57	19:23
30°	04:49	05:18	05:43	18:44	19:09	19:38
35°	04:39	05:11	05:37	18:50	19:16	19:48
40°	04:28	05:02	05:30	18:57	19:25	19:59
45°	04:13	04:51	05:22	19:05	19:36	20:13
S 50°	03:54	04:38	05:13	19:14	19:49	20:32
52°	03:45	04:31	05:08	19:19	19:55	20:41
54°	03:35	04:24	05:03	19:23	20:02	20:51
56°	03:22	04:16	04:58	19:29	20:10	21:03
58°	03:08	04:07	04:51	19:35	20:19	21:17
S 60°	02:50	03:56	04:44	19:42	20:29	21:34

Lat.		Moonris	е		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°						
64°						
62°	08:10		10:00	06:27		08:26
60°	09:06	09:45	10:58	05:31	06:48	07:27
N 58°	09:39	10:23	11:31	04:58	06:09	06:54
56°	10:04	10:51	11:56	04:34	05:42	06:29
54°	10:24	11:12	12:16	04:14	05:21	06:09
52°	10:40	11:30	12:32	03:58	05:03	05:52
50°	10:55	11:45	12:46	03:44	04:48	05:38
45°	11:24	12:15	13:15	03:15	04:17	05:09
N 40°	11:47	12:39	13:38	02:53	03:54	04:46
35°	12:05	12:59	13:56	02:34	03:34	04:27
30°	12:22	13:15	14:12	02:18	03:17	04:10
20°	12:49	13:44	14:39	01:51	02:49	03:43
N 10°	13:13	14:08	15:03	01:28	02:25	03:19
0°	13:35	14:31	15:24	01:07	02:02	02:57
S 10°	13:58	14:53	15:46	00:45	01:39	02:34
20°	14:22	15:18	16:09	00:22	01:15	02:10
30°	14:50	15:46	16:36		00:47	01:42
35°	15:06	16:03	16:51		00:30	01:26
40°	15:26	16:22	17:10		00:10	01:06
45°	15:49	16:46	17:32	23:47	•• ••	00:43
S 50°	16:20	17:17	18:00	23:16		00:12
52°	16:35	17:32	18:13	23:01	23:57	
54°	16:52	17:50	18:29	22:43	23:40	
56°	17:14	18:11	18:48	22:22	23:18	
58°	17:41	18:38	19:10	21:55	22:51	
S 60°	18:19	19:17	19:40	21:16	22:12	23:40

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-82%	
18	13:58	13:56	12:14	19:49	07:21		
19	13:53	13:50	12:14	20:44	08:16		
20	13:48	13:45	12:14	21:37	09:11		

February 21, 22, 23 UT (Wed., Thu., Fri.)

h	Aries	Venus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA De	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	150°25.18	202°37.24 \$19°1		S19°44.98	112°39.57	N13°52.15	169°22.80	S09°45.67	A lash a water	357°35.84	29° 13.38
1	$165^{\circ}27.64$		4.07 216°49.75	44.52	127°41.66	52.28	184°24.98	45.56	Alpheratz Ankaa	353°8.18	-42° 10.72
2	180°30.11		3.43 231°50.23	44.06	142°43.76	52.41	199°27.16	45.45	Schedar	349° 32.34	56° 40.27
3 4	195° 32.57 210° 35.04	247°35.01 · · 1: 262°34.27 1:	2.78 246°50.70 2.13 261°51.18	· · 43.60 43.14	157°45.85 172°47.94	• • 52.54 52.67	214°29.34 229°31.51	•• 45.34 45.22	Diphda	348°48.26	$-17^{\circ}51.45$
5	210 35.04 225°37.50		2.13 201 51.16 1.48 276°51.65	43.14	172 47.94 187°50.04	52.80	244° 33.69	45.22 45.11	Achernar	335°21.03	-57°7.13
6	240°39.96	292°32.79 \$19°1		S19°42.21	202°52.13	N13°52.93	259°35.87	S09°45.00	Hamal	327°52.18	23°34.59
7	255° 42.43		0.18 306°52.61	41.75	217°54.22	53.06	274°38.05	44.88	Polaris Acamar	314°31.23 315°12.42	89°22.26 -40°12.74
8	270°44.89		9.53 321°53.08	41.29	232°56.32	53.19	289°40.23	44.77	Menkar	314°6.98	4° 10.97
9	285° 47.36	337°30.58 · · ·		• • 40.82	247°58.41	• • 53.32	304°42.40	• • 44.66	Mirfak	308°29.38	49°56.97
10 11	300° 49.82 315° 52.29		8.22 351°54.04 7.56 6°54.51	40.36 39.90	263°0.50 278°2.59	53.45 53.58	319°44.58 334°46.76	44.54 44.43	Aldebaran	290°40.40	$16^{\circ}33.46$
12	330°54.75	22°28.36 \$19°		\$19°39.43	293°4.68	N13°53.71	349°48.94	509°44.32	Rigel	281°4.45	-8° 10.55
13	345° 57.21		6.25 36°55.47	38.97	308°6.78	53.84	4°51.11	44.20	Capella	280°22.81 278°23.53	46°1.47 6°22.23
14	0°59.68		5.59 51°55.94	38.50	323°8.87	53.97	19°53.29	44.09	Bellatrix Elnath	278°2.64	28° 37.71
15	16°2.14	67°26.16 · · ·		• • 38.04	338°10.96	• • 54.10	34°55.47	• • 43.98	Alnilam	275°38.33	-1°11.28
16 17	31°4.61 46°7.07		4.27 81°56.90 3.61 96°57.38	37.57 37.10	353°13.05 8°15.14	54.23 54.36	49°57.65 64°59.83	43.87 43.75	Betelgeuse	270°52.71	$7^{\circ}24.64$
18	61°9.53	112°23.95 \$19°		\$19°36.64	23°17.23	N13° 54.49	80°2.00	509°43.64	Canopus	263°52.41	-52°42.71
19	76° 12.00		2.28 126°58.33	36.17	38°19.32	54.62	95°4.18	43.53	Sirius	258°26.66	-16°45.09
20	91°14.46		1.62 141°58.81	35.70	53°21.41	54.75	110°6.36	43.41	Adhara Procyon	255°6.18 244°51.33	-29°0.45 5°9.72
21	106° 16.93	157°21.75 · · ·		• • 35.23	68°23.50	• • 54.88	125°8.54	• • 43.30	Pollux	244 51.33 243° 17.88	27°58.08
22	121°19.39	172°21.02 19°		34.77	83°25.59	55.01	140° 10.72	43.19	Avior	234°14.48	-59°35.30
23	136°21.86	187°20.29 18°5		34.30	98°27.68	55.14	155° 12.89	43.07	Suhail	222°46.43	-43°31.88
Mer. _I	pass. 13:56	ν -0.7' d -0.6' m-3	$\nu 0.5' d-0$.5' m1.29	$\nu 2.1' \ d0.$	1′ m-2.23	ν 2.2′ d-0	$.1^\prime$ m 0.97	Miaplacidus	221°37.57	-69°49.00
									Alphard	217°48.15	-8°45.88
Thu	GHA	GHA De	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°34.88 193°41.20	11°50.87 61°37.14
0	151°24.32	202°19.56 \$18°5		S19°33.83	113°29.77	N13°55.27	170° 15.07	S09°42.96	Denebola	182° 25.38	14°26.10
1	166°26.78		8.28 217°1.20	33.36	128°31.85	55.40	185° 17.25	42.85	Gienah	175°44.06	-17°40.60
2	181°29.25 196°31.71	232°18.09 5 247°17.36 · · · 5	7.61 232°1.68 6.94 247°2.16	32.89 · · 32.42	143°33.94 158°36.03	55.53 •• 55.66	200°19.43 215°21.60	42.73 •• 42.62	Acrux	173°0.39	$-63^{\circ}13.83$
4	211°34.18		6.27 262°2.64	31.95	173° 38.12	55.79	230° 23.78	42.51	Gacrux	171°52.02	-57°14.78
5	226° 36.64		5.60 277°3.12	31.48	188°40.21	55.93	245°25.96	42.39	Alioth	166°13.15 158°22.86	55°49.49 -11°17.30
6	241°39.10	292°15.17 \$18°5	4.93 292°3.60	S19°31.01	203°42.30	N13°56.06	260°28.14	S09°42.28	Spica Alkaid	150° 52.80° 152° 52.28	49° 11.28
7	256°41.57		4.25 307° 4.08	30.54	218°44.38	56.19	275°30.31	42.17	Hadar	148°36.75	-60°29.16
8 9	271°44.03		3.58 322°4.56	30.06	233°46.47 248°48.56	56.32 • • 56.45	290°32.49 305°34.67	42.05	Menkent	$147^{\circ}58.29$	$-36^{\circ}29.24$
10	286° 46.50 301° 48.96		2.90 337°5.04 2.22 352°5.52	· · 29.59 29.12	263°50.64	• • 56.45 56.58	320° 36.85	•• 41.94 41.83	Arcturus	145°48.41	19°3.19
11	316°51.42		1.54 7°6.00	28.65	278°52.73	56.71	335°39.03	41.71	Rigil Kent.	139°41.08	-60°55.89
12	331°53.89	22°10.81 \$18°5		S19°28.17	293°54.82	N13°56.84	350°41.20	S09°41.60	Kochab Zuben'ubi	137°19.36 136°56.72	74°2.99 -16°8.56
13	$346^{\circ}56.35$		0.18 37°6.96	27.70	308°56.90	56.97	5°43.38	41.49	Alphecca	126°4.30	26°37.72
14	1°58.82		9.50 52°7.44	27.23	323°58.99	57.11	20°45.56	41.38	Antares	112° 16.77	-26°29.10
15 16	17°1.28 32°3.75	67°8.63 · · 4 82°7.91 4	8.82 67°7.92 8.14 82°8.40	•• 26.75	339°1.07 354°3.16	· · 57.24 57.37	35°47.74 50°49.91	· · 41.26 41.15	Atria	$107^{\circ}11.80$	-69°3.99
16 17	32 3.75 47°6.21		7.45 97°8.89	26.28 25.80	9°5.24	57.50	65° 52.09	41.15	Sabik	102°3.71	-15°45.34
18	62°8.67	112°6.46 \$18°4		S19°25.33	24°7.33	N13°57.63	80°54.27	S09°40.92	Shaula	96°11.50 95°59.34	-37°7.20 12°32.32
19	$77^{\circ}11.14$		6.08 127°9.85	24.85	39°9.41	57.76	95°56.45	40.81	Rasalhague Eltanin	95 59.34 90°42.76	51° 28.77
20	92° 13.60		5.40 142°10.33	24.37	54°11.50	57.89	110°58.62	40.70	Kaus Aust.		-34°22.35
21	107° 16.07	157°4.29 · · 4		• • 23.90	69°13.58	• • 58.03	126°0.80	• • 40.58	Vega	80°33.97	38°48.04
22 23	122° 18.53 137° 20.99		4.02 172°11.29 3.33 187°11.78	23.42 22.94	84°15.67 99°17.75	58.16 58.29	141°2.98 156°5.16	40.47 40.36	Nunki		-26° 16.03
						_			Altair	62°0.93	8°55.73
Mer. _I	pass. 13:52	ν -0.7′ d -0.7′ m-3	$0.88 \nu 0.5' \ d-0$.5′ m1.28	$\nu 2.1' d0.$	1′ m-2.22	$\nu^{2.2'} d-0$.1′ m0.97	Peacock Deneb	53°7.37 49°26.74	-56° 39.42 45° 21.76
									Enif	33°39.83	9°58.97
Fri	GHA	GHA De		Dec	GHA	Dec	GHA	Dec	Al Na'ir		-46° 50.77
0	152°23.46	202°2.12 \$18°4		S19°22.47	114°19.83	N13°58.42	171°7.33	S09°40.24	Fomalhaut	$15^{\circ}15.65$	-29°29.84
1 2	167° 25.92 182° 28.39		1.95 217°12.74 1.25 232°13.22	21.99 21.51	129°21.92 144°24.00	58.55 58.69	186°9.51 201°11.69	40.13 40.02	Scheat	13°46.26	28° 12.73
3	102 20.39 197°30.85	246°59.96 · · 4		•• 21.03	159°26.08	• 58.82	216° 13.87	• • 39.90	Markab	13°30.94	15° 19.98
4	212°33.31		9.87 262°14.19	20.55	174°28.17	58.95	231°16.04	39.79	Feb 21 Wed	SHA	Mer.pass
5	227°35.78	276°58.52	9.17 277°14.67	20.07	189°30.25	59.08	246°18.22	39.68	Venus	52°12.06	10:30
6	242°38.24	291°57.80 \$18°3		S19°19.59	204°32.33	N13°59.21	261°20.40	S09°39.56	Mars	51°24.10	10:32
7	257° 40.71		7.78 307°15.64	19.11	219°34.41	59.35	276°22.58	39.45	Jupiter Saturn	322°14.39 18°57.62	16:27
8 9	272° 43.17 287° 45.63	321°56.37 3°36°55.65 · · 3	7.08 322°16.12 6.38 337°16.61	18.63 •• 18.15	234°36.50 249°38.58	59.48 •• 59.61	291°24.75 306°26.93	39.34 •• 39.22	Saturn	10 57.02	12:41
10	302°48.10		5.68 352°17.09	17.67	264° 40.66	59.74	300 20.93 321°29.11	39.22	Feb 22 Thu	SHA	Mer.pass
11	317° 50.56		4.98 7°17.58	17.19	279°42.74	13°59.88	336° 31.28	39.00	Venus	50°55.24	10:31
12	332° 53.03	21°53.50 \$18°3		S 19°16.71	294°44.82	N14°0.01	351° 33.46	S 09°38.88	Mars Jupiter	50°36.40 322°5.45	10:32 16:24
13	347°55.49		3.58 37°18.54	16.23	309°46.90	0.14	6°35.64	38.77	Saturn	18° 50.75	12:37
14 15	2°57.96		2.87 52°19.03	15.74	324°48.98	0.27	21°37.82	38.66			
15 16	18°0.42 33°2.88	66°51.35 · · 3 81°50.64 3	2.17 67°19.51 1.46 82°20.00	· · 15.26 14.78	339°51.06 354°53.14	· · 0.41 0.54	36°39.99 51°42.17	· · 38.54 38.43	Feb 23 Fri Venus	SHA 49°38.66	Mer.pass 10:32
17	48°5.35		0.75 97°20.48	14.70	9°55.22	0.54	66° 44.35	38.32	Mars	49 38.00 49°48.80	10:32
18	63°7.81	111°49.21 S 18°3	0.05 112°20.97	S19°13.81	24°57.30	N14°0.80	81°46.53	S09°38.20		321°56.38	16:20
19	78° 10.28		9.34 127°21.45	13.32	39°59.38	0.94	96°48.70	38.09	Saturn	18°43.88	12:34
20	93°12.74		8.63 142°21.94	12.84	55°1.46	1.07	111°50.88	37.98	Horizon	ntal parallax	
21 22	108° 15.20 123° 17.67	156°47.08 · · · 2° 171°46.36 · · · 2°	7.92 157°22.42 7.21 172°22.91	· · 12.36 11.87	70°3.54 85°5.62	· · 1.20 1.34	126°53.06 141°55.24	· · 37.86 37.75	71011201	Venus:	0.1
23	138°20.13		6.50 187°23.40	11.38	100°7.70	1.34	141 55.24 156° 57.41	37.75		Mars:	0.1
ivier.	pass. 13:48	ν-0.7′ d-0.7′ m-3	$\frac{0.88}{0.000} = \frac{\nu 0.5' \ d-0}{0.0000}$.ɔ m1.2ŏ	ν2.1' α 0.	1′ m-2.22	ν2.2 a-0	.1′ m0.97			

	011010-	-0.0022 360		011 —	+09.1002	500	
h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°34.65	S10°49.20	34°35.13	10.0'	N26°29.75	-5.7'	54.8'
1	191°34.72	48.30	49°4.15 63°33.25	10.1'	26°24.09 26°18.29	-5.8'	54.8'
2	206°34.79 221°34.86	47.40 •• 46.50	78° 2.42	10.2' 10.2'	26° 18.29 26° 12.37	-5.9' -6.0'	54.8' 54.8'
4	236°34.93	45.60	92°31.66	10.2	26°6.33	-6.2'	54.6 54.7'
5	251°35.00	44.70	107° 0.98	10.4	26°0.16	-6.3'	54.7'
6	266°35.07	S10°43.80	121°30.37	10.5'	N25°53.86	-6.4	54.7'
7	281°35.14	42.89	135°59.84	10.5'	25°47.45	-6.5'	54.7'
8	296°35.21	41.99	150°29.38	10.6'	25°40.92	-6.7'	54.7'
9	311°35.28	• • 41.09	164°59.00	10.7'	25°34.26	-6.8'	54.7'
10	326°35.35	40.19	179°28.70	10.8'	25°27.49	-6.9'	54.6'
11 12	341°35.42 356°35.49	39.29 \$10°38.38	193°58.47 208°28.33	10.9' 10.9'	25°20.60 N25°13.59	-7.0' -7.1'	54.6' 54.6'
13	11°35.56	37.48	200 20.33 222°58.26	11.0'	25°6.46	-7.1 -7.2'	54.6'
14	26°35.63	36.58	237°28.26	11.1'	24°59.22	-7.4'	54.6'
15	41°35.71	• • 35.67	251°58.35	11.2'	24°51.87	-7.5'	54.6'
16	56°35.78	34.77	$266^{\circ}28.52$	11.2'	24°44.40	-7.6'	54.6'
17	71°35.85	33.87	280°58.76	11.3'	24°36.82	-7.7'	54.5'
18	86°35.93	S10°32.96	295°29.09	11.4'	N24°29.13	-7.8'	54.5'
19	101°36.00	32.06	309°59.49	11.5'	24°21.33	-7.9'	54.5'
20 21	116°36.07 131°36.15	31.15 · · 30.25	324°29.97 339°0.54	11.6' 11.6'	24°13.42 24°5.40	-8.0' -8.1'	54.5' 54.5'
21	131 36.15 146°36.22	29.34	353° 31.18	11.7	24 5.40 23°57.28	-8.1 -8.2'	54.5'
23	161°36.30	28.43	8°1.91	11.7	23°49.05	-8.3'	54.5'
	SD = 16.2'	d = -0.9'			D = 14.9'		
	3D = 10.2	<i>u</i> = -0.9		31	J = 14.9		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.37	S10°27.53	22°32.71	11.9'	N23°40.71	-8.4'	54.5'
1	191°36.45 206°36.52	26.62	37°3.59 51°34.56	12.0' 12.0'	23°32.28 23°23.73	-8.5'	54.4'
2	206°36.52 221°36.60	25.72 •• 24.81	51°34.56 66°5.60	12.1'	23° 23.73 23° 15.09	-8.6' -8.7'	54.4' 54.4'
4	236°36.67	23.90	80°36.73	12.1	23°6.34	-8.8'	54.4
5	251°36.75	22.99	95°7.93	12.3'	22°57.50	-8.9'	54.4'
6	266°36.83	S10°22.09	109°39.22	12.4'	N22°48.56	-9.0'	54.4'
7	281°36.90	21.18	124°10.58	12.4'	22°39.51	-9.1'	54.4'
8	296°36.98	20.27	138°42.03	12.5'	22°30.38	-9.2'	54.4'
9	311°37.06	• • 19.36	153°13.55	12.6'	22°21.14	-9.3'	54.3'
10	326°37.14 341°37.21	18.45	167°45.16 182°16.84	12.7' 12.8'	22°11.81 22°2.39	-9.4'	54.3' 54.3'
11 12	341 37.21 356°37.29	17.54 \$10°16.63	182 16.84 196°48.61	12.8'	N21°52.88	-9.5' -9.6'	54.3'
13	11°37.37	15.72	211°20.45	12.9'	21°43.27	-9.0' -9.7'	54.3'
14	26°37.45	14.81	225°52.37	13.0'	21°33.57	-9.8'	54.3'
15	41°37.53	• • 13.90	240°24.37	13.1'	21°23.79	-9.9'	54.3'
16	56°37.61	12.99	254°56.45	13.2'	$21^{\circ}13.91$	-10.0'	54.3'
17	71°37.69	12.08	269°28.60	13.2'	21°3.95	-10.0'	54.3'
18 19	86°37.77 101°37.85	\$10°11.17 10.26	284°0.83 298°33.14	13.3' 13.4'	N20°53.90 20°43.77	-10.1'	54.2' 54.2'
20	101 37.85 116°37.93	9.35	298 33.14 313°5.53	13.4	20 43.77 20°33.55	-10.2	54.2'
21	131°38.01	• • 8.44	313 3.33 327°37.99	13.5'	20°23.24	-10.3 -10.4'	54.2'
22	146°38.09	7.53	342°10.53	13.6'	20°12.86	-10.5'	54.2'
23	161°38.17	6.61	$356^{\circ}43.15$	13.7'	20°2.39	-10.5'	54.2'
	SD = 16.2'	d = -0.9'		SI	D = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°38.25 191°38.33	\$10°5.70	11°15.84	13.8'	N19°51.84 19°41.22	-10.6'	54.2' 54.2'
1 2	191°38.33 206°38.42	4.79 3.87	25°48.61 40°21.45	13.8' 13.9'	19°41.22 19°30.51	-10.7' -10.8'	54.2' 54.2'
3	200 38.42 221°38.50	2.96	54° 54.36	14.0'	19° 19.73	-10.6	54.2'
4	236°38.58	2.05	69°27.35	14.1'	19°8.87	-10.9	54.2'
5	251°38.66	1.13	84°0.41	14.1'	18°57.94	-11.0'	54.1'
6	266°38.75	\$10°0.22	98°33.54	14.2'	N18°46.93	-11.1'	54.1'
7	281°38.83	09°59.30	113°6.74	14.3'	18°35.85	-11.2'	54.1'
8	296°38.91	58.39	127°40.02	14.3'	18°24.69	-11.2'	54.1'
9 10	311°39.00 326°39.08	•• 57.47 56.56	142°13.37 156°46.78	14.4' 14.5'	18°13.46 18°2.17	-11.3' -11.4'	54.1' 54.1'
11	341°39.17	55.64	171°20.27	14.6'	16 2.17 17°50.80	-11.4'	54.1'
12	356°39.25	S09°54.73	185°53.82	14.6'	N17°39.37	-11.5'	54.1'
13	11°39.34	53.81	200°27.45	14.7'	17°27.86	-11.6'	54.1'
14	26°39.42	52.90	215°1.14	14.8'	17°16.29	-11.6'	54.1'
15	41°39.51	• • 51.98	229°34.90	14.8'	17°4.66	-11.7'	54.1'
16	56°39.59	51.06	244°8.72	14.9'	16°52.96	-11.8'	54.1'
17 18	71°39.68 86°39.77	50.15 \$09°49.23	258°42.61 273°16.57	15.0' 15.0'	16°41.19 N16°29.37	-11.8' -11.9'	54.1' 54.0'
18 19	101°39.85	48.31	273°16.57 287°50.59	15.0° 15.1'	16° 17.48	-11.9' -11.9'	54.0' 54.0'
20	116°39.94	47.39	302°24.67	15.1'	16°5.53	-12.0'	54.0'
21	131°40.03	• • 46.47	316°58.82	15.2'	15°53.52	-12.1'	54.0'
22	146°40.12	45.56	331°33.03	15.3'	15°41.45	-12.1'	54.0'
23	161°40.20	44.64	346°7.30	15.3'	15°29.32	-12.2'	54.0'
	SD = 16.2'	d = -0.9'		SI	O = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:46	07:04	08:17	16:12	17:25	18:44
N 70°	05:47	06:58	08:03	16:26	17:31	18:42
68°	05:48	06:52	07:51	16:38	17:36	18:41
66°	05:49	06:48	07:41	16:47	17:41	18:40
64°	05:49	06:44	07:33	16:55	17:44	18:40
62°	05:49	06:41	07:26	17:02	17:48	18:39
60°	05:49	06:37	07:20	17:08	17:51	18:39
N 58°	05:49	06:35	07:15	17:13	17:53	18:39
56°	05:49	06:32	07:10	17:18	17:56	18:39
54°	05:49	06:30	07:06	17:22	17:58	18:39
52°	05:49	06:28	07:02	17:26	18:00	18:39
50°	05:48	06:26	06:58	17:29	18:02	18:40
45°	05:47	06:21	06:51	17:37	18:07	18:41
N 40°	05:45	06:17	06:44	17:43	18:11	18:42
35°	05:44	06:13	06:39	17:49	18:14	18:44
30°	05:42	06:10	06:34	17:54	18:18	18:46
20°	05:37	06:03	06:25	18:02	18:24	18:50
N 10°	05:32	05:56	06:18	18:10	18:31	18:56
0°	05:25	05:49	06:10	18:17	18:38	19:02
S 10°	05:16	05:41	06:03	18:24	18:46	19:10
20°	05:06	05:32	05:55	18:32	18:55	19:21
30°	04:52	05:21	05:45	18:41	19:06	19:35
35°	04:43	05:14	05:40	18:47	19:13	19:44
40°	04:32	05:06	05:34	18:53	19:21	19:54
45°	04:18	04:56	05:26	19:00	19:30	20:08
S 50°	04:01	04:43	05:18	19:08	19:42	20:25
52°	03:52	04:37	05:14	19:12	19:48	20:33
54°	03:43	04:31	05:09	19:17	19:55	20:43
56°	03:31	04:24	05:04	19:21	20:02	20:53
58°	03:18	04:15	04:59	19:27	20:10	21:06
S 60°	03:02	04:05	04:52	19:33	20:19	21:22

Lat.		Moonris	e		Moonset	į.
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°			12:36			10:57
N 70°			13:46			09:45
68°		11:12	14:22		10:44	09:08
66°		12:41	14:47		09:14	08:41
64°	11:04	13:18	15:07	09:10	08:36	08:20
62°	11:58	13:45	15:23	08:15	08:09	08:03
60°	12:31	14:05	15:36	07:42	07:47	07:49
N 58°	12:55	14:22	15:47	07:18	07:30	07:37
56°	13:14	14:36	15:57	06:58	07:15	07:27
54°	13:30	14:48	16:06	06:41	07:03	07:17
52°	13:44	14:59	16:13	06:27	06:52	07:09
50°	13:56	15:08	16:20	06:15	06:42	07:01
45°	14:21	15:28	16:35	05:49	06:21	06:45
N 40°	14:40	15:44	16:47	05:29	06:04	06:32
35°	14:57	15:57	16:57	05:12	05:49	06:21
30°	15:11	16:09	17:06	04:57	05:37	06:11
20°	15:35	16:29	17:21	04:31	05:15	05:54
N 10°	15:56	16:46	17:35	04:10	04:56	05:39
0°	16:15	17:03	17:47	03:49	04:38	05:24
S 10°	16:34	17:19	17:59	03:28	04:21	05:10
20°	16:55	17:36	18:12	03:06	04:01	04:55
30°	17:18	17:55	18:27	02:41	03:39	04:37
35°	17:32	18:07	18:36	02:25	03:26	04:26
40°	17:48	18:20	18:46	02:07	03:11	04:15
45°	18:07	18:35	18:57	01:46	02:53	04:00
S 50°	18:31	18:54	19:11	01:19	02:30	03:43
52°	18:42	19:02	19:17	01:05	02:19	03:35
54°	18:55	19:12	19:24	00:50	02:07	03:25
56°	19:10	19:23	19:32	00:32	01:53	03:15
58°	19:27	19:36	19:41	00:09	01:36	03:03
S 60°	19:48	19:51	19:51		01:16	02:49

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	89-98%	
21	13:41	13:38	12:14	22:27	10:02		
22	13:35	13:31	12:14	23:14	10:51		
23	13:27	13:23	12:13	23:57	11:36		

February 24, 25, 26 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	153°22.60	201°44.94 \$18°25.78	202°23.88 S 19°10.90	115°9.78 N14°1.60	171°59.59	Alpheratz 357°35.85 29°13.37
1	168° 25.06	216°44.23 25.07	217°24.37 10.41	130°11.85 1.74	187°1.77 37.41	Ankaa 353°8.18 -42°10.71
2	183° 27.52	231°43.52 24.36	232°24.85 9.93	145°13.93 1.87	202°3.94 37.30	Schedar 349°32.36 56°40.26
3 4	198° 29.99 213° 32.45	246° 42.81 · · 23.64 261° 42.10 22.92	247°25.34 · · 9.44 262°25.83 8.95	160°16.01 · · 2.00 175°18.09 2.13	217°6.12 · · 37.18 232°8.30 37.07	Diphda 348°48.27 -17°51.44
5	228° 34.92	276°41.39 22.21	277°26.31 8.46	190°20.16 2.27	247°10.48 36.96	Achernar 335°21.05 -57°7.12
6	243°37.38	291°40.69 \$18°21.49	292°26.80 \$19°7.97	205°22.24 N14°2.40	262°12.65 S09°36.84	Hamal 327°52.20 23°34.58
7	258°39.84	306°39.98 20.77	307°27.29 7.49	220°24.32 2.54	277° 14.83 36.73	Polaris 314°32.81 89°22.26 Acamar 315°12.43 -40°12.74
8	273°42.31	321°39.27 20.05	322°27.78 7.00	235°26.39 2.67	292°17.01 36.62	Acamar 315°12.43 -40°12.74 Menkar 314°6.99 4°10.97
9	288° 44.77	336°38.56 · · 19.33	337°28.26 · · 6.51	250°28.47 · · 2.80	307° 19.19 · · 36.50	Mirfak 308°29.40 49°56.97
10	303°47.24	351°37.86 18.60	352°28.75 6.02	265°30.55 2.94	322°21.36 36.39	Aldebaran 290°40.41 16°33.46
11 12	318° 49.70 333° 52.16	6°37.15 17.88 21°36.45 \$18°17.16	7°29.24 5.53 22°29.73 \$19°5.04	280°32.62 3.07 295°34.70 N14°3.20	337°23.54 36.28 352°25.72 \$09°36.16	Rigel 281°4.47 -8°10.55
13	348° 54.63	36°35.74 16.43	37°30.21 4.55	310°36.77 3.34	7°27.89 36.05	Capella 280°22.83 46°1.47
14	3°57.09	51°35.04 15.71	52°30.70 4.06	325°38.85 3.47	22°30.07 35.94	Bellatrix 278°23.55 6°22.23
15	$18^{\circ}59.56$	66°34.33 · · 14.98	67°31.19 · · 3.57	340°40.92 · · 3.60	$37^{\circ}32.25 \cdot \cdot 35.82$	Elnath 278° 2.66 28° 37.72 Alnilam 275° 38.34 -1° 11.28
16	34°2.02	81°33.63 14.25	82°31.68 3.07	355°43.00 3.74	52°34.43 35.71	Betelgeuse 270°52.72 7°24.64
17	49°4.49	96°32.93 13.52	97°32.17 2.58	10°45.07 3.87	67°36.60 35.60	Canopus 263°52.43 -52°42.72
18 19	64°6.95 79°9.41	111°32.22 \$18°12.79 126°31.52 12.06	112°32.66 \$19°2.09 127°33.15 1.60	25°47.15 N14°4.01 40°49.22 4.14	82°38.78 S 09°35.48 97°40.96 35.37	Sirius 258°26.67 -16°45.10
20	94° 11.88	141°30.82 11.33	142°33.63 1.10	55°51.30 4.27	112°43.13 35.26	Adhara 255°6.19 -29°0.45
21	109° 14.34	156°30.12 · · 10.60	157°34.12 · · 0.61	70°53.37 · · 4.41	127°45.31 · · 35.14	Procyon 244°51.34 5°9.72
22	$124^{\circ}16.81$	171°29.42 9.87	$172^{\circ}34.61$ $19^{\circ}0.12$	85°55.44 4.54	142° 47.49 35.03	Pollux 243°17.89 27°58.08 Avior 234°14.50 -59°35.32
23	139° 19.27	186°28.72 9.13	187°35.10 18°59.62	100°57.52 4.68	157°49.67 34.92	Suhail 222°46.44 -43°31.89
Mer.	pass. 13:44	ν-0.7' d-0.7' m-3.88	ν0.5' d-0.5' m1.28	ν2.1' d0.1' m-2.21	ν2.2' d-0.1' m0.96	Miaplacidus 221°37.59 -69°49.01
						Alphard 217°48.15 -8°45.88
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.87 11°50.87
o 0	154° 21.73	201°28.02 \$18°8.40	202°35.59 \$18°59.13	115°59.59 N14°4.81	172°51.84 \$09°34.80	Dubhe 193°41.18 61°37.16
1	169° 24.20	216°27.32 7.66	217°36.08 58.63	131°1.66 4.95	187°54.02 34.69	Denebola 182°25.37 14°26.10
2	184°26.66	231°26.62 6.93	232°36.57 58.14	146°3.74 5.08	202°56.20 34.58	Gienah 175°44.05 -17°40.61 Acrux 173°0.37 -63°13.85
3	199°29.13	246°25.92 · · 6.19	247°37.06 · · 57.64	161°5.81 · · 5.21	217°58.37 · · 34.46	Gacrux 171°52.00 -57°14.80
4	214°31.59	261°25.22 5.45	262°37.55 57.15	176°7.88 5.35	233°0.55 34.35	Alioth 166°13.12 55°49.49
5	229° 34.05	276°24.52 4.71	277°38.04 56.65	191°9.95 5.48	248°2.73 34.24	Spica 158°22.84 -11°17.31
6 7	244° 36.52 259° 38.98	291°23.82 \$18°3.97 306°23.13 3.23	292°38.53 \$18°56.15 307°39.02 55.66	206°12.03 N14°5.62 221°14.10 5.75	263°4.90 S09°34.12 278°7.08 34.01	Alkaid 152°52.25 49°11.28
8	274°41.45	321°22.43 2.49	322°39.52 55.16	236°16.17 5.89	293°9.26 33.90	Hadar 148°36.72 -60°29.17
9	289°43.91	336°21.74 · · 1.74	337°40.01 · · 54.66	251°18.24 · · 6.02	308° 11.44 · · 33.78	Menkent 147°58.27 -36°29.25 Arcturus 145°48.39 19°3.18
10	304°46.37	351°21.04 1.00	352°40.50 54.16	266°20.31 6.16	323°13.61 33.67	Rigil Kent. 139°41.04 -60°55.90
11	319°48.84	6°20.34 18°0.26	7°40.99 53.67	281°22.38 6.29	338°15.79 33.56	Kochab 137°19.29 74°3.00
12	334°51.30	21°19.65 \$17°59.51	22°41.48 \$18°53.17	296°24.45 N14°6.43	353°17.97 S09°33.44	Zuben'ubi 136°56.70 -16°8.57
13 14	349°53.77 4°56.23	36°18.96 58.76 51°18.26 58.02	37°41.97 52.67 52°42.46 52.17	311°26.52 6.56 326°28.59 6.70	8°20.14 33.33 23°22.32 33.21	Alphecca 126°4.28 26°37.72
15	19° 58.69	66°17.57 · · 57.27	67°42.96 · · 51.67	341°30.66 · · 6.83	38°24.50 · · 33.10	Antares 112°16.74 -26°29.11
16	35°1.16	81°16.88 56.52	82°43.45 51.17	356°32.73 6.97	53°26.68 32.99	Atria 107°11.74 -69°3.99
17	50°3.62	96°16.18 55.77	97°43.94 50.67	11°34.80 7.10	68°28.85 32.87	Sabik 102°3.69 -15°45.34 Shaula 96°11.48 -37°7.21
18	65°6.09	111°15.49 \$17°55.02	112°44.43 \$18°50.17	26°36.87 N14°7.24	83°31.03 S 09°32.76	Rasalhague 95°59.32 12°32.32
19	80°8.55	126°14.80 54.27	127°44.93 49.67	41°38.94 7.37	98°33.21 32.65	Eltanin 90°42.73 51°28.76
20	95° 11.01 110° 13.48	141°14.11 53.51 156°13.42 · · 52.76	142°45.42 49.17 157°45.91 • 48.66	56°41.01 7.51 71°43.08 · · 7.64	113°35.38 32.53	Kaus Aust. 83°33.67 -34°22.35
21 22	110 13.46 125° 15.94	156°13.42 · · 52.76 171°12.73 52.01	157°45.91 · · 48.66 172°46.40 48.16	71°43.08 · · 7.64 86°45.15 7.78	128°37.56 · · 32.42 143°39.74 32.31	Vega 80°33.95 38°48.03
23	140° 18.41	186°12.04 51.25	187°46.90 47.66	101°47.22 7.91	158°41.91 32.19	Nunki 75°48.87 -26°16.03
						Altair 62°0.92 8°55.72 Peacock 53°7.34 -56°39.41
ivier.	pass. 13:40	ν-0.7' d-0.7' m-3.88	$\nu 0.5' \ d$ -0.5' m1.28	$\nu 2.1' \ d0.1' \ \text{m-}2.21$	ν2.2' d-0.1' m0.96	Peacock 53°7.34 -56°39.41 Deneb 49°26.73 45°21.75
						Enif 33°39.82 9°58.97
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°34.25 -46°50.76
0 1	155° 20.87 170° 23.33	201°11.35 \$17°50.49 216°10.66 49.74	202°47.39 \$18°47.16 217°47.89 46.65	116°49.28 N14°8.05 131°51.35 8.19	173°44.09 \$09°32.08 188°46.27 31.97	Fomalhaut 15°15.65 -29°29.83
2	170 25.33 185° 25.80	231°9.97 48.98	232°48.38 46.15	146°53.42 8.32	203°48.45 31.85	Scheat 13°46.26 28°12.72
3	200° 28.26	246°9.28 · · 48.22	247°48.87 · · 45.65	161°55.49 · · 8.46	218° 50.62 · · 31.74	Markab 13°30.94 15°19.98
4	215° 30.73	261°8.60 47.46	262°49.37 45.14	176°57.55 8.59	233°52.80 31.63	Feb 24 Sat SHA Mer.pass
5	230° 33.19	276°7.91 46.70	277°49.86 44.64	191°59.62 8.73	248°54.98 31.51	Venus 48°22.35 10:34
6	245° 35.65	291°7.22 \$17°45.94	292°50.36 \$18°44.13	207°1.69 N14°8.86	263°57.15 \$09°31.40	Mars 49°1.29 10:30 Jupiter 321°47.18 16:17
7 8	260° 38.12 275° 40.58	306°6.54 45.17 321°5.85 44.41	307°50.85 43.63 322°51.34 43.12	222°3.75 9.00 237°5.82 9.14	278°59.33 31.29 294°1.51 31.17	Jupiter 321°47.18 16:17 Saturn 18°36.99 12:30
9	275 40.56 290°43.05	336°5.17 · · 43.65	337°51.84 · · 42.62	257 5.82 9.14 252°7.89 · · 9.27	309°3.68 · · 31.06	
10	305° 45.51	351°4.48 42.88	352°52.33 42.11	267°9.95 9.41	324°5.86 30.95	Feb 25 Sun SHA Mer.pass
11	320°47.97	6°3.80 42.12	7°52.83 41.60	282°12.02 9.54	339°8.04 30.83	Venus 47°6.28 10:35 Mars 48°13.86 10:29
12	335° 50.44	21°3.11 \$17°41.35	22°53.32 \$18°41.10	297°14.08 N14°9.68	354°10.21 S09°30.72	Jupiter 321°37.86 16:14
13	350° 52.90	36°2.43 40.58	37°53.82 40.59	312°16.15 9.82	9°12.39 30.61	Saturn 18°30.11 12:27
14 15	5°55.37 20°57.83	51°1.75 39.81 66°1.06 · · 39.04	52°54.32 40.08 67°54.81 · · 39.57	327°18.21 9.95 342°20.28 •• 10.09	24°14.57 30.49 39°16.75 · · 30.38	
15 16	20 57.83 36°0.29	81°0.38 38.27	82°55.31 39.07	357°22.34 10.23	54°18.92 30.27	Feb 26 Mon SHA Mer.pass Venus 45°50.48 10:36
17	51°2.76	95°59.70 37.50	97°55.80 38.56	12°24.41 10.36	69°21.10 30.15	Mars 47°26.52 10:28
18	66°5.22	110°59.02 \$17°36.73	112°56.30 \$18°38.05	27°26.47 N14°10.50	84°23.28 S 09°30.04	Jupiter 321°28.41 16:10
19	81°7.69	125°58.34 35.96	127°56.80 37.54	42°28.54 10.63	99°25.45 29.93	Saturn 18°23.22 12:23
20	96° 10.15	140°57.66 35.18	142°57.29 37.03	57°30.60 10.77	114°27.63 29.81	Horizontal parallax
21 22	111° 12.62 126° 15.08	155°56.98 · · 34.41 170°56.30 33.63	157°57.79 · · · 36.52 172°58.29	72°32.66 ·· 10.91 87°34.73	129°29.81 · · 29.70 144°31.98 29.58	Venus: 0.1
23	120 15.08 141° 17.54	170 56.30 33.63 185°55.62 32.86	172 58.29 30.01 187°58.78 35.50	102°36.79 11.18	159° 34.16 29.47	Mars: 0.1
ivier.	pass. 13:36	ν-0.7' d-0.8' m-3.88	$\nu 0.5' \ d$ -0.5' m1.27	ν2.1' d0.1' m-2.20	ν2.2' d-0.1' m0.96	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	176°40.29	S09°43.72	0°41.63	15.4'	$N15^{\circ}17.14$	-12.2'	54.0
1	191°40.38	42.80	15° 16.02	15.5'	15°4.90	-12.3'	54.0
2	206°40.47	41.88	29°50.47	15.5'	14°52.60	-12.4'	54.0
3	221°40.56	• • 40.96	44°24.98	15.6'	14° 40.25	-12.4'	54.0
4	236°40.65	40.04	58° 59.55	15.6'	14°27.85	-12.5'	54.0
5	251°40.73	39.12	73°34.17	15.7'	14° 15.39	-12.5'	54.0
6	266°40.82	S09°38.20	88°8.85	15.7'	N14°2.88	-12.6'	54.0
7	281°40.91	37.28	102°43.59	15.8'	13°50.32	-12.6'	54.0
8	296°41.00	36.36	117° 18.38	15.8'	13°37.71	-12.7'	54.0
9	311°41.09 326°41.19	35.44	131°53.22	15.9'	13°25.05	-12.7'	54.0
10	326°41.19 341°41.28	34.52	146°28.12	15.9'	13° 12.34 12° 59.59	-12.8'	54.0 54.0
11	341 41.28 356°41.37	33.59 \$09°32.67	161°3.07 175°38.07	16.0'	N12°46.79	-12.8'	
12 13	11°41.46	31.75	175 38.07 190° 13.12	16.1' 16.1'	12° 33.94	-12.8' -12.9'	54.0 54.0
13 14	26°41.55	30.83	204° 48.23	16.2	12° 21.05	-12.9'	53.9
15	41°41.64	29.91	219°23.38	16.2	12°21.03	-13.0'	53.9
16	56°41.73	28.98	233°58.58	16.2'	11°55.14	-13.0'	53.9
17	71°41.83	28.06	248° 33.82	16.3	11°42.11	-13.1'	53.9
18	86°41.92	S09°27.14	263°9.11	16.3'	N11°29.05	-13.1'	53.9
19	101°42.01	26.21	277° 44.45	16.4	11° 15.95	-13.1'	53.9
20	116°42.11	25.29	292° 19.83	16.4	11°2.81	-13.2	53.9
21	131°42.20	24.36	306°55.26	16.5	10°49.63	-13.2'	53.9
22	146°42.29	23.44	321°30.73	16.5'	10°36.41	-13.3	53.9
23	161°42.39	22.52	336°6.24	16.6'	10° 23.15	-13.3'	53.9
			330 0.24			20.0	55.5
	SD = 16.2'	d = -0.9'		SI	D = 14.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°42.48	\$09°21.59	350°41.79	16.6'	N10°9.86	-13.3'	53.9
1	191°42.58	20.67	5°17.38	16.6'	09°56.53	-13.4'	53.9
2	206°42.67	19.74	19°53.01	16.7'	09°43.17	-13.4'	53.9
3	221°42.76 236°42.86	17.80	34°28.68 49°4.39	16.7'	09°29.77 09°16.34	-13.4'	53.9
4	236°42.86 251°42.96	17.89	49°4.39 63°40.13	16.7' 16.8'	09°16.34 09°2.88	-13.5'	53.9
5	251°42.96 266°43.05	16.96 \$09° 16.04	63° 40.13 78° 15.91	16.8'	09°2.88 N08°49.38	-13.5' -13.5'	53.9 53.9
6 7	266°43.05 281°43.15	15.11	78° 15.91 92° 51.73	16.8'	08° 35.86		
7 2	281°43.15 296°43.24	15.11 14.18	92°51.73 107°27.57	16.8'	08°35.86 08°22.31	-13.6' -13.6'	53.9 53.9
8 9	296°43.24 311°43.34	14.18	107°27.57 122°3.45	16.9'	08°22.31 08°8.72	-13.6' -13.6'	53.9
9 10	311 43.34 326°43.44	12.33	122° 3.45 136° 39.37	16.9	08°8.72 07°55.11	-13.6'	53.9
10	326°43.44 341°43.53	12.33 11.40	130° 39.37 151° 15.31	16.9	07°55.11 07°41.47	-13.6 -13.7'	53.9
12	341 43.53 356°43.63	11.40 S09° 10.47	151° 15.31 165° 51.28	17.0'	07°41.47 N07°27.81	-13.7'	53.9
13	350°43.63 11°43.73	9.55	165°51.28 180°27.28	17.0' 17.0'	07° 14.12	-13.7' -13.7'	53.9
14	26°43.83	9.55 8.62	180 27.28 195°3.31	17.0 17.1'	07 14.12 07°0.40	-13.7'	53.9
15	41°43.92	7.69	209° 39.37	17.1	06° 46.66	-13.8'	53.9
16	56°44.02	6.76	224° 15.45	17.1	06°32.90	-13.8'	53.9
17	71°44.12	5.83	238° 51.56	17.1	06°19.11	-13.8'	53.9
18	86°44.22	S09°4.90	253°27.70	17.2'	N06°5.30	-13.8'	53.9
19	101°44.32		268°3.85		05°51.47		
20	116°44.42	3.04	282°40.03	17.2'	05°37.62	-13.9'	53.9
21	131°44.52	2.11	297° 16.23	17.2'	05°23.75	-13.9'	53.9
22	146°44.62	1.18	311°52.45	17.2'	05°9.86	-13.9'	53.9
23	161°44.72	0.25	326°28.69	17.3'	04°55.95	-13.9'	53.9
	SD = 16.2'	d = -0.9'		SI	D = 14.7'		
∕lon ˈ	GHA	Dec	GHA	ν	Dec	d	НР
0	176°44.82	508°59.32	341°4.95	17.3'	N04°42.03	-13.9'	53.9
1	191°44.92	58.39	355°41.23	17.3'	04°28.09	-14.0'	53.9
2	206°45.02	57.46	$10^{\circ}17.52$	17.3'	$04^{\circ}14.13$	-14.0'	53.9
3	221°45.12	• • 56.53	24°53.83	17.3'	$04^{\circ}0.16$	-14.0'	53.9
4	236°45.22	55.60	39°30.15	17.3'	$03^{\circ}46.17$	-14.0'	53.9
5	251°45.32	54.66	54°6.48	17.3'	03°32.17	-14.0'	53.9
6	266°45.42	S08°53.73	68°42.83	17.4'	N03°18.16	-14.0'	53.9
7	281°45.53	52.80	83° 19.19	17.4'	$03^{\circ}4.14$	-14.0'	53.9
8	296°45.63	51.87	97° 55.56	17.4'	$02^{\circ}50.10$	-14.0'	53.9
	311°45.73	• • 50.94	112°31.94	17.4'	02°36.05	-14.1'	53.9
9		50.00	127°8.33	17.4'	02°21.99	-14.1'	53.9
9 10	326°45.83					-14.1'	53.9
9 10 11	341°45.94	49.07	141°44.73	17.4'	02°7.93		53.9
9 10 11 12	341°45.94 356°46.04	49.07 \$08°48.14	141° 44.73 156° 21.13	17.4'	N01°53.85	-14.1'	
9 10 11 12 13	341°45.94 356°46.04 11°46.14	49.07 \$08° 48.14 47.20	141° 44.73 156° 21.13 170° 57.54	17.4' 17.4'	N01°53.85 01°39.77	-14.1' -14.1'	53.9
9 10 11 12 13 14	341°45.94 356°46.04 11°46.14 26°46.25	49.07 \$08°48.14 47.20 46.27	141°44.73 156°21.13 170°57.54 185°33.95	17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68	-14.1' -14.1' -14.1'	53.9 53.9
9 10 11 12 13 14 15	341°45.94 356°46.04 11°46.14 26°46.25 41°46.35	49.07 \$08° 48.14 47.20 46.27 •• 45.33	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37	17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59	-14.1' -14.1' -14.1' -14.1'	53.9 53.9 53.9
9 10 11 12 13 14 15 16	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45	49.07 \$08° 48.14 47.20 46.27 •• 45.33 44.40	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79	17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49	-14.1' -14.1' -14.1' -14.1' -14.1'	53.9 53.9 53.9 54.0
9 10 11 12 13 14 15 16	341°45.94 356°46.04 11°46.14 26°46.25 41°46.35 56°46.45 71°46.56	49.07 \$08° 48.14 47.20 46.27 • 45.33 44.40 43.47	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21	17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38	-14.1' -14.1' -14.1' -14.1' -14.1'	53.9 53.9 53.9 54.0 54.0
9 10 11 12 13 14 15 16 17	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45 71° 46.56 86° 46.66	49.07 \$08° 48.14 47.20 46.27 · · 45.33 44.40 43.47 \$08° 42.53	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21 243° 59.63	17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38 N00°29.27	-14.1' -14.1' -14.1' -14.1' -14.1' -14.1'	53.9 53.9 53.9 54.0 54.0
9 10 11 12 13 14 15 16 17 18	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45 71° 46.56 86° 46.66 101° 46.77	49.07 \$08° 48.14 47.20 46.27 • 45.33 44.40 43.47 \$08° 42.53 41.60	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21 243° 59.63 258° 36.05	17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38 N00°29.27 00°15.16	-14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1'	53.9 53.9 53.9 54.0 54.0 54.0 54.0
9 10 11 12 13 14 15 16 17 18 19 20	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45 71° 46.56 86° 46.66 101° 46.77 116° 46.87	49.07 \$08° 48.14 47.20 46.27 • 45.33 44.40 43.47 \$08° 42.53 41.60 40.66	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21 243° 59.63 258° 36.05 273° 12.47	17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38 N00°29.27 00°15.16 N00°1.04	-14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1'	53.9 53.9 54.0 54.0 54.0 54.0 54.0
9 10 11 12 13 14 15 16 17 18 19 20 21	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45 71° 46.56 86° 46.66 101° 46.77 116° 46.87 131° 46.98	49.07 \$08° 48.14 47.20 46.27 • 45.33 44.40 43.47 \$08° 42.53 41.60 40.66 • 39.73	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21 243° 59.63 258° 36.05 273° 12.47 287° 48.89	17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38 N00°29.27 00°15.16 N00°1.04 S00°13.07	-14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' 14.1'	53.9 53.9 53.9 54.0 54.0 54.0 54.0 54.0
9 10 11 12 13 14 15 16 17 18 19 20 21	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45 71° 46.56 86° 46.66 101° 46.77 116° 46.87 131° 46.98 146° 47.08	49.07 \$08° 48.14 47.20 46.27 • 45.33 44.40 43.47 \$08° 42.53 41.60 40.66 • 39.73 38.79	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21 243° 59.63 258° 36.05 273° 12.47 287° 48.89 302° 25.30	17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38 N00°29.27 00°15.16 N00°1.04 S00°13.07 00°27.19	-14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' 14.1' 14.1'	53.9 53.9 53.9 54.0 54.0 54.0 54.0 54.0 54.0
9 10 11 12 13 14 15 16 17 18 19 20	341° 45.94 356° 46.04 11° 46.14 26° 46.25 41° 46.35 56° 46.45 71° 46.56 86° 46.66 101° 46.77 116° 46.87 131° 46.98	49.07 \$08° 48.14 47.20 46.27 • 45.33 44.40 43.47 \$08° 42.53 41.60 40.66 • 39.73	141° 44.73 156° 21.13 170° 57.54 185° 33.95 200° 10.37 214° 46.79 229° 23.21 243° 59.63 258° 36.05 273° 12.47 287° 48.89	17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4' 17.4'	N01°53.85 01°39.77 01°25.68 01°11.59 00°57.49 00°43.38 N00°29.27 00°15.16 N00°1.04 S00°13.07	-14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' -14.1' 14.1'	53.9 53.9 54.0 54.0 54.0 54.0 54.0 54.0

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:32	06:50	08:01	16:27	17:39	18:57
N 70°	05:35	06:45	07:48	16:39	17:43	18:54
68°	05:37	06:41	07:38	16:49	17:47	18:51
66°	05:38	06:37	07:30	16:58	17:50	18:50
64°	05:40	06:34	07:23	17:04	17:53	18:48
62°	05:41	06:32	07:17	17:10	17:56	18:47
60°	05:41	06:29	07:12	17:16	17:58	18:46
N 58°	05:42	06:27	07:07	17:20	18:00	18:46
56°	05:42	06:25	07:03	17:24	18:02	18:45
54°	05:42	06:23	06:59	17:28	18:04	18:45
52°	05:43	06:22	06:56	17:31	18:06	18:45
50°	05:43	06:20	06:53	17:34	18:07	18:45
45°	05:42	06:16	06:46	17:41	18:11	18:45
N 40°	05:41	06:13	06:40	17:47	18:14	18:45
35°	05:40	06:10	06:35	17:51	18:17	18:46
30°	05:39	06:07	06:31	17:56	18:20	18:48
20°	05:35	06:01	06:23	18:03	18:26	18:51
N 10°	05:30	05:55	06:16	18:10	18:31	18:56
0°	05:24	05:49	06:10	18:16	18:37	19:02
S 10°	05:17	05:42	06:03	18:23	18:44	19:09
20°	05:07	05:33	05:56	18:30	18:52	19:19
30°	04:54	05:23	05:48	18:38	19:03	19:31
35°	04:46	05:17	05:43	18:43	19:09	19:40
40°	04:36	05:09	05:37	18:48	19:16	19:49
45°	04:23	05:00	05:31	18:55	19:25	20:02
S 50°	04:07	04:49	05:23	19:02	19:36	20:18
52°	03:59	04:43	05:19	19:06	19:41	20:25
54°	03:50	04:38	05:15	19:10	19:47	20:34
56°	03:40	04:31	05:11	19:14	19:54	20:44
58°	03:28	04:23	05:06	19:19	20:01	20:56
S 60°	03:14	04:14	05:00	19:24	20:10	21:10

Lat.		Moonris	е		Moonse	t
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	15:42	17:50	19:47	09:19	08:36	08:02
N 70°	16:04	17:59	19:47	08:55	08:24	07:59
68°	16:21	18:06	19:47	08:36	08:14	07:56
66°	16:34	18:12	19:47	08:21	08:06	07:53
64°	16:45	18:17	19:47	08:09	08:00	07:51
62°	16:55	18:22	19:47	07:58	07:54	07:49
60°	17:03	18:26	19:47	07:49	07:49	07:47
N 58°	17:10	18:29	19:47	07:41	07:44	07:46
56°	17:16	18:32	19:47	07:34	07:40	07:44
54°	17:21	18:35	19:47	07:28	07:36	07:43
52°	17:26	18:37	19:47	07:22	07:33	07:42
50°	17:31	18:39	19:47	07:17	07:30	07:41
45°	17:40	18:44	19:47	07:06	07:23	07:39
N 40°	17:48	18:48	19:47	06:56	07:17	07:37
35°	17:55	18:51	19:47	06:48	07:13	07:35
30°	18:01	18:54	19:47	06:41	07:08	07:34
20°	18:11	19:00	19:47	06:29	07:01	07:31
N 10°	18:20	19:04	19:47	06:18	06:54	07:29
0°	18:29	19:08	19:47	06:07	06:48	07:27
S 10°	18:37	19:13	19:47	05:57	06:42	07:25
20°	18:46	19:17	19:47	05:46	06:35	07:23
30°	18:56	19:22	19:47	05:33	06:27	07:20
35°	19:02	19:25	19:47	05:25	06:22	07:18
40°	19:08	19:28	19:48	05:17	06:17	07:17
45°	19:16	19:32	19:48	05:07	06:11	07:15
S 50°	19:25	19:37	19:48	04:54	06:04	07:12
52°	19:29	19:39	19:48	04:49	06:01	07:11
54°	19:33	19:41	19:48	04:42	05:57	07:10
56°	19:39	19:43	19:48	04:35	05:53	07:08
58°	19:44	19:46	19:48	04:27	05:48	07:07
S 60°	19:50	19:49	19:48	04:18	05:43	07:05

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-98%	
24	13:19	13:15	12:13	-:-	12:18		
25	13:10	13:05	12:13	00:38	12:58		
26	13:01	12:56	12:13	01:18	13:37		

February 27, 28, 29 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	156° 20.01	200°54.94 S 17°32.08	202°59.28 \$18°34.99	117°38.85 N14°11.32	174°36.34 S 09°29.36	
1	$171^{\circ}22.47$	215°54.26 31.30	217°59.78 34.48	132°40.92 11.45	189°38.51 29.24	Alpheratz 357°35.86 29°13.36 Ankaa 353°8.19 -42°10.70
2	186°24.94	230°53.59 30.52	233°0.28 33.96	147°42.98 11.59	204°40.69 29.13	Schedar 349°32.38 56°40.25
3	201°27.40	245°52.91 · · 29.74	248° 0.77 · · · 33.45	162°45.04 · · 11.73	219° 42.87 · · 29.02	Diphda 348°48.28 -17°51.44
4	216° 29.86	260° 52.23 28.96	263°1.27 32.94	177°47.10 11.86	234°45.05 28.90	Achernar 335°21.07 -57°7.11
5 6	231°32.33 246°34.79	275°51.56 28.18 290°50.88 \$17°27.40	278°1.77 32.43 293°2.27 \$18°31.91	192°49.17 12.00 207°51.23 N14°12.14	249°47.22 28.79 264°49.40 \$09°28.68	Hamal 327°52.21 23°34.58
7	261° 37.26	305°50.21 26.61	308°2.76 31.40	207 51.23 N14 12.14 222°53.29 12.28	279°51.58 28.56	Polaris 314°34.34 89°22.25
8	276°39.72	320°49.53 25.83	323°3.26 30.89	237°55.35 12.41	294°53.75 28.45	Acamar 315°12.45 -40°12.73
9	291°42.18	335°48.86 · · 25.04	338° 3.76 · · 30.37	252°57.41 · · 12.55	309°55.93 · · 28.34	Menkar 314°7.01 4°10.97
10	306°44.65	350°48.18 24.26	353°4.26 29.86	267°59.47 12.69	324°58.11 28.22	Mirfak 308°29.43 49°56.96 Aldebaran 290°40.43 16°33.46
11	321°47.11	5°47.51 23.47	8°4.76 29.34	283°1.53 12.82	340°0.28 28.11	Rigel 281°4.49 -8°10.55
12	336° 49.58	20°46.84 S 17°22.68	23°5.26 \$18°28.83	298°3.59 N14°12.96	355°2.46 \$09°28.00	Capella 280°22.85 46°1.47
13	351°52.04	35°46.17 21.89	38° 5.76 28.31	313°5.65 13.10	10°4.64 27.88	Bellatrix 278°23.56 6°22.23
14 15	6°54.50 21°56.97	50° 45.49 21.10 65° 44.82 · · 20.31	53°6.26 27.80 68°6.76 · · 27.28	328°7.71 13.24 343°9.77 · · 13.37	25°6.81 27.77 40°8.99 · · 27.66	Elnath 278°2.68 28°37.72
16	36° 59.43	80°44.15 19.52	83°7.26 26.77	358°11.83 13.51	55°11.17 27.54	Alnilam 275°38.36 -1°11.28
17	52°1.90	95°43.48 18.73	98° 7.76 26.25	13°13.89 13.65	70°13.34 27.43	Betelgeuse 270°52.74 7°24.64
18	67°4.36	110°42.81 S 17°17.94	113°8.26 \$18°25.73	28°15.95 N14°13.79	85°15.52 S 09°27.32	Canopus 263°52.46 -52°42.72
19	82°6.82	125° 42.14 17.14	128°8.76 25.22	43°18.01 13.92	100° 17.70 27.20	Sirius 258°26.69 -16°45.10 Adhara 255°6.21 -29°0.46
20	97°9.29	140°41.47 16.35	143°9.26 24.70	58°20.07 14.06	115°19.88 27.09	Procyon 244°51.35 5°9.72
21	112°11.75	155°40.80 · · 15.55	158° 9.76 · · 24.18	73°22.13 · · 14.20	130°22.05 · · 26.98	Pollux 243°17.90 27°58.09
22	127°14.22	170°40.13 14.76	173°10.26 23.66	88°24.19 14.34	145°24.23 26.86	Avior 234°14.52 -59°35.33
23	142°16.68	185°39.47 13.96	188°10.76 23.14	103°26.25 14.47	160°26.41 26.75	Suhail 222°46.45 -43°31.90
Mer.p	bass. 13:32	ν -0.7′ d -0.8′ m-3.88	$ u 0.5' \ d \text{-} 0.5' \ \text{m} 1.27$	$\nu 2.1'~d0.1'~\text{m-}2.20$	$ u 2.2' \ d 0.1' \ \text{m} 0.95$	Miaplacidus 221°37.61 -69°49.03
						Alphard 217°48.15 -8°45.89
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.88 11°50.87
0	157° 19.14	200°38.80 \$17°13.16	203°11.26 \$18°22.62	118°28.30 N14°14.61	175°28.58	Dubhe 193°41.17 61°37.17 Denebola 182°25.37 14°26.10
1	$172^{\circ}21.61$	215°38.13 12.36	218°11.76 22.10	133°30.36 14.75	190°30.76 26.52	Gienah 175°44.04 -17°40.61
2	$187^{\circ}24.07$	230° 37.47 11.56	233°12.26 21.58	148°32.42 14.89	205°32.94 26.41	Acrux 173°0.35 -63°13.86
3	202°26.54	245°36.80 · · 10.76	248°12.76 · · 21.06	163°34.48 · · 15.02	220°35.11 · · 26.29	Gacrux 171°51.99 -57°14.81
4	217°29.00	260°36.13 9.96	263°13.26 20.54	178°36.53 15.16	235°37.29 26.18	Alioth 166°13.10 55°49.50
5 6	232°31.46	275°35.47 9.16	278°13.77 20.02	193°38.59 15.30	250°39.47 26.07	Spica 158°22.83 -11°17.31
7	247°33.93 262°36.39	290°34.80 \$17°8.36 305°34.14 7.55	293°14.27 \$18°19.50 308°14.77 18.98	208°40.65 N14°15.44 223°42.70 15.58	265°41.64 S09°25.95 280°43.82 25.84	Alkaid 152°52.23 49°11.29
8	202 30.39 277°38.86	320°33.48 6.75	323°15.27 18.46	238°44.76 15.72	295°46.00 25.73	Hadar 148°36.69 -60°29.19
9	292°41.32	335°32.81 · · 5.94	338°15.77 · · 17.94	253°46.82 · · 15.85	310°48.17 · · 25.61	Menkent 147°58.26 -36°29.26
10	307°43.78	350°32.15 5.14	353°16.28 17.41	268°48.87 15.99	325°50.35 25.50	Arcturus 145°48.38 19°3.18
11	322°46.25	5°31.49 4.33	8°16.78 16.89	283°50.93 16.13	340° 52.53 25.39	Rigil Kent. 139°41.01 -60°55.91 Kochab 137°19.23 74°3.00
12	337°48.71	20°30.83 \$17°3.52	23°17.28 \$18°16.37	298°52.98 N14°16.27	355°54.71 S 09°25.27	Zuben'ubi 136°56.68 -16°8.57
13	352°51.18	35° 30.16 2.71	38°17.79 15.85	313°55.04 16.41	10°56.88 25.16	Alphecca 126°4.26 26°37.72
14	7°53.64	50°29.50 1.90	53°18.29 15.32	328°57.09 16.55	25°59.06 25.05	Antares 112°16.72 -26°29.11
15	22°56.10	65°28.84 · · 1.09	68°18.79 · · 14.80	343°59.15 · · 16.68	41°1.24 · · 24.93	Atria 107°11.70 -69°3.99
16 17	37°58.57 53°1.03	80°28.18 17°0.28 95°27.52 16°59.47	83°19.30 14.27 98°19.80 13.75	359°1.20 16.82 14°3.26 16.96	56°3.41 24.82 71°5.59 24.71	Sabik 102°3.67 -15°45.35
18	68° 3.50	110°26.86 \$16°58.65	113°20.30 \$18°13.22	14°3.26 16.96 29°5.31 N14°17.10	86°7.77 \$09°24.59	Shaula 96°11.46 -37°7.21
19	83°5.96	125°26.21 57.84	128°20.81 12.70	44°7.37 17.24	101°9.94 24.48	Rasalhague 95°59.31 12°32.31
20	98°8.42	140°25.55 57.02	143°21.31 12.17	59°9.42 17.38	116°12.12 24.37	Eltanin 90°42.71 51°28.75
21	113°10.89	155°24.89 · · 56.21	158°21.82 · · 11.65	74°11.47 · · 17.52	131°14.30 · · 24.25	Kaus Aust. 83°33.65 -34°22.35 Vega 80°33.93 38°48.02
22	$128^{\circ}13.35$	170°24.23 55.39	173°22.32 11.12	89°13.53 17.65	146°16.48 24.14	Nunki 75°48.86 -26°16.03
23	143°15.82	185°23.58 54.57	188°22.82 10.59	104°15.58 17.79	161°18.65 24.03	Altair 62°0.90 8°55.72
Mer.	pass. 13:29	ν-0.7' d-0.8' m-3.88	ν 0.5' d-0.5' m1.27	ν2.1' d0.1' m-2.19	ν2.2' d-0.1' m0.95	Peacock 53°7.32 -56°39.40
						Deneb 49°26.71 45°21.73
ть	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.82 9°58.96
Thu 0	158° 18.28	GHA Dec 200°22.92 S 16°53.76	203°23.33 \$18°10.07	GHA Dec 119°17.63 N14°17.93	GHA Dec 176°20.83 S 09°23.91	Al Na'ir 27°34.24 -46°50.74
1	173° 20.75	215°22.26 52.94	218°23.83 9.54	134°19.69 18.07	191°23.01 23.80	Fomalhaut 15°15.65 -29°29.82 Scheat 13°46.27 28°12.70
2	188° 23.21	230°21.61 52.12	233°24.34 9.01	149°21.74 18.21	206°25.18 23.69	Markab 13°30.94 15°19.97
3	203° 25.67	245°20.95 · · 51.30	248°24.84 · · 8.48	164°23.79 · · 18.35	221°27.36 · · 23.57	
4	218°28.14	260°20.30 50.48	263°25.35 7.95	179°25.85 18.49	236°29.54 23.46	Feb 27 Tue SHA Mer.pass
5	233°30.60	275°19.64 49.65	278°25.85 7.43	194°27.90 18.63	251°31.71 23.34	Venus 44°34.94 10:37
6 7	248° 33.07	290°18.99 \$16°48.83	293°26.36 \$18°6.90	209°29.95 N14°18.77 224°32.00 18.91	266°33.89 S09°23.23 281°36.07 23.12	Mars 46°39.27 10:28 Jupiter 321°18.85 16:07
8	263°35.53 278°37.99	305°18.34 48.01 320°17.68 47.18	308°26.87 6.37 323°27.37 5.84	224°32.00 18.91 239°34.05 19.04	281°36.07 23.12 296°38.24 23.00	Saturn 18°16.33 12:20
9	278 37.99 293°40.46	335°17.03 · · 46.35	338°27.88 · · 5.31	254°36.10 · · 19.18	311°40.42 · · 22.89	
10	308° 42.92	350°16.38 45.53	353°28.38 4.78	269°38.15 19.32	326°42.60 22.78	Feb 28 Wed SHA Mer.pass
11	323°45.39	5°15.73 44.70	8°28.89 4.25	284°40.21 19.46	341°44.78 22.66	Venus 43°19.66 10:38
12	338° 47.85	20°15.08 \$16°43.87	23°29.40 \$18°3.72	299°42.26 N14°19.60	356°46.95 \$09°22.55	Mars 45°52.12 10:27 Jupiter 321°9.16 16:04
13	353°50.31	35°14.43 43.04	38°29.90 3.18	314°44.31 19.74	11°49.13 22.44	Saturn 18°9.44 12:16
14	8°52.78	50°13.78 42.21	53°30.41 2.65	329°46.36 19.88	26°51.31 22.32	
15 16	23°55.24 38°57.71	65°13.13 · · 41.38 80°12.48 40.55	68°30.92 · · 2.12 83°31.43 1.59	344°48.41 · · 20.02 359°50.46 20.16	41°53.48 · · 22.21 56°55.66 22.10	Feb 29 Thu SHA Mer.pass
17	54°0.17	95°11.83 39.72	98°31.93 1.06	14°52.51 20.30	71°57.84 21.98	Venus 42°4.64 10:39 Mars 45°5.05 10:26
18	69°2.63	110°11.18 \$16°38.89	113°32.44 \$18°0.52	29°54.56 N14°20.44	87°0.01 S09°21.87	Mars 45°5.05 10:26 Jupiter 320°59.35 16:01
19	84°5.10	125°10.53 38.05	128°32.95 17°59.99	44°56.61 20.58	102°2.19 21.75	Saturn 18°2.55 12:13
20	99°7.56	140°9.89 37.22	143°33.46 17°59.46	59°58.65 20.72	117°4.37 21.64	
21	114°10.03	155°9.24 · · 36.38	158°33.96 · · 58.92	75°0.70 · · 20.86	132°6.55 · · 21.53	Horizontal parallax
22	129° 12.49	170°8.59 35.55	173°34.47 58.39	90°2.75 21.00	147°8.72 21.41	Venus: 0.1
23	144°14.95	185°7.95 34.71	188°34.98 57.85	105°4.80 21.14	162°10.90 21.30	Mars: 0.1
Mer.p	bass. 13:25	ν -0.7′ d -0.8′ m-3.88	$ u 0.5' \ d \text{-} 0.5' \ \text{m} 1.27$	$\nu 2.1'~d0.1'~\text{m-}2.19$	$\nu 2.2' \ d\text{-}0.1' \ \text{m}0.95$	

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.30	S08°36.92	331°38.11	17.4'	S00°55.43	14.1'	54.0'
1	191°47.40	35.98	$346^{\circ}14.51$	17.4'	$01^{\circ}9.55$	14.1'	54.0'
2	206°47.51	35.05	0°50.90	17.4'	01°23.66	14.1'	54.0'
3 4	221°47.62 236°47.72	· · 34.11 33.17	15°27.28 30°3.65	17.4' 17.4'	01°37.77 01°51.88	14.1' 14.1'	54.0' 54.0'
5	250 47.72 251°47.83	32.23	44°40.00	17.4	01 51.66 02°5.99	14.1	54.0'
6	266°47.94	S08°31.30	59°16.35	17.3'	S02°20.09	14.1'	54.0'
7	281°48.04	30.36	73°52.69	17.3'	$02^{\circ}34.18$	14.1'	54.0'
8	296°48.15	29.42	88°29.01	17.3'	02°48.27	14.1'	54.0'
9	311°48.26 326°48.37	• • 28.48	103°5.31 117°41.60	17.3' 17.3'	03°2.35 03°16.43	14.1'	54.0'
10 11	320 48.37 341°48.48	27.55 26.61	117 41.60 132°17.87	17.3'	03 10.43 03°30.49	14.1' 14.1'	54.1' 54.1'
12	356°48.59	S08°25.67	146°54.13	17.2'	S03°44.55	14.0'	54.1'
13	11°48.70	24.73	161°30.36	17.2'	$03^{\circ}58.59$	14.0'	54.1'
14	26°48.81	23.79	176°6.58	17.2'	04°12.63	14.0'	54.1'
15	41°48.91	• • 22.85	190°42.77	17.2'	04°26.65	14.0'	54.1'
16 17	56°49.02 71°49.13	21.91 20.97	205°18.94 219°55.09	17.1' 17.1'	04°40.66 04°54.66	14.0' 14.0'	54.1' 54.1'
18	86°49.24	S08° 20.03	234°31.21	17.1	S05°8.65	14.0'	54.1'
19	101°49.36	19.09	249°7.31	17.1'	05°22.62	14.0'	54.1'
20	116°49.47	18.15	263°43.38	17.0'	$05^{\circ}36.57$	13.9'	54.1'
21	131°49.58	• • 17.21	278°19.43	17.0'	05°50.51	13.9'	54.1'
22	146°49.69	16.27	292°55.44	17.0'	06°4.44 06°18.34	13.9'	54.2'
23	161°49.80	15.33	307°31.43	17.0'		13.9'	54.2'
	SD = 16.1'	d = -0.9'		SE	0 = 14.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.91	S08°14.39	322°7.38	16.9'	S06°32.23	13.9'	54.2'
1	191°50.02	13.45	336°43.31	16.9'	06°46.09	13.8'	54.2'
2	206°50.14 221°50.25	12.50	351°19.20 5°55.05	16.9'	06°59.94 07°13.77	13.8'	54.2'
3 4	221°50.25 236°50.36	· · 11.56 10.62	5°55.05 20°30.87	16.8' 16.8'	07° 13.77 07° 27.58	13.8' 13.8'	54.2' 54.2'
5	251°50.47	9.68	35°6.66	16.7	07°41.36	13.8'	54.2'
6	266°50.59	S08°8.73	49°42.41	16.7'	S07°55.12	13.7'	54.2'
7	281°50.70	7.79	$64^{\circ}18.11$	16.7'	$08^{\circ}8.86$	13.7'	54.2'
8	296°50.81	6.85	78°53.78	16.6'	08°22.57	13.7'	54.3'
9	311°50.93 326°51.04	• • 5.91	93°29.41 108°5.00	16.6'	08°36.26 08°49.92	13.7'	54.3'
10 11	326°51.04 341°51.15	4.96 4.02	108°5.00 122°40.55	16.5' 16.5'	08°49.92 09°3.55	13.6' 13.6'	54.3' 54.3'
12	356°51.27	S08°3.07	137°16.05	16.5'	S09°17.16	13.6'	54.3'
13	11°51.38	2.13	151°51.51	16.4'	09°30.73	13.5'	54.3'
14	26°51.50	1.19	166°26.92	16.4'	09°44.28	13.5'	54.3'
15	41°51.61 56°51.73	08°0.24 07°59.30	181°2.28	16.3' 16.3'	09°57.80 10°11.29	13.5'	54.3' 54.4'
16 17	50°51.73 71°51.84	58.35	195°37.60 210°12.87	16.2	10°11.29 10°24.74	13.5' 13.4'	54.4' 54.4'
18	86°51.96	S07°57.41	224°48.08	16.2	\$10°38.17	13.4	54.4'
19	101°52.08	56.46	239°23.25	16.1'	$10^{\circ}51.56$	13.4'	54.4'
20	116°52.19	55.52	253°58.36	16.1'	11°4.91	13.3'	54.4'
21	131°52.31	• • 54.57	268°33.42	16.0'	11°18.23	13.3'	54.4'
22 23	146°52.42 161°52.54	53.63 52.68	283°8.43 297°43.38	16.0' 15.9'	11°31.51 11°44.76	13.2' 13.2'	54.4' 54.5'
23	SD = 16.1'	d = -0.9'	291 43.30		0 = 14.8'	15.2	34.3
	<u> </u>	<u>u = -0.9</u>			7 = 14.0		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	176°52.66 191°52.78	\$07°51.73 50.79	312°18.28 326°53.11	15.8' 15.8'	\$11°57.97 12°11.14	13.2' 13.1'	54.5' 54.5'
2	206°52.89	49.84	341°27.89	15.7'	12 11.14 12°24.27	13.1	54.5'
3	221°53.01	• • 48.89	356°2.61	15.7'	$12^{\circ}37.36$	13.0'	54.5'
4	236°53.13	47.95	10°37.27	15.6'	12°50.41	13.0'	54.5'
5	251°53.25	47.00	25°11.87	15.5'	13°3.42	13.0'	54.6'
6 7	266°53.37 281°53.48	S07°46.05 45.10	39°46.40 54°20.87	15.5' 15.4'	\$13°16.38 13°29.30	12.9' 12.9'	54.6' 54.6'
8	281 53.48 296°53.60	45.10 44.16	54 20.87 68°55.27	15.4	13 29.30 13°42.17	12.9	54.6'
9	311°53.72	43.21	83°29.61	15.3'	13°55.00	12.8'	54.6'
10	326°53.84	42.26	98°3.88	15.2'	$14^{\circ}7.78$	12.7'	54.6'
11	341°53.96	41.31	112°38.09	15.1'	14°20.52	12.7'	54.7'
12	356°54.08 11°54.20	\$07°40.36 39.41	127°12.22 141°46.29	15.1'	\$14°33.20 14°45.84	12.6'	54.7'
13 14	26°54.32	39.41 38.46	141°46.29 156°20.28	15.0' 14.9'	14°45.84 14°58.42	12.6' 12.5'	54.7' 54.7'
15	41°54.44	37.52	170°54.20	14.8'	15° 10.96	12.5'	54.7'
16	56°54.56	36.57	185°28.05	14.8'	$15^{\circ}23.44$	12.4'	54.7'
17	71°54.68	35.62	200°1.82	14.7'	15° 35.87	12.4'	54.8'
18	86°54.80	S07°34.67	214°35.52	14.6'	\$15°48.24	12.3'	54.8'
19	101°54.92 116°55.05	33.72 32.77	229°9.14 243°42.69	14.5' 14.5'	16°0.56 16°12.82	12.3' 12.2'	54.8' 54.8'
20 21	116°55.05 131°55.17	32.77 · · 31.82	243°42.69 258°16.15	14.5'	16° 12.82 16° 25.02	12.2'	54.8'
22	131 55.17 146°55.29	30.87	272°49.54	14.4	16° 25.02	12.1'	54.6 54.9'
23	161°55.41	29.91	287°22.85	14.2'	16°49.25	12.0'	54.9'
	SD = 16.1'	d = -0.9'		SE	0 = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:17	06:35	07:45	16:42	17:52	19:10
N 70°	05:22	06:32	07:34	16:53	17:55	19:06
68°	05:25	06:29	07:26	17:01	17:58	19:02
66°	05:28	06:27	07:19	17:08	18:00	18:59
64°	05:30	06:25	07:13	17:14	18:02	18:57
62°	05:32	06:23	07:08	17:19	18:04	18:55
60°	05:33	06:21	07:03	17:23	18:05	18:54
N 58°	05:34	06:19	06:59	17:27	18:07	18:52
56°	05:35	06:18	06:55	17:31	18:08	18:51
54°	05:36	06:17	06:52	17:34	18:10	18:51
52°	05:36	06:15	06:49	17:37	18:11	18:50
50°	05:37	06:14	06:47	17:39	18:12	18:49
45°	05:37	06:11	06:41	17:45	18:15	18:49
N 40°	05:37	06:09	06:36	17:50	18:17	18:49
35°	05:37	06:06	06:31	17:54	18:20	18:49
30°	05:36	06:04	06:28	17:58	18:22	18:50
20°	05:33	05:59	06:21	18:04	18:27	18:52
N 10°	05:29	05:54	06:15	18:10	18:31	18:56
0°	05:24	05:48	06:09	18:16	18:37	19:01
S 10°	05:17	05:42	06:03	18:22	18:43	19:08
20°	05:09	05:35	05:57	18:28	18:50	19:16
30°	04:57	05:25	05:50	18:35	18:59	19:28
35°	04:49	05:20	05:45	18:39	19:05	19:35
40°	04:40	05:13	05:41	18:44	19:12	19:45
45°	04:28	05:05	05:35	18:49	19:20	19:56
S 50°	04:13	04:54	05:28	18:56	19:30	20:11
52°	04:06	04:49	05:25	18:59	19:34	20:18
54°	03:58	04:44	05:21	19:03	19:40	20:26
56°	03:48	04:38	05:17	19:06	19:46	20:35
58°	03:37	04:31	05:13	19:11	19:52	20:45
S 60°	03:25	04:23	05:08	19:15	20:00	20:58

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	21:45	23:55		07:31	06:57	06:12
N 70°	21:36	23:32		07:35	07:09	06:37
68°	21:28	23:15		07:38	07:18	06:56
66°	21:22	23:02		07:40	07:27	07:11
64°	21:17	22:50		07:42	07:33	07:24
62°	21:13	22:41		07:44	07:39	07:34
60°	21:09	22:33		07:46	07:45	07:44
N 58°	21:05	22:26	23:50	07:47	07:49	07:52
56°	21:02	22:20	23:40	07:49	07:53	07:59
54°	21:00	22:14	23:31	07:50	07:57	08:05
52°	20:57	22:09	23:23	07:51	08:00	08:11
50°	20:55	22:05	23:16	07:52	08:03	08:16
45°	20:50	21:55	23:02	07:54	08:10	08:28
N 40°	20:46	21:47	22:49	07:56	08:16	08:37
35°	20:43	21:40	22:39	07:58	08:21	08:45
30°	20:40	21:34	22:30	07:59	08:25	08:53
20°	20:35	21:24	22:15	08:02	08:32	09:05
N 10°	20:30	21:15	22:01	08:04	08:39	09:16
0°	20:26	21:06	21:49	08:06	08:45	09:26
S 10°	20:22	20:58	21:36	08:08	08:52	09:37
20°	20:18	20:49	21:23	08:10	08:58	09:48
30°	20:13	20:39	21:08	08:13	09:06	10:01
35°	20:10	20:34	21:00	08:14	09:10	10:08
40°	20:07	20:27	20:50	08:16	09:15	10:17
45°	20:03	20:20	20:39	08:18	09:21	10:27
S 50°	19:59	20:11	20:25	08:20	09:28	10:39
52°	19:57	20:07	20:19	08:21	09:32	10:44
54°	19:55	20:02	20:12	08:22	09:35	10:51
56°	19:52	19:57	20:04	08:23	09:39	10:58
58°	19:50	19:52	19:55	08:25	09:44	11:06
S 60°	19:47	19:46	19:45	08:26	09:49	11:15

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-83%	
27	12:51	12:46	12:13	01:57	14:16		
28	12:40	12:35	12:13	02:36	14:56		
29	12:29	12:24	12:12	03:16	15:37		

h	Aries	Ven	ius	Mai	rs	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	159° 17.42		S16°33.87		S17°57.32	120°6.85	N14°21.28	177° 13.08	S09°21.19			
1	174° 19.88	215°6.66	33.03	218°36.00	56.78	135°8.90	21.42	192° 15.25	21.07	Alpheratz	357°35.86	29°13.35
2	189°22.35	230°6.01	32.19	233°36.51	56.25	150°10.94	21.56	207° 17.43	20.96	Ankaa	353°8.20	-42°10.69
3	204°24.81	245°5.37	• • 31.35	248°37.02	• • 55.71	165°12.99	• • 21.70	222°19.61	• • 20.85	Schedar	349°32.39	56°40.23
4	$219^{\circ}27.28$	260°4.73	30.51	263°37.53	55.17	180°15.04	21.84	$237^{\circ}21.78$	20.73	Diphda	348°48.29	-17°51.44
5	234°29.74	275°4.08	29.67	278°38.03	54.64	195°17.09	21.98	252°23.96	20.62	Achernar	335°21.09	-57°7.10 23°34.57
6	249°32.20	290°3.44	S16°28.83	293°38.54	S17°54.10	210°19.13	N14°22.12	267°26.14	S09°20.51	Hamal	327°52.22 314°35.61	23 34.37 89°22.24
7	264°34.67	305°2.80	27.98	308°39.05	53.56	225°21.18	22.26	282°28.31	20.39	Polaris Acamar	315° 12.47	-40°12.73
8	$279^{\circ}37.13$	$320^{\circ}2.16$	27.14	323°39.56	53.03	240°23.23	22.40	297°30.49	20.28	Menkar	314°7.02	4°10.97
9	294°39.60	335°1.52	• • 26.29	338°40.07	• • 52.49	255°25.27	• • 22.54	312°32.67	• • 20.16	Mirfak	308°29.45	49°56.96
10	309°42.06	350°0.87	25.45	353°40.58	51.95	270°27.32	22.68	327° 34.85	20.05	Aldebaran	290°40.44	16°33.45
11	324°44.52	5°0.23	24.60	8°41.09	51.41	285°29.37	22.82	342°37.02	19.94	Rigel	281°4.50	-8°10.56
12	339°46.99		\$16°23.75		S17°50.87	300°31.41	N14°22.96	357°39.20	S09°19.82	Capella	280° 22.87	46°1.47
13	354° 49.45	34°58.96	22.90	38°42.12	50.33	315°33.46	23.10	12°41.38	19.71	Bellatrix	278°23.58	6°22.23
14	9°51.92	49°58.32	22.06	53°42.63	49.79	330°35.50	23.24	27°43.55	19.60	Elnath	278°2.69	28°37.71
15	24° 54.38	64°57.68	• • 21.21	68°43.14	• • 49.25	345°37.55 0°39.59	• • 23.38	42°45.73	• • 19.48	Alnilam	275°38.37	$-1^{\circ}11.29$
16 17	39° 56.84 54° 59.31	79°57.04 94°56.40	20.35 19.50	83°43.65 98°44.16	48.71 48.17	0 39.59 15°41.64	23.52 23.66	57°47.91 72°50.08	19.37 19.26	Betelgeuse	$270^{\circ}52.75$	$7^{\circ}24.64$
18	70°1.77		\$16°18.65		\$17°47.63	30°43.68	N14°23.81	87° 52.26	S09°19.14	Canopus	263°52.48	-52°42.73
19	85°4.24	124° 55.13	17.80	128°45.18	47.09	45°45.73	23.95	102°54.44	19.03	Sirius	258°26.70	-16°45.11
20	100°6.70	139°54.49	16.94	143°45.69	46.55	60°47.77	24.09	117°56.62	18.92	Adhara	255°6.22	-29°0.47
21	115°9.16	154°53.86	• • 16.09	158°46.21	• • 46.01	75°49.82	24.23	132°58.79	• 18.80	Procyon	244°51.36	5°9.72
22	130° 11.63	169°53.22	15.23	173°46.72	45.47	90°51.86	24.37	148°0.97	18.69	Pollux	243° 17.91	27°58.09
23	145° 14.09	184°52.59	14.38	188°47.23	44.92	105°53.90	24.51	163°3.15	18.57	Avior	234° 14.54	-59°35.35
						-				Suhail	222°46.45	-43°31.92
Mer.	pass. 13:21	ν -0.6' d-0.8	8′ m-3.88	ν 0.5′ d-0.5	o' m1.27	$\nu^{2.0'} d0.$	1′ m-2.18	$\nu^{2.2'} d-0$.1′ m0.96	Miaplacidus	221°37.63	-69°49.05
										Alphard	217°48.15	-8°45.89
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°34.88	11°50.87 61°37.18
0	160° 16.56		S16°13.52	203°47.74	S17°44.38	120°55.95	N14°24.65	178°5.32	S09°18.46	Dubhe Denebola	193°41.17 182°25.36	61°37.18 14°26.10
1	$175^{\circ}19.02$	214°51.32	12.66	218°48.26	43.84	135°57.99	24.79	193°7.50	18.35	Gienah	182 25.30 175°44.03	-17°40.62
2	$190^{\circ}21.49$	229°50.69	11.80	233°48.77	43.30	151°0.03	24.93	208°9.68	18.23	Acrux	173 44.03 173°0.33	-63°13.88
3	$205^{\circ}23.95$	244°50.05	• • 10.94	248°49.28	• • 42.75	166°2.08	• • 25.07	223°11.85	• • 18.12	Gacrux	173 0.33 171°51.97	-57°14.83
4	$220^{\circ}26.41$	259°49.42	10.08	263°49.79	42.21	181°4.12	25.22	238°14.03	18.01	Alioth	166° 13.09	55°49.51
5	235°28.88	274°48.79	9.22	278°50.31	41.66	196°6.16	25.36	253°16.21	17.89	Spica	158° 22.82	-11°17.32
6	250°31.34	289°48.16	\$16°8.36		S17°41.12	211°8.20	N14°25.50	268° 18.39	S09°17.78	Alkaid	152°52.21	49°11.29
7	265°33.81	304°47.52	7.50	308°51.33	40.57	226°10.24	25.64	283°20.56	17.67	Hadar	148° 36.66	-60°29.20
8	280°36.27	319°46.89	6.63	323°51.85	40.03	241°12.29	25.78	298°22.74	17.55	Menkent	147°58.24	-36°29.27
9	295° 38.73	334°46.26	• • 5.77	338°52.36	• • 39.48	256°14.33	• • 25.92	313°24.92	• • 17.44	Arcturus	145°48.36	19°3.18
10	310°41.20	349°45.63	4.90	353°52.88	38.94	271°16.37	26.06	328°27.09	17.33	Rigil Kent.	139°40.98	-60°55.92
11	325° 43.66	4° 45.01	4.04	8°53.39	38.39	286°18.41	26.20	343°29.27	17.21	Kochab	$137^{\circ}19.18$	$74^{\circ}3.01$
12	340°46.13	19°44.38	\$16° 3.17		\$17°37.84	301°20.45 316°22.49	N14° 26.35	358° 31.45	509°17.10	Zuben'ubi	136°56.66	$-16^{\circ}8.58$
13 14	355° 48.59 10° 51.05	34°43.75 49°43.12	2.30 1.43	38°54.42 53°54.93	37.30 36.75	310 22.49 331°24.53	26.49 26.63	13°33.62 28°35.80	16.99 16.87	Alphecca	126°4.24	26°37.72
15	25° 53.52	64° 42.49	1.43 16°0.57	68°55.45	36.20	346°26.57	26.77	43°37.98	. 16.76	Antares	112° 16.70	-26°29.12
16	40°55.98	79°41.87	15°59.70	83°55.96	35.66	1°28.61	26.91	58°40.16	16.64	Atria	107° 11.64	-69°3.99
17	55° 58.45	94° 41.24	58.82	98°56.48	35.11	16°30.65	27.05	73°42.33	16.53	Sabik	102°3.64	-15°45.35
18	71°0.91		S15°57.95		S17°34.56	31°32.69	N14°27.20	88° 44.51	S09°16.42	Shaula	96°11.43	-37°7.20
19	86°3.38	124°39.99	57.08	128°57.51	34.01	46°34.73	27.34	103°46.69	16.30	Rasalhague	95°59.29	12°32.31
20	101°5.84	139°39.36	56.21	143°58.02	33.46	61°36.77	27.48	118°48.86	16.19	Eltanin	90°42.68	51°28.75
21	116°8.30	154°38.74	• • 55.33	158°58.54	• • 32.91	76°38.81	• • 27.62	133°51.04	• • 16.08	Kaus Aust. Vega	83°33.63 80°33.90	-34°22.35 38°48.02
22	131° 10.77	169°38.11	54.46	173°59.06	32.36	91°40.85	27.76	148°53.22	15.96	Vega Nunki	75° 48.83	-26°16.03
23	$146^{\circ}13.23$	184°37.49	53.58	188°59.57	31.81	106°42.89	27.91	163°55.40	15.85	Altair	62°0.89	8°55.71
Mar	pass. 13:17	ν -0.6' d-0.9	0/ m 2 00	ν 0.5' d-0.5	5′ m1 26	1,2 0/ 40	1' m-2.18		.1′ m0.96	Peacock	53°7.30	-56°39.39
- Ivier.	pass. 13.11	ν -0.0 u -0.1	9 111-3.00	νο.5 α-υ.5		ν2.0 do.	1 111-2.10	ν2.2 u -0	.1 1110.90	Deneb	49°26.70	45°21.72
										Enif	33°39.81	9°58.96
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°34.24	-46°50.73
0	161°15.70	199°36.87		204°0.09		121°44.93	N14°28.05	178° 57.57	S09°15.74	Fomalhaut	15° 15.65	-29°29.82
1	176° 18.16	214°36.24	51.83	219°0.60	30.71	136°46.97	28.19	193°59.75	15.62	Scheat	13°46.26	28°12.70
2	191°20.62	229°35.62	50.95	234°1.12	30.16	151°49.01	28.33	209°1.93	15.51	Markab	13°30.94	$15^{\circ}19.96$
3	206° 23.09	244°35.00	• • 50.08	249°1.64	• • 29.61	166°51.04	• • 28.47	224°4.10	15.40	N4 01 F :	CIIA	
4	221°25.55	259°34.38	49.20	264°2.15	29.06	181°53.08	28.62	239°6.28	15.28	Mar 01 Fri	SHA 40° 40. 99	Mer.pass
5	236° 28.02	274°33.76	48.32 \$15°47.44	279°2.67	28.50 \$17°27.05	196°55.12	28.76	254°8.46	15.17 \$00°15.06	Venus Mars	40°49.88 44°18.07	10:40 10:25
6 7	251° 30.48 266° 32.95	289°33.14 304°32.52	46.55		\$17°27.95	211°57.16	N14°28.90	269° 10.64 284° 12.81	\$09°15.06	Jupiter	320°49.43	10:25
8	266° 32.95 281° 35.41	304°32.52 319°31.90	46.55 45.67	309°3.71 324°4.22	27.40 26.85	226°59.20 242°1.23	29.04 29.18	284°12.81 299°14.99	14.94 14.83	Saturn	17°55.66	12:09
9	281 35.41 296° 37.87	319 31.90 334°31.28	45.07	324 4.22 339°4.74	. 26.29	242 1.23 257°3.27	29.18	299 14.99 314°17.17	14.83			14.03
10	311°40.34	349°30.66	43.91	354° 5.26	25.74	272°5.31	29.47	329° 19.34	14.71	Mar 02 Sat	SHA	Mer.pass
11	326° 42.80	4° 30.04	43.91	9° 5.78	25.14	287°7.34	29.47	344°21.52	14.49	Venus	39°35.40	10:41
12	341°45.27		S15°42.14		S17°24.63	302°9.38	N14°29.75	359°23.70	S09°14.37	Mars	43°31.19	10:24
13	356° 47.73	34°28.80	41.25	39°6.81	24.08	317°11.42	29.90	14°25.88	14.26	Jupiter	320°39.39	15:54
14	11°50.19	49°28.19	40.36	54°7.33	23.52	332°13.45	30.04	29°28.05	14.15	Saturn	17°48.77	12:06
15	26°52.66	64°27.57	• • 39.48	69°7.85	• • 22.97	$347^{\circ}15.49$	• • 30.18	44°30.23	• • 14.03	Mar 03 Sun	SHA	Mer.pass
16	41°55.12	79°26.96	38.59	84°8.37	22.41	2°17.52	30.33	59°32.41	13.92	Venus	38°21.17	10:42
17	56° 57.59	94°26.34	37.70	99°8.89	21.86	$17^{\circ}19.56$	30.47	74°34.58	13.81	Mars	42°44.39	10:24
18	72°0.05		S15°36.81		S17°21.30	32°21.59	N14°30.61	89°36.76	S09°13.69	Jupiter	320°29.23	15:51
19	87°2.52	124°25.11	35.92	129° 9.93	20.74	47°23.63	30.75	104°38.94	13.58	Saturn	17°41.88	12:02
20	102°4.98	139°24.50	35.03	144°10.45	20.19	62°25.66	30.90	119°41.12	13.47	11	tal navall-	
21	117°7.44	154° 23.88	• • 34.13	159°10.97	• • 19.63	77°27.70	• • 31.04	134° 43.29	• • 13.35	Horizoi	ital parallax	0.1
22	132°9.91	169°23.27	33.24	174°11.49	19.07	92°29.73	31.18	149° 45.47	13.24		Venus: Mars:	0.1 0.1
23	147° 12.37	184°22.66	32.35	189°12.01	18.52	107°31.77	31.32	164° 47.65	13.13		ividi5:	0.1
Mer.	pass. 13:13	ν-0.6′ d-0.	9′ m-3.88	ν 0.5′ d-0.6	5′ m1.26	ν 2.0′ d0.	.1′ m-2.17	ν2.2′ d-0	.1′ m0.97			

Fri	h	Su	n	Moon				
101°55.66 28.01 316°59.22 41.1 17°31.24 11.0 54.07	Fri	GHA	Dec	GHA	ν	Dec	d	HP
2 206°55.78 27.06 331°2.28 14.0° 17°25.14 11.8′ 54.0° 326°55.09 22.11 48°0.55 26 13.9° 17°36.97 11.8′ 55.0° 13.3° 17°36.97 11.8′ 55.0° 25.15° 5.5° 5.5° 5.5° 5.5° 5.5° 5.5° 5.5°	0							
221°55.90								
236°56.02								
The color of the			24.21					
8	6							
19 311°86.96 · · · · · · · · · · · · · · · · · ·								
10 326° 56 77 19.44 87° 23 67 13.3' 18° 57.96 11.3' 55.1' 112 336° 57.02 S07° 17.54 116° 28.12 13.1' S19° 20.4 11.1' 55.2' 13 11° 57.14 16.58 131° 0.2! 13.0' 19° 31.60 11.1' 55.2' 14° 67.77 15.63 145° 32.20 12.9' 19° 42.66 11.0' 55.2' 15.4' 15° 7.39 · 14.68 160° 4.10 12.8' 19° 53.64 10.9' 55.2' 15.65 41° 57.39 · 14.68 160° 4.10 12.8' 19° 53.64 10.9' 55.2' 17 71° 57.64 12.77 189° 7.62 12.6' 20° 15.38 10.7' 55.3' 17 71° 57.64 12.77 189° 7.62 12.6' 20° 15.38 10.7' 55.3' 19 101° 57.90 10.86 218° 10.75 12.4' 20° 36.79 10.6' 55.3' 19 101° 57.90 10.86 218° 10.75 12.4' 20° 36.79 10.6' 55.3' 22 146° 58.02 9.91 232° 42.16 12.3' 20° 47.38 10.5' 55.4' 22 146° 58.28 8.00 261° 44.70 12.1' 21° 8.29 10.3' 55.4' 22 160° 58.87 50.13 50° 17.75 118 21° 39.00 10.6' 55.4' 22 206° 58.78 4.17 319° 48.56 11.7' 21° 49.06 10.2' 55.5' 22 206° 58.78 4.17 319° 48.56 11.7' 21° 49.06 10.0' 55.5' 22 206° 58.78 4.17 319° 48.56 11.7' 21° 49.06 10.0' 55.5' 22 206° 59.30 507° 0.35 17° 50.8 11.3' 522° 28.90 9.8' 55.6' 251° 59.17 1.31 32° 28° 59.04 2.26 348° 49.88 11.5' 22° 8.90 9.8' 55.6' 26° 59.93 507° 0.35 17° 50.8 11.3' 522° 28.90 9.8' 55.6' 26° 59.55 56.44 46° 12.7 11.1' 22° 47.4 9.4' 55.7' 13 13° 29° 69.5 56.6' 56° 59.50 56.44 46° 12.7 11.1' 22° 47.4 9.4' 55.7' 11 341° 59.96 55.54 56.52 75° 133 10.9' 23° 6.12 9.2' 55.7' 11 341° 59.94 55.56 90° 11.0 10.8' 23° 51.31 9.1' 55.8' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.3' 12° 0.0' 11.5' 11.5' 11.3' 12° 0.0' 11.5' 11.5'								
11 341° 66.89 18.49 101° 85.94 13.2° 19° 90.24 11.2° 55.1° 12 356° 57.02 S07° 17.54 116° 88.12 13.1° S19° 20.46 11.1° 55.2° 13 11° 57.14 16.58 131° 0.21 13.0° 19° 31.60 11.1° 55.2° 14 26° 57.72 15.63 145° 32.20 12.9° 19° 42.66 11.0° 55.2° 15 41° 57.39 14.68 160° 41.01 12.8° 19° 53.46 10.9° 55.2° 16 56° 57.52 13.72 174° 35.91 12.7° 20° 4.55 10.8° 55.3° 17 71° 57.64 12.77 189° 7.62 12.6° 20° 15.38 10.7° 55.3° 18 86° 57.77 S07° 11.81 203° 39.23 12.5° 520° 26.13 10.7° 55.3° 19 101° 57.90 10.86 218° 10.75 12.4° 20° 36.79 10.6° 55.3° 20 116° 58.02 9.91 232° 42.16 12.3° 20° 47.38 10.5° 55.3° 21 131° 58.15 8.95 247° 13.48 12.2° 20° 57.87 10.4° 55.4° 22 146° 58.28 80.0 261° 44.70 12.1° 21° 82.99 10.3° 55.4° 23 161° 58.40 7.04 276° 15.82 12.0° 21° 18.61 10.2° 55.4° 24 236° 59.04 2.26 346° 49.88 11.5° 21° 28.85 10.1° 55.5° 3 221° 58.91 3.22 334° 19.27 11.6° 21° 59.03 9.9° 55.5° 4 236° 59.04 2.26 346° 49.88 11.5° 22° 89.09 9.8° 55.6° 5 251° 91.77 .31 32° 20.91 11.3° 22° 28.36 9.6° 55.6° 6 266° 59.30 507° 0.35 17° 50.78 11.3° 522° 28.36 9.6° 55.6° 8 296° 59.55 58.44 46° 51.27 11.1° 22° 47.44 9.4° 55.7° 10 326° 59.81 56.52 75° 51.33 10.9° 23° 61.2 9.2° 55.7° 11 341° 59.94 56° 59.39 32° 10.18 11.2° 22° 37.9° 55.5° 12 357° 0.07 505° 4.61 104° 50.97 10.7° 523° 33.37 8.9° 55.8° 13 12° 0.20 53.65 119° 20.62 10.5° 23° 33.37 8.9° 55.8° 14 27° 0.07 20° 54.61 104° 50.97 10.7° 523° 33.37 8.9° 55.8° 15 42° 0.46 51.73 148° 19.62 10.1° 22° 52° 8.84 7.6° 56.2° 17 77° 0.72 49.82 177° 18.18 10.1° 22° 52° 8.84 55.0° 18 68° 1.10 50.78 50.78 50.78 50.78 50.78 50.7								
13						19° 9.24		
14								
15								
16								
17								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				189°7.62	12.6'	20°15.38		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
Solution								
Sat GHA Dec GHA ν Dec d HP 0 176°58.53 S07°6.09 290°46.83 11.9' \$21°28.85 10.1' 55.5' 1 191°58.66 5.13 305°17.75 11.8' 21°39.00 10.1' 55.5' 3 221°58.91 3.22 334°19.27 11.6' 21°59.03 9.9' 55.5' 4 236°59.04 2.26 348°49.88 11.5' 22°8.90 9.8' 55.6' 6 266°59.30 S07°0.35 17°50.78 11.3' 522°8.36 9.6' 55.6' 7 281°59.43 06°59.39 32°21.08 11.2' 22°37.95 9.5' 55.6' 9 311°59.68 · 57.48 46°81.27 11.1' 22°44.74 9.4' 55.7' 9 311°59.81 56.52 75°51.33 10.9' 23°6.12 9.2' 55.7' 10 326°59.81 56.52 75°51.33 10.9' 23°5.31 3.1' <		161°58.40		276°15.82				
16		SD = 16.1'	d = -1.0'		SD	0 = 15.0'		
16								
1 191°58.66 5.13 305°17.75 11.8' 21°39.00 10.1' 55.5' 2 206°58.78 4.17 319°48.56 11.7' 21°49.06 10.0' 55.5' 3 221°58.91 · 3.22 334°19.27 11.6' 21°59.03 9.9' 55.5' 4 236°59.04 2.26 348°49.88 11.5' 22°8.89 9.8' 55.6' 5 251°59.17 1.31 3°20.39 11.4' 22°18.68 9.7' 55.6' 6 266°59.30 SO7°0.35 17°50.78 11.3' S22°8.36 9.6' 55.6' 7 281°59.43 06°59.39 32°21.08 11.2' 22°37.95 9.5' 55.6' 8 296°59.55 58.44 46°51.27 11.1' 22°47.44 9.4' 55.7' 9 311°59.68 · 57.48 61°21.35 11.0' 22°6.83 9.3' 55.7' 10 326°59.81 56.52 75°51.33 10.9' 23°6.12 9.2' 55.7' 11 341°59.94 55.56 90°21.20 10.8' 23°51.31 91' 55.8' 12 357°0.07 S06°54.61 104°55.97 10.7' S23°24.39 9.0' 55.8' 13 12°0.20 53.65 119°20.62 10.5' 23°33.37 8.9' 55.8' 14 27°0.33 52.69 133°50.17 10.4' 23°42.24 8.8' 55.8' 15 42°0.46 · 51.73 148°19.62 10.3' 23°51.01 8.7' 55.9' 16 57°0.59 50.78 162°48.95 10.2' 23°51.01 8.7' 55.9' 17 72°0.72 49.82 177°18.18 10.1' 24°8.21 8.4' 55.9' 18 88°0.85 S06°48.86 191°47.29 10.0' 524°16.65 8.3' 55.9' 20 117°1.12 46.94 220°45.20 9.8' 24°24.97 8.2' 55.0' 21 132°1.25 · 45.98 235°14.00 9.7' 24°41.27 8.0' 56.1' 22 147°1.38 45.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 22 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.2' 23 162°1.51 44.06 264°11.25 9.5' 24°57.11 7.7' 56.1' SD = 16.1' d = -1.0' SD = 16.1' d = -1.0' SD = 16.1' d = -1.0' SD = 16.1' 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 3 222°2.04 · 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 506°37.34 5°28.23 8.7' 525°4.88 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.6' 10 327°2.97 33.50 63°1.84 8.5' 26°2.28 6.6' 56.4' 10 327°2.97 33.50 63°1.84 8.5' 26°2.28 6.6' 56.4' 11 342°3.51 2.96 51.14 62°7.15 7.9' 26°3.39.3 5.9' 56.6' 11 342°3.51 2.96 51.14 62°7.14 7.9' 26°51.26 5.5' 56.5' 12 357°3.24 506°3.15 8.92 12.28 8.1' 526°1.26 5.5' 56.5' 11 342°3.51 2.96 51.16 63°7.55 5.7' 56.5' 12 357°3.48 50°6 25.80 178°53.75 7.5' 527°2.10 5.2' 56.5' 13								
2 206° 58.78								
4 236°59.04 2.26 348°49.88 11.5' 22°8.90 9.8' 55.6' 551°5917 1.31 3°20.39 11.4' 22°18.66 9.7' 55.6' 66 266°59.30 \$O7°0.35 17°50.78 11.3' \$S22°8.36 9.6' 55.6' 7 281°59.43 06°59.39 32°21.08 11.2' 22°37.95 9.5' 55.6' 8 296°59.55 58.44 46°51.27 11.1' 22°47.44 9.4' 55.7' 9 311°59.68 5.57.48 61°21.35 11.0' 22°66.83 9.3' 55.7' 10 326°59.81 56.52 75°51.33 10.9' 23°6.12 9.2' 55.7' 11 341°59.94 55.56 90°21.20 10.8' 23°15.31 9.1' 55.8' 12 357°0.07 \$O6°54.61 104°50.97 10.7' \$23°24.39 9.0' 55.8' 13 12°0.20 53.65 119°20.62 10.5' 23°33.37 8.9' 55.8' 13 12°0.20 53.65 119°20.62 10.5' 23°33.37 8.9' 55.8' 14 27°0.33 52.69 133°50.17 10.4' 23°42.24 8.8' 55.8' 15 42°0.46 · 51.73 148°19.62 10.3' 23°51.01 8.7' 55.9' 16 57°0.59 50.78 162°48.95 10.2' 23°59.67 8.5' 55.9' 17 72°0.72 49.92 177°18.18 10.1' 24°8.21 8.4' 55.9' 18 87°0.85 \$O6°48.86 191°47.29 10.0' \$S24°16.65 8.3' 56.0' 19 102°0.98 47.90 206°16.30 9.9' 24°24.97 8.2' 56.0' 20 117°1.12 46.94 220°45.20 9.8' 24°33.18 8.1' 56.0' 22 147°1.38 45.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 22 147°1.38 45.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 22 147°1.38 45.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 22 147°1.38 345.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 32°22.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 32°22.21 33.30 330 351°0.42 8.8' 25°4.86 6.9' 56.3' 4.22°2.71 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 56.2' 24°29.71 35.42 34°23.54 8.5' 226°2.28 6.6' 56.4' 9.31°22.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.2' 9.9 31°22.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 9.31°22.97 33.50 63°8.42 8.8' 25°41.69 7.0' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 66.2' 244 506°37.34 5°28.23 8.7' \$25°48.66 6.9' 56.3' 11 342°3.11 32°3.8 30.61 106°39.95 8.0' 26°39.93 5.9' 56.6' 11 34								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3		• • 3.22		11.6'		9.9'	55.5'
6								
7 281°59.43 06°59.39 32°21.08 11.2′ 22°37.95 9.5′ 55.6′ 8 296°59.55 58.44 46°51.27 11.1′ 22°47.44 9.4′ 55.7′ 9 311°59.68 · 57.48 61°21.35 11.0′ 22°56.83 9.3′ 55.7′ 10 326°59.81 56.52 75°51.33 10.9′ 23°6.12 9.2′ 55.7′ 11 341°59.94 55.56 90°21.20 10.8′ 23°15.31 9.1′ 55.8′ 12 357°0.07 S06°54.61 10/4°50.97 10.7′ S23°24.39 9.0′ 55.8′ 13 12°0.20 53.65 119°20.62 10.5′ 23°33.37 8.9′ 55.8′ 14 27°0.33 52.69 133°50.17 10.4′ 23°42.24 8.8′ 55.8′ 14 27°0.33 52.69 133°50.17 10.4′ 23°42.24 8.8′ 55.8′ 15 42°0.46 · 51.73 148°19.62 10.3′ 23°51.01 8.7′ 55.9′ 16 57°0.59 50.78 162°48.95 10.2′ 23°59.67 8.5′ 55.9′ 17 72°0.72 49.82 177°18.18 10.1′ 24°8.21 8.4′ 55.9′ 18 87°0.85 S06°48.86 191°47.29 10.0′ S24°16.65 8.3′ 56.0′ 20 117°1.12 46.94 220°45.20 9.8′ 24°33.18 8.1′ 56.0′ 20 117°1.12 46.94 220°45.20 9.8′ 24°33.18 8.1′ 56.0′ 21 132°1.25 · 45.98 235°14.00 9.7′ 24°41.27 8.0′ 56.1′ 22 147°1.38 45.02 249°42.68 9.6′ 24°49.25 7.9′ 56.1′ 22 147°1.38 45.02 249°42.68 9.6′ 24°49.25 7.9′ 56.1′ 22 207°1.91 41.18 307°36.32 9.1′ 25°19.96 7.4′ 56.2′ 2 207°1.91 41.18 307°36.32 9.1′ 25°19.96 7.4′ 56.2′ 2 207°1.91 41.18 307°36.32 9.1′ 25°19.96 7.4′ 56.2′ 2 207°2.44 S06°37.34 5°28.23 8.7′ S25°48.68 6.9′ 56.3′ 4 237°2.17 39.26 336°32.49 8.9′ 25°37.33 7.2′ 56.3′ 56.2′ 2 20°2.44 S06°37.34 5°28.23 8.7′ S25°48.68 6.9′ 56.3′ 7 282°2.57 36.38 19°55.94 8.6′ 25°55.55 6.7′ 56.3′ 3 222°2.44 · 34.46 48°51.03 8.4′ 26°8.88 6.5′ 56.4′ 9 312°2.84 · 34.46 48°51.03 8.4′ 26°8.88 6.5′ 56.4′ 10 327°2.97 33.50 63°18.42 8.3′ 26°15.34 6.3′ 56.5′ 11 342°3.11 32.54 77°45.70 8.2′ 26°21.67 6.2′ 56.5′ 12 357°3.78 27.73 150°0.54 7.7′ 26°51.26 5.5′ 56.7′ 17 72°3.92 26.77 16°2.77 17 76°1.28 13.38 30.61 106°39.95 8.0′ 26°33.93 5.9′ 56.6′ 17 72°3.92 26.77 16°2.71 77′ 26°51.26 5.5′ 56.7′ 17 72°3.92 26.77 16°2.71 77′ 26°51.26 5.5′ 56.7′ 17 72°3.92 26.77 16°2.71 77′ 26°51.26 5.5′ 56.7′ 17 72°3.92 26.77 16°2.71 77′ 26°51.26 5.5′ 56.7′ 17 72°3.92 26.77 156°2.77 17 70′ 26°51.26 5.5′ 56.7′ 17 72°3.92 26.77 156°2.77 17 76°2.20 4.6′ 56.5′ 56.5′ 17 72°3.92 26.77 16°2.71 77′ 26°51.26 5.5′ 56.7′								
8								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	9	311°59.68	• • 57.48	61°21.35	11.0'	$22^{\circ}56.83$	9.3'	55.7'
12								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
14								
16 57°0.59 50.78 162°48.95 10.2' 23°59.67 8.5' 55.9' 17 72°0.72 49.82 177°18.18 10.1' 24°8.21 8.4' 55.9' 18 87°0.85 S06°48.86 191°47.29 10.0' S24°16.65 8.3' 56.0' 19 102°0.98 47.90 206°16.30 9.9' 24°24.97 8.2' 56.0' 20 117°1.12 46.94 220°45.20 9.8' 24°33.18 8.1' 56.0' 21 132°1.25 ··· 45.98 235°14.00 9.7' 24°41.27 8.0' 56.1' 22 147°1.38 45.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 23 162°1.51 44.06 264°11.25 9.5' 24°57.11 7.7' 56.1' Sun GHA Dec GHA ν Dec d HP 0 177°1.64 S06°43.10 278°39.72 9.4' S25°4.84 7.6' 56.2' 1 192°1.77 42.14 293°8.08 9.2' 25°12.46 7.5' 56.2' 2 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.2' 3 222°2.04 ··· 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 S06°37.34 5°28.23 8.7' S25°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 ··· 34.46 48°51.03 8.4' 26°8.88 6.5' 56.5' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 S06°31.58 92°12.88 8.1' S26°2.787 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 14 27°3.51 29.65 121°6.91 7.9' 26°33.94 5.8' 56.6' 15 42°3.65 ··· 28.69 135°33.78 7.8' 26°45.62 5.5' 56.7' 16 57°3.78 27.73 150°0.54 7.7' 26°51.26 5.5' 56.7' 17 72°3.92 26.77 164°27.19 7.6' 26°51.26 5.5' 56.7' 18 87°4.05 S06°25.80 178°53.75 7.5' S27°2.10 5.2' 56.8' 19 102°4.19 24.84 193°20.20 7.4' 27°7.30 5.1' 56.8' 20 117°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'								
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$								
18 87°0.85 S06°48.86 191°47.29 10.0' S24°16.65 8.3' 56.0' 19 102°0.98 47.90 206°16.30 9.9' 24°24.97 8.2' 56.0' 20 117°1.12 46.94 220°45.20 9.8' 24°33.18 8.1' 56.0' 21 132°1.25 · · 45.98 235°14.00 9.7' 24°41.27 8.0' 56.1' 22 147°1.38 45.02 249°42.68 9.6' 24°49.25 7.9' 56.1' 23 162°1.51 44.06 264°11.25 9.5' 24°57.11 7.7' 56.1' SD = 16.1' d = -1.0' SD = 15.1' Sun GHA Dec GHA V Dec d HP 0 177°1.64 S06°43.10 278°39.72 9.4' S25°4.84 7.6' 56.2' 1 192°1.77 42.14 293°8.08 9.2' 25°12.46 7.5' 56.2' 2 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.2' 3 222°2.04 · · 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 233°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 506°37.34 5°28.23 8.7' S25°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 9 312°2.84 · · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 S06°31.58 92°12.88 8.1' S26°27.87 6.1' 56.5' 12 357°3.24 S06°31.58 92°12.88 8.1' S26°27.87 6.1' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 S06°31.58 92°12.88 8.1' S26°27.87 6.1' 56.5' 12 357°3.55 0.2 26.57 11 32°3.8 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 15 42°3.65 · · · 28.69 135°3.78 7.8' 26°45.62 5.6' 56.7' 16°27.378 27.73 150°0.54 7.7' 26°51.26 5.5' 56.7' 16°27.378 27.73 150°0.54 7.7' 26°51.26 5.5' 56.7' 18 87°4.05 S06°25.80 178°53.75 7.5' S27°2.10 5.2' 56.8' 20 117°4.32 23.88 207°46.55 7.3' 27°12.36 4.9' 56.8' 21 132°4.46 · · · 22.91 222°12.81 7.2' 27°17.27 4.8' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°2.03 4.6' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°2.03 4.6' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°2.03 4.6' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°2.03 4.6' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°2.03 4.6' 56.9' 22 147°4.59 21.95 236°38.								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					9.8'	24°33.18		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								
Sun GHA Dec GHA ν Dec d HP 0 177°1.64 \$06°43.10 278°39.72 9.4' \$25°4.84 7.6' 56.2' 1 192°1.77 42.14 293°8.08 9.2' 25°12.46 7.5' 56.2' 2 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.3' 3 222°2.04 · · 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 \$06°37.34 5°28.23 8.7' \$25°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4'	23			204 11.25			1.1	50.1
0 177°1.64 \$06°43.10 278°39.72 9.4' \$25°4.84 7.6' 56.2' 1 192°1.77 42.14 293°8.08 9.2' 25°12.46 7.5' 56.2' 2 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.2' 3 222°2.04 · · 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 \$06°37.34 5°28.23 8.7' \$25°4.86 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5'		SD = 16.1'	d = -1.0'		- SL	0 = 15.1'		
1 192°1.77 42.14 293°8.08 9.2' 25°12.46 7.5' 56.2' 2 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.2' 3 222°2.04 · 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 506°37.34 5°28.23 8.7' 525°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1'	Sun	GHA						HP
2 207°1.91 41.18 307°36.32 9.1' 25°19.96 7.4' 56.2' 3 222°2.04 · · 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 506°37.34 5°28.23 8.7' 525°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1' 226°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0'								
3 222°2.04 ·· 40.22 322°4.46 9.0' 25°27.33 7.2' 56.3' 4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 506°37.34 5°28.23 8.7' 525°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°21.67 6.2' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1' 526°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0'								
4 237°2.17 39.26 336°32.49 8.9' 25°34.57 7.1' 56.3' 5 252°2.31 38.30 351°0.42 8.8' 25°41.69 7.0' 56.3' 6 267°2.44 S06°37.34 5°28.23 8.7' S25°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1' 526°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 14 27°3.51 29.65 121°6.91 7.9'								
6 267°2.44 S06°37.34 5°28.23 8.7' S25°48.68 6.9' 56.3' 7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1' 526°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 14 27°3.51 29.65 121°6.91 7.9' 26°39.84 5.8' 56.6' 15 42°3.65 · 28.69 135°33.78 7.8' 26°45.62 5.6'	4						7.1'	56.3'
7 282°2.57 36.38 19°55.94 8.6' 25°55.55 6.7' 56.4' 8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 S06°31.58 92°12.88 8.1' S26°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 14 27°3.51 29.65 121°6.91 7.9' 26°39.84 5.8' 56.6' 15 42°3.65 · 28.69 135°33.78 7.8' 26°45.62 5.6' 56.7' 16 57°3.78 27.73 150°0.54 7.7' 26°51.26 5.5' 56.7' 18 87°4.05 S06°25.80 178°53.75 7.5'								
8 297°2.71 35.42 34°23.54 8.5' 26°2.28 6.6' 56.4' 9 312°2.84 · · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1' 526°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 14 27°3.51 29.65 121°6.91 7.9' 26°39.84 5.8' 56.6' 15 42°3.65 · 28.69 135°33.78 7.8' 26°45.62 5.6' 56.7' 16 57°3.78 27.73 150°0.54 7.7' 26°51.26 5.5' 56.7' 17 72°3.92 26.77 164°27.19 7.6' 26°56.75 5.3' 56.7' 18 87°4.05 506°25.80 178°53.75 7.5'								
9 312°2.84 · · 34.46 48°51.03 8.4' 26°8.88 6.5' 56.4' 10 327°2.97 33.50 63°18.42 8.3' 26°15.34 6.3' 56.5' 11 342°3.11 32.54 77°45.70 8.2' 26°21.67 6.2' 56.5' 12 357°3.24 506°31.58 92°12.88 8.1' 526°27.87 6.1' 56.5' 13 12°3.38 30.61 106°39.95 8.0' 26°33.93 5.9' 56.6' 14 27°3.51 29.65 121°6.91 7.9' 26°39.84 5.8' 56.6' 15 42°3.65 · 28.69 135°33.78 7.8' 26°45.62 5.6' 56.7' 16 57°3.78 27.73 150°0.54 7.7' 26°51.26 5.5' 56.7' 17 72°3.92 26.77 164°27.19 7.6' 26°56.75 5.3' 56.7' 18 87°4.05 506°25.80 178°53.75 7.5' 527°2.10 5.2' 56.8' 19 102°4.19 24.84 193°20.20 7.4' </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
17 72°3.92 26.77 164°27.19 7.6' 26°56.75 5.3' 56.7' 18 87°4.05 \$06°25.80 178°53.75 7.5' \$27°2.10 5.2' 56.8' 19 102°4.19 24.84 193°20.20 7.4' 27°7.30 5.1' 56.8' 20 117°4.32 23.88 207°46.55 7.3' 27°12.36 4.9' 56.8' 21 132°4.46 · · 22.91 222°12.81 7.2' 27°17.27 4.8' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'	15	42°3.65	• • 28.69	135°33.78	7.8'	$26^{\circ}45.62$	5.6'	56.7'
18 87°4.05 \$06°25.80 178°53.75 7.5' \$27°2.10 5.2' 56.8' 19 102°4.19 24.84 193°20.20 7.4' 27°7.30 5.1' 56.8' 20 117°4.32 23.88 207°46.55 7.3' 27°12.36 4.9' 56.8' 21 132°4.46 · · 22.91 222°12.81 7.2' 27°17.27 4.8' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'								
19 102°4.19 24.84 193°20.20 7.4' 27°7.30 5.1' 56.8' 20 117°4.32 23.88 207°46.55 7.3' 27°12.36 4.9' 56.8' 21 132°4.46 22.91 222°12.81 7.2' 27°17.27 4.8' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'								
20 117°4.32 23.88 207°46.55 7.3' 27°12.36 4.9' 56.8' 21 132°4.46 22.91 222°12.81 7.2' 27°17.27 4.8' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'								
21 132°4.46 · · · 22.91 222°12.81 7.2' 27°17.27 4.8' 56.9' 22 147°4.59 21.95 236°38.96 7.1' 27°22.03 4.6' 56.9' 23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'								
23 162°4.73 20.99 251°5.02 7.0' 27°26.63 4.5' 56.9'	21	132°4.46	• • 22.91	222°12.81	7.2'	$27^{\circ}17.27$	4.8'	56.9'
SD = 16.1' d = -1.0' $SD = 15.3'$	23			251° 5.02			4.5'	56.9'
		SD = 16.1'	d = -1.0'		SD	0 = 15.3'		

	Twi	light			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	05:03	06:21	07:29	16:57	18:06	19:24
N 70°	05:08	06:19	07:20	17:05	18:07	19:18
68°	05:13	06:17	07:13	17:12	18:09	19:13
66°	05:17	06:16	07:07	17:18	18:10	19:09
64°	05:20	06:15	07:02	17:23	18:11	19:06
62°	05:22	06:14	06:58	17:27	18:12	19:03
60°	05:25	06:13	06:54	17:31	18:13	19:01
N 58°	05:26	06:12	06:51	17:34	18:14	18:59
56°	05:28	06:11	06:48	17:37	18:14	18:58
54°	05:29	06:10	06:45	17:40	18:15	18:56
52°	05:30	06:09	06:43	17:42	18:16	18:55
50°	05:31	06:08	06:40	17:44	18:17	18:54
45°	05:32	06:06	06:35	17:49	18:19	18:53
N 40°	05:33	06:04	06:31	17:53	18:20	18:52
35°	05:33	06:02	06:28	17:57	18:22	18:52
30°	05:33	06:00	06:24	18:00	18:24	18:52
20°	05:31	05:57	06:19	18:06	18:28	18:53
$N 10^{\circ}$	05:28	05:52	06:14	18:11	18:32	18:56
0°	05:24	05:48	06:09	18:15	18:36	19:00
S 10°	05:18	05:42	06:04	18:20	18:41	19:06
20°	05:10	05:36	05:58	18:25	18:48	19:14
30°	04:59	05:28	05:52	18:32	18:56	19:24
35°	04:52	05:22	05:48	18:35	19:01	19:31
40°	04:44	05:16	05:44	18:39	19:07	19:40
45°	04:33	05:09	05:39	18:44	19:14	19:50
S 50°	04:19	05:00	05:33	18:50	19:23	20:03
52°	04:13	04:55	05:30	18:53	19:27	20:10
54°	04:05	04:50	05:27	18:56	19:32	20:17
56°	03:57	04:45	05:24	18:59	19:37	20:26
58°	03:47	04:39	05:20	19:02	19:44	20:35
S 60°	03:35	04:32	05:16	19:06	19:50	20:46
Lat		Moonris	e		Moonset	t .

Lat.		Moonris	e		Moonset	t
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	03:22			04:16		
N 70°	01:56			05:43		
68°	01:18			06:23		
66°	00:51	03:06		06:50	06:12	
64°	00:31	02:25	05:08	07:12	06:54	05:57
62°	00:15	01:57	03:52	07:29	07:22	07:13
60°	00:01	01:36	03:17	07:43	07:44	07:49
N 58°		01:19	02:51	07:56	08:02	08:15
56°		01:04	02:31	08:06	08:18	08:36
54°		00:52	02:14	08:16	08:31	08:53
52°		00:41	02:00	08:24	08:42	09:08
50°		00:31	01:47	08:32	08:52	09:21
45°		00:11	01:22	08:48	09:14	09:47
N 40°	23:54		01:01	09:02	09:31	10:08
35°	23:41		00:44	09:13	09:46	10:26
30°	23:29		00:30	09:23	09:59	10:41
20°	23:08		00:05	09:41	10:21	11:07
N 10°	22:51	23:44		09:56	10:40	11:29
0°	22:35	23:25		10:10	10:58	11:50
S 10°	22:18	23:05	23:57	10:25	11:16	12:11
20°	22:01	22:44	23:34	10:40	11:35	12:34
30°	21:42	22:20	23:07	10:58	11:58	13:00
35°	21:30	22:06	22:51	11:08	12:11	13:15
40°	21:17	21:50	22:32	11:20	12:26	13:33
45°	21:02	21:31	22:10	11:35	12:45	13:55
S 50°	20:43	21:07	21:42	11:52	13:07	14:23
52°	20:34	20:56	21:28	12:00	13:18	14:36
54°	20:24	20:43	21:12	12:09	13:31	14:52
56°	20:13	20:28	20:53	12:20	13:45	15:10
58° S 60°	20:01	20:11	20:30	12:32	14:02	15:33
3 60°	19:46	19:49	20:00	12:46	14:23	16:03

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-57%
01	12:18	12:12	12:12	03:59	16:22	
02	12:06	12:00	12:12	04:46	17:11	
03	11.53	11.47	12.12	05:37	18.05	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	162° 14.84	199°22.04 \$15°31.45	204°12.53 \$17°17.96	122°33.80 N14°31.47	179°49.82 \$09°13.01	SHA
1	177° 17.30	214°21.43 30.56	219°13.05 17.40	137°35.83 31.61	194°52.00 12.90	Alpheratz 357°35.86
2	192° 19.76	229°20.82 29.66	234°13.57 16.84	152°37.87 31.75	209°54.18 12.79	Ankaa 353°8.20
3	207°22.23	244°20.21 · · 28.76	249°14.09 · · 16.28	167°39.90 · · 31.90	224°56.36 · · 12.67	Schedar 349° 32.39
4	222°24.69	259°19.60 27.87	264°14.61 15.72	182°41.93 32.04	239°58.53 12.56	Diphda 348°48.29
5	237°27.16	274°18.99 26.97	279°15.13 15.16	197°43.97 32.18	255°0.71 12.45	Achernar 335°21.11
6	252°29.62	289°18.38 \$15°26.07	294°15.65 \$17°14.60	212°46.00 N14°32.33	270°2.89 S09°12.33	Hamal 327° 52.23
7	267°32.09	304°17.77 25.17	309°16.17 14.04	227°48.03 32.47	285°5.07 12.22	Polaris 314° 36.71
8	282°34.55	319°17.16 24.27	324°16.69 13.48	242°50.07 32.61	300°7.24 12.11	Acamar 315°12.49
9	297°37.01	334°16.55 · · 23.37	339°17.21 · · 12.92	257°52.10 · · 32.76	315°9.42 · · 11.99	Menkar 314°7.03
10	312°39.48	349°15.95 22.47	354°17.74 12.36	272°54.13 32.90	330°11.60 11.88	Mirfak 308°29.46
11	327°41.94	4°15.34 21.56	9°18.26 11.80	287°56.16 33.04	345°13.77 11.77	Aldebaran 290°40.45
12	342° 44.41	19°14.73 \$15°20.66	24°18.78 \$17°11.24	302°58.19 N14°33.19	0°15.95 S 09°11.65	Rigel 281°4.51
13	357° 46.87	34°14.13 19.76	39°19.30 10.68	318°0.23 33.33	15°18.13 11.54	Capella 280°22.88
14	12°49.33	49° 13.52 18.85	54°19.82 10.12	333°2.26 33.47	30°20.31 11.43	Bellatrix 278°23.59
15	27°51.80	64°12.91 · · 17.95	69°20.35 · · 9.55	348°4.29 · · 33.62	45°22.48 ·· 11.31	Elnath 278° 2.70 Alnilam 275° 38.38
16	42°54.26	79°12.31 17.04	84°20.87 8.99	3°6.32 33.76	60°24.66 11.20	Betelgeuse 270°52.76
17	57° 56.73	94°11.70 16.13	99°21.39 8.43	18°8.35 33.90	75°26.84 11.09	Canopus 263°52.51
18	72°59.19	109°11.10 S15°15.23	114°21.92 \$17°7.86	33°10.38 N14°34.05	90°29.02 S 09°10.97	Sirius 258°26.71
19	88°1.66	124°10.50 14.32	129°22.44 7.30	48°12.41 34.19	105°31.19 10.86	Adhara 255° 6.23
20	103°4.12	139°9.89 13.41	144°22.96 6.74	63°14.44 34.34	120°33.37 10.75	Procyon 244°51.36
21	118°6.58	154°9.29 · · 12.50	159°23.49 · · 6.17	78°16.47 · · 34.48	135°35.55 · · 10.63	Pollux 243°17.92
22	133°9.05	169°8.69 11.59	174°24.01 5.61	93°18.50 34.62	150° 37.73 10.52	Avior 234°14.56
23	148°11.51	184°8.09 10.67	189°24.53 5.04	108°20.53 34.77	165°39.90 10.41	Suhail 222° 46.46
Mer r	pass. 13:09	ν-0.6' d-0.9' m-3.88	ν0.5' d-0.6' m1.26	ν2.0' d0.1' m-2.17	ν2.2' d-0.1' m0.97	Miaplacidus 221°37.65
- IVICI.P	7433. 13.03	ν σ.σ u σ.σ m σ.σσ				Alphard 217°48.15
						Regulus 207°34.87
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.16
0	163° 13.98	199°7.49 \$15°9.76	204°25.06 \$17°4.48	123°22.56 N14°34.91	180°42.08 S 09°10.29	Denebola 182°25.35
1	178° 16.44	214°6.88 8.85	219°25.58 3.91	138°24.59 35.06	195°44.26 10.18	Gienah 175°44.01
2	193° 18.90	229°6.28 7.94	234°26.11 3.35	153°26.62 35.20	210°46.44 10.07	Acrux 173°0.30
3	208°21.37	244°5.68 · · 7.02	249°26.63 · · 2.78	168°28.65 · · 35.34	225°48.61 · · 9.95	Gacrux 171°51.94
4	223°23.83	259°5.08 6.11	264°27.15 2.21	183°30.68 35.49	240° 50.79 9.84	Alioth 166°13.06
5	238°26.30	274°4.49 5.19	279°27.68 1.65	198°32.70 35.63	255°52.97 9.73	Spica 158°22.80
6	253°28.76	289°3.89 \$15°4.27	294°28.20 \$17°1.08	213°34.73 N14°35.78	270°55.15 S09°9.61	Alkaid 152° 52.18
7	268°31.23	304°3.29 3.36	309°28.73 17°0.51	228°36.76 35.92	285°57.32 9.50	Hadar 148° 36.62
8	283°33.69	319°2.69 2.44	324°29.26 16°59.94	243°38.79 36.06	300°59.50 9.39	Menkent 147° 58.21
9	298°36.15	334°2.09 · · 1.52	339°29.78 · · 59.38	258°40.82 · · 36.21	316°1.68 · · 9.27	Arcturus 145°48.34
10	313°38.62	349°1.50 15°0.60	354°30.31 58.81	273°42.84 36.35	331°3.86 9.16	Rigil Kent. 139°40.93
11	328° 41.08	4°0.90 14°59.68	9°30.83 58.24	288°44.87 36.50	346°6.03 9.05	Kochab 137°19.13
12	343°43.55	19°0.30 \$14°58.76	24°31.36 \$16°57.67	303°46.90 N14°36.64	1°8.21 S09°8.93	Zuben'ubi 136°56.64
13	358° 46.01	33°59.71 57.84	39°31.88 57.10	318°48.92 36.79	16°10.39 8.82	Alphecca 126°4.21
14	13° 48.48	48°59.11 56.91	54°32.41 56.53	333°50.95 36.93	31°12.57 8.71	Antares 112°16.67
15	28° 50.94	63°58.52 · · 55.99	69°32.94 · · 55.96	348°52.98 · · 37.08	46°14.74 · · 8.59	Atria 107°11.57
16	43°53.40 58°55.87	78°57.93 55.07 93°57.33 54.14	84°33.46 55.39 99°33.99 54.82	3°55.00 37.22	61°16.92 8.48	Sabik 102°3.62
17 18	73°58.33	93°57.33 54.14 108°56.74 \$14°53.22	99°33.99 54.82 114°34.52 \$16°54.25	18°57.03 37.36 33°59.06 N14°37.51	76°19.10 8.37 91°21.28 S09°8.25	Shaula 96° 11.40
19	73 36.33 89°0.80	100 50.74 514 53.22 123°56.15 52.29	129°35.04 53.68	49°1.08 37.65	106°23.45 8.14	Rasalhague 95°59.26
20	104°3.26	138°55.55 51.36	144°35.57 53.11	64°3.11 37.80	121°25.63 8.03	Eltanin 90° 42.65
21	119°5.72	153°54.96 · · 50.44	159°36.10 · · 52.54	79°5.13 · · 37.94	136°27.81 · · 7.91	Kaus Aust. 83°33.59
22	134°8.19	168°54.37 49.51	174°36.63 51.96	94°7.16 38.09	151°29.99 7.80	Vega 80°33.88
23	149° 10.65	183°53.78 48.58	189°37.15 51.39	109°9.18 38.23	166°32.17 7.69	Nunki 75°48.81
						Altair 62°0.87
Mer.p	bass. 13:05	ν -0.6′ <i>d</i> -0.9′ m-3.88	$ u 0.5' \ d$ -0.6' m1.26	$ u 2.0' \ d0.1' \ \text{m-}2.16$	$ u 2.2' \ d$ -0.1' m0.98	Peacock 53°7.27
						Deneb 49°26.68
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.80
0	164° 13.12	198°53.19 \$14°47.65	204°37.68 \$16°50.82	124°11.21 N14°38.38	181°34.34 \$09°7.57	Al Na'ir 27° 34.22
1	179° 15.58	213°52.60 46.72	219°38.21 50.25	139°13.23 38.52	196°36.52 7.46	Fomalhaut 15° 15.64
2	194° 18.05	228°52.01 45.79	234°38.74 49.67	154°15.26 38.67	211°38.70 7.35	Scheat 13°46.26 Markab 13°30.93
3	209° 20.51	243°51.42 · · 44.86	249°39.27 · · 49.10	169°17.28 · · 38.81	226°40.88 · · 7.23	Markab 13°30.93
4	224° 22.97	258° 50.83 43.92	264°39.80 48.53	184°19.31 38.96	241°43.05 7.12	Mar 04 Mon SHA
5	239°25.44	273°50.24 42.99	279°40.33 47.95	199°21.33 39.10	256°45.23 7.01	Venus 37°7.21
6	254°27.90	288°49.66 S 14°42.06	294°40.85 \$16°47.38	214°23.35 N14°39.25	271°47.41 S 09°6.89	Mars 41°57.69
7	269°30.37	303°49.07 41.12	309°41.38 46.80	229°25.38 39.39	286° 49.59 6.78	Jupiter 320°18.96
8	284°32.83	318°48.48 40.19	324°41.91 46.23	244°27.40 39.54	301°51.77 6.67	Saturn 17° 34.99
9	299°35.29	333°47.89 · · 39.25	339°42.44 · · 45.65	259°29.42 · · 39.68	316°53.94 · · 6.55	May 05 To-
10	$314^{\circ}37.76$	348°47.31 38.31	354°42.97 45.08	274°31.45 39.83	331°56.12 6.44	Mar 05 Tue SHA
11	$329^{\circ}40.22$	3°46.72 37.38	9°43.50 44.50	289°33.47 39.97	346°58.30 6.33	Venus 35°53.51
12	344° 42.69	18°46.14 S 14°36.44	24°44.03 \$16°43.93	304°35.49 N14°40.12	2°0.48 S 09°6.21	Mars 41°11.08 Jupiter 320°8.58
13	$359^{\circ}45.15$	33°45.55 35.50	39°44.56 43.35	319°37.52 40.26	17°2.65 6.10	Jupiter 320°8.58 Saturn 17°28.10
14	14°47.62	48°44.97 34.56	54°45.09 42.77	334°39.54 40.41	32°4.83 5.99	Jatum 17 20.10
15	29°50.08	63°44.39 · · 33.62	69°45.62 · · 42.20	349°41.56 · · 40.56	47°7.01 · · 5.88	Mar 06 Wed SHA
16	44°52.54	78°43.80 32.68	84°46.15 41.62	4°43.58 40.70	62°9.19 5.76	Venus 34° 40.07
17	59°55.01	93°43.22 31.74	99°46.68 41.04	19°45.60 40.85	77°11.37 5.65	Mars 40°24.57
18	74° 57.47	108°42.64 \$14°30.79	114°47.21 \$16°40.46	34°47.63 N14°40.99	92°13.54	Jupiter 319°58.09
19	89°59.94	123°42.06 29.85	129°47.75 39.89	49°49.65 41.14	107° 15.72 5.42	Saturn 17°21.23
20	105°2.40	138°41.47 28.91	144°48.28 39.31	64°51.67 41.28	122°17.90 5.31	Horizontal parallax
21	120°4.86	153°40.89 · · 27.96	159°48.81 · · 38.73	79°53.69 · · 41.43	137°20.08 · · 5.20	Venus:
22	135°7.33	168° 40.31 27.02	174°49.34 38.15	94°55.71 41.57	152°22.26 5.08	Mars:
23	150°9.79	183°39.73 26.07	189°49.87 37.57	109°57.73 41.72	167°24.43 4.97	iviai5.
Mer.p	bass. 13:01	ν-0.6′ d-0.9′ m-3.88	$ u 0.5' \ d\text{-}0.6' \ \text{m}1.25$	ν2.0′ d0.1′ m-2.16	ν2.2′ d-0.1′ m0.99	

Dec 29°13.34 -42°10.68 56°40.22 -17°51.43 $\text{-}57^{\circ}7.09$ $23^{\circ}34.57$ $89^{\circ}22.24$ -40°12.72 4°10.97 49°56.95 16°33.45 -8°10.56 $46^{\circ}1.47$ $6^{\circ}22.23$ 28°37.71 -1°11.29 $7^{\circ}24.63$ -52°42.74 -16°45.11 -29°0.48 5°9.71 27°58.09 -59°35.36 -43°31.93 -69°49.07 -8°45.90 11°50.87 $61^{\circ}37.19$ $14^{\circ}26.10$ -17°40.63 $\textbf{-63}^{\circ}13.90$ -57°14.85 55°49.52 -11°17.33 49°11.30 -60°29.21 -36°29.28 $19^{\circ}3.18$ -60°55.93 $74^{\circ}3.02$ $-16^{\circ}8.58$ 26°37.72 -26°29.12 -69°3.99 -15°45.35 $\text{-37}^{\circ}\text{7.20}$ $12^{\circ}32.31$ 51°28.74 -34°22.35 38°48.01 -26°16.02 8°55.71 -56°39.38 $45^{\circ}21.71$ $9^{\circ}58.96$ -46°50.72 -29°29.80 28°12.69 15°19.96 Mer.pass 10:43 10:23 15:48 11:59 Mer.pass 10:44 10:22 15:44 11:55 Mer.pass 10:45 10:21 15:41 11:52

 $0.1 \\ 0.1$

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°4.87	S06°20.02	265°30.99	6.9'	\$27°31.09	4.3'	57.0'
1 2	192°5.00 207°5.14	19.06 18.10	279°56.85 294°22.63	6.8' 6.7'	27°35.39 27°39.53	4.1' 4.0'	57.0' 57.0'
3	222°5.28	17.13	308°48.30	6.6'	27°43.52	3.8'	57.1
4	237°5.42	16.17	323° 13.89	6.5'	27°47.36	3.7'	57.1'
5 6	252°5.55 267°5.69	15.21 \$06° 14.24	337°39.39 352°4.80	6.4' 6.3'	27°51.03 \$27°54.54	3.5' 3.4'	57.2' 57.2'
7	282°5.83	13.28	6°30.12	6.2'	27°57.89	3.4	57.2
8	297°5.97	12.31	$20^{\circ}55.35$	6.1'	$28^{\circ}1.08$	3.0'	57.3'
9 10	312°6.11 327°6.24	• • 11.35	35°20.50 49°45.56	6.1' 6.0'	28° 4.11 28° 6.97	2.9' 2.7'	57.3'
10	327 6.24 342°6.38	10.38 9.42	64° 10.54	5.9'	28 0.97 28° 9.67	2.7	57.3' 57.4'
12	357°6.52	S06°8.45	78°35.44	5.8'	S28°12.20	2.4'	57.4'
13	12°6.66	7.49	93°0.27	5.7'	28°14.56 28°16.75	2.2'	57.5'
14 15	27°6.80 42°6.94	6.52 •• 5.55	107°25.01 121°49.68	5.7' 5.6'	28° 16.75 28° 18.77	2.0' 1.9'	57.5' 57.5'
16	57°7.08	4.59	136° 14.27	5.5'	28°20.62	1.7'	57.6'
17	72°7.22	3.62	150°38.79	5.4'	28°22.30	1.5'	57.6'
18 19	87°7.36 102°7.50	\$06°2.66 1.69	165°3.24 179°27.62	5.4' 5.3'	\$28°23.81 28°25.14	1.3' 1.2'	57.6' 57.7'
20	117°7.64	06°0.72	193°51.93	5.2'	28°26.29	1.0'	57.7'
21	132°7.78	$05^{\circ}59.76$	$208^{\circ}16.18$	5.2'	28°27.27	0.8'	57.8'
22	147°7.92	58.79	222°40.36 237°4.48	5.1'	28°28.07	0.6'	57.8'
23	162°8.06	57.82	231 4.48	5.1'	28°28.70	0.4'	57.8'
	SD = 16.1'	d = -1.0'		SI	O = 15.5'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°8.20	S05°56.86	251°28.55	5.0'	\$28°29.14	0.3'	57.9'
1 2	192°8.34 207°8.48	55.89 54.92	265°52.55 280°16.50	4.9' 4.9'	28°29.41 28°29.49	0.1' -0.1'	57.9' 58.0'
3	222°8.62	• • 53.95	294°40.39	4.8'	28°29.40	-0.1	58.0'
4	237°8.77	52.99	309°4.24	4.8'	28°29.12	-0.5'	58.0'
5 6	252°8.91 267°9.05	52.02 \$05° 51.05	323°28.03 337°51.78	4.7' 4.7'	28°28.66 \$28°28.01	-0.6' -0.8'	58.1' 58.1'
7	282° 9.19	50.08	352° 15.48	4.7'	28°27.19	-1.0'	58.1
8	297°9.33	49.11	6°39.13	4.6'	28°26.17	-1.2'	58.2'
9	312°9.48	• • 48.15	21°2.75	4.6'	28°24.97	-1.4'	58.2'
10 11	327°9.62 342°9.76	47.18 46.21	35°26.33 49°49.87	4.5' 4.5'	28°23.59 28°22.02	-1.6' -1.8'	58.3' 58.3'
12	357°9.91	S05°45.24	64°13.37	4.5'	S28°20.26	-1.9'	58.3'
13	12°10.05 27°10.19	44.27	78°36.85 93°0.29	4.4'	28°18.32 28°16.19	-2.1' -2.3'	58.4'
14 15	42°10.19	43.30 •• 42.33	93 0.29 107°23.70	4.4' 4.4'	28 10.19 28°13.86	-2.5'	58.4' 58.5'
16	57°10.48	41.36	121°47.09	4.4'	28°11.36	-2.7'	58.5'
17	72°10.62	40.39 \$05°39.42	136°10.46	4.3'	28° 8.66 \$28° 5.77	-2.9'	58.5'
18 19	87°10.77 102°10.91	38.45	150°33.81 164°57.13	4.3' 4.3'	528°5.77 28°2.69	-3.1' -3.3'	58.6' 58.6'
20	117°11.06	37.48	179°20.44		27°59.43	-3.5'	58.7'
21	132°11.20	• • 36.51	193° 43.74	4.3'	27°55.97	-3.6'	58.7'
22 23	147°11.34 162°11.49	35.54 34.57	208°7.02 222°30.29	4.3' 4.3'	27°52.33 27°48.49	-3.8' -4.0'	58.7' 58.8'
23	SD = 16.1'	d = -1.0'			O = 15.8'	-4.0	30.0
				<u> </u>			
Wed	GHA 177°11.63	Dec \$05° 33.60	GHA 236° 53.56	ν	Dec \$27°44.47	d 4.2'	HP
0 1	177°11.63 192°11.78	32.63	230°53.56 251°16.82	4.3' 4.3'	27°44.47 27°40.25	-4.2' -4.4'	58.8' 58.9'
2	207°11.93	31.66	265°40.07	4.3'	27°35.85	-4.6'	58.9'
3 4	222°12.07 237°12.22	· · 30.69 29.72	280°3.33 294°26.58	4.3' 4.3'	27°31.25 27°26.46	-4.8' -5.0'	58.9' 59.0'
5	252°12.36	28.75	308° 49.84	4.3'	27°21.49	-5.0 -5.2'	59.0'
6	267°12.51	S05°27.78	323°13.11	4.3'	S27°16.32	-5.4'	59.1'
7	282°12.66 297°12.80	26.81 25.84	337°36.38 351°59.66	4.3' 4.3'	27°10.97 27°5.43	-5.5' -5.7'	59.1' 59.1'
8 9	297°12.80 312°12.95	25.84	351°59.66 6°22.96	4.3'	27°5.43 26°59.69	-5.7° -5.9'	59.1° 59.2'
10	327°13.10	23.89	20°46.27	4.3'	$26^{\circ}53.77$	-6.1'	59.2'
11	342°13.24 357°13.39	22.92 \$05°21.95	35°9.59	4.3'	26°47.66	-6.3'	59.2'
12 13	357°13.39 12°13.54	20.98	49°32.93 63°56.30	4.4' 4.4'	\$26°41.37 26°34.88	-6.5' -6.7'	59.3' 59.3'
14	27°13.68	20.00	78° 19.68	4.4'	$26^{\circ}28.21$	-6.9'	59.4'
15	42°13.83	19.03	92°43.09	4.4'	26°21.35	-7.0'	59.4'
16 17	57°13.98 72°14.13	18.06 17.09	107°6.52 121°29.98	4.5' 4.5'	26°14.31 26°7.08	-7.2' -7.4'	59.4' 59.5'
18	87°14.28	S05° 16.11	135°53.47	4.5'	S25°59.67	-7.6'	59.5'
19	102°14.42	15.14	150°17.00	4.6'	25°52.07	-7.8'	59.5'
20 21	117°14.57 132°14.72	14.17 •• 13.19	164° 40.55 179° 4.14	4.6' 4.6'	25°44.29 25°36.33	-8.0' -8.1'	59.6' 59.6'
22	132 14.72 147°14.87	12.22	179 4.14 193°27.77	4.7'	25°28.18	-8.3'	59.0 59.7'
23	162°15.02	11.25	207°51.44	4.7'	25°19.85	-8.5'	59.7'
	SD = 16.1'	d = -1.0'		SI	O = 16.0'	_	

N 72° N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52°	Naut. 04:47 04:55 05:01 05:06 05:10 05:13 05:16 05:18 05:20 05:22 05:23	Civil 06:06 06:06 06:05 06:05 06:05 06:04 06:04 06:04 06:03	07:13 07:06 07:01 06:56 06:52 06:49 06:45	17:11 17:18 17:24 17:28 17:32 17:36 17:38	Civil 18:19 18:19 18:19 18:20 18:20 18:20 18:20	Naut. 19:39 19:31 19:24 19:19 19:15 19:11
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52° 50°	04:55 05:01 05:06 05:10 05:13 05:16 05:18 05:20 05:22	06:06 06:05 06:05 06:05 06:04 06:04 06:04	07:06 07:01 06:56 06:52 06:49 06:45	17:18 17:24 17:28 17:32 17:36 17:38	18:19 18:19 18:20 18:20 18:20	19:31 19:24 19:19 19:15 19:11
68° 66° 64° 62° 60° N 58° 56° 54° 52° 50°	05:01 05:06 05:10 05:13 05:16 05:18 05:20 05:22	06:05 06:05 06:05 06:04 06:04 06:04	07:01 06:56 06:52 06:49 06:45	17:24 17:28 17:32 17:36 17:38	18:19 18:20 18:20 18:20	19:24 19:19 19:15 19:11
66° 64° 62° 60° N 58° 56° 54° 52° 50°	05:06 05:10 05:13 05:16 05:18 05:20 05:22	06:05 06:05 06:04 06:04 06:04 06:03	06:56 06:52 06:49 06:45	17:28 17:32 17:36 17:38	18:20 18:20 18:20	19:19 19:15 19:11
64° 62° 60° N 58° 56° 54° 52° 50°	05:10 05:13 05:16 05:18 05:20 05:22	06:05 06:04 06:04 06:04 06:03	06:52 06:49 06:45	17:32 17:36 17:38	18:20 18:20	19:15 19:11
62° 60° N 58° 56° 54° 52° 50°	05:13 05:16 05:18 05:20 05:22	06:04 06:04 06:04 06:03	06:49 06:45	17:36 17:38	18:20	19:11
60° N 58° 56° 54° 52° 50°	05:16 05:18 05:20 05:22	06:04 06:04 06:03	06:45	17:38		
N 58° 56° 54° 52° 50°	05:18 05:20 05:22	06:04 06:03			18:20	
56° 54° 52° 50°	05:20 05:22	06:03	06:43	l		19:08
54° 52° 50°	05:22			17:41	18:20	19:06
52° 50°			06:40	17:44	18:21	19:04
50°	05:23	06:03	06:38	17:46	18:21	19:02
		06:02	06:36	17:48	18:21	19:00
4E0	05:25	06:02	06:34	17:49	18:22	18:59
40	05:27	06:01	06:30	17:53	18:23	18:57
N 40°	05:28	06:00	06:27	17:57	18:24	18:55
35°	05:29	05:58	06:24	17:59	18:25	18:54
30°	05:29	05:57	06:21	18:02	18:26	18:54
20°	05:29	05:54	06:16	18:07	18:29	18:54
N 10°	05:27	05:51	06:12	18:11	18:32	18:56
0°	05:23	05:47	06:08	18:15	18:35	19:00
S 10°	05:18	05:43	06:04	18:19	18:40	19:04
20°	05:11	05:37	05:59	18:23	18:45	19:11
30°	05:01	05:30	05:54	18:28	18:52	19:21
35°	04:55	05:25	05:51	18:31	18:57	19:27
40°	04:47	05:20	05:47	18:35	19:02	19:35
45°	04:37	05:13	05:43	18:39	19:09	19:44
S 50°	04:25	05:05	05:38	18:44	19:17	19:56
52°	04:19	05:01	05:36	18:46	19:20	20:02
54°	04:12	04:57	05:33	18:48	19:25	20:09
56°	04:04	04:52	05:30	18:51	19:29	20:16
58°	03:55	04:46	05:27	18:54	19:35	20:25
S 60°	03:45	04:40	05:24	18:57	19:41	20:35
	33.13					

Lat.		Moonris	e		Moonset	<u> </u>
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°						
62°			07:35			09:40
60°	04:57	06:12	06:44	08:05	08:54	10:30
N 58°	04:20	05:31	06:12	08:42	09:35	11:02
56°	03:54	05:02	05:48	09:08	10:03	11:25
54°	03:33	04:40	05:29	09:29	10:25	11:44
52°	03:16	04:22	05:12	09:47	10:44	12:00
50°	03:01	04:06	04:58	10:02	10:59	12:14
45°	02:31	03:35	04:29	10:32	11:30	12:42
N 40°	02:08	03:11	04:07	10:56	11:54	13:04
35°	01:49	02:51	03:48	11:15	12:14	13:22
30°	01:32	02:34	03:32	11:32	12:31	13:38
20°	01:05	02:05	03:04	12:00	13:00	14:04
N 10°	00:41	01:41	02:41	12:24	13:24	14:27
0°	00:19	01:18	02:19	12:47	13:47	14:48
S 10°	•• ••	00:55	01:57	13:09	14:09	15:09
20°		00:30	01:33	13:34	14:34	15:31
30°		00:02	01:05	14:02	15:02	15:57
35°	23:45		00:49	14:19	15:19	16:12
40° 45°	23:25 23:01		00:30 00:07	14:38	15:38	16:29 16:50
			00:07	15:02	16:01	
S 50°	22:31	23:37		15:33	16:31	17:16
52°	22:15	23:23		15:48	16:46	17:29
54°	21:58	23:06		16:06	17:03	17:43
56°	21:36	22:45	22.50	16:27	17:24	18:00
58°	21:09	22:20	23:58	16:54	17:50	18:20
S 60°	20:30	21:44	23:33	17:33	18:25	18:45

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	46-26%	
04	11:41	11:34	12:12	06:33	19:02		
05	11:27	11:20	12:11	07:32	20:03		
06	11:13	11:06	12:11	08:33	21:04		

h	Aries	Ve	nus	M	ars	Jup	piter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	$165^{\circ}12.26$	$198^{\circ}39.15$	S14°25.13	204°50.40	S16°36.99	124°59.75	N14°41.87	$182^{\circ}26.61$	S09°4.86	Alpheratz	357°35.85	29°13.34
1	180° 14.72	213°38.57	24.18	219°50.94	36.41	140°1.77	42.01	197°28.79	4.74	Ankaa	353°8.20	-42°10.66
2	195° 17.19	228° 37.99	23.23	234°51.47	35.83	155°3.79	42.16	212°30.97	4.63	Schedar	349°32.40	56°40.21
3 4	210° 19.65 225° 22.11	243°37.42	• • 22.28	249°52.00	• • 35.25	170°5.81	• • 42.30	227°33.15 242°35.32	• • 4.52	Diphda	348°48.28	-17°51.42
5	240°24.58	258° 36.84 273° 36.26	21.33 20.38	264°52.53 279°53.07	34.67 34.09	185°7.83 200°9.85	42.45 42.59	242 35.32 257°37.50	4.40 4.29	Achernar	335°21.12	-57°7.07
6	255°27.04	288° 35.68	\$14°19.43	294°53.60	\$16°33.51	215°11.87	N14° 42.74	272°39.68	S09°4.18	Hamal	327°52.23	23°34.57
7	270°29.51	303°35.11	18.48	309°54.13	32.92	230°13.89	42.89	287°41.86	4.07	Polaris	314°37.96	89°22.23
8	285°31.97	318°34.53	17.53	324°54.66	32.34	245°15.91	43.03	302°44.04	3.95	Acamar Menkar	315°12.50 314°7.03	-40°12.72 4°10.97
9	300°34.43	333°33.96	• • 16.58	339°55.20	• • 31.76	260°17.93	• • 43.18	$317^{\circ}46.21$	• • 3.84	Mirfak	308°29.47	4 10.97 49°56.95
10	315°36.90	348°33.38	15.62	354°55.73	31.18	275°19.94	43.32	332°48.39	3.73	Aldebaran	290°40.46	16°33.45
11	330°39.36	3°32.81	14.67	9°56.27	30.59	290°21.96	43.47	347° 50.57	3.61	Rigel	281°4.52	-8°10.56
12	345°41.83	18° 32.23	\$14°13.71	24°56.80	\$16°30.01	305°23.98	N14° 43.62	2°52.75	S09°3.50	Capella	280°22.89	46°1.47
13 14	0° 44.29 15° 46.76	33°31.66 48°31.08	12.76 11.80	39°57.33 54°57.87	29.43 28.84	320°26.00 335°28.02	43.76 43.91	17°54.93 32°57.11	3.39 3.27	Bellatrix	278°23.59	$6^{\circ}22.23$
15	30° 49.22	63°30.51	. 10.84	69°58.40	. 28.26	350°30.03	• • 44.06	47°59.28	3.16	Elnath	278°2.71	28°37.72
16	45°51.68	78° 29.94	9.89	84°58.94	27.68	5°32.05	44.20	63°1.46	3.05	Alnilam	275°38.39	-1°11.29
17	$60^{\circ}54.15$	93°29.37	8.93	99°59.47	27.09	20°34.07	44.35	78°3.64	2.94	Betelgeuse Canopus	270°52.77 263°52.53	7°24.64 -52°42.74
18	75°56.61	108°28.79	S 14°7.97	$115^{\circ}0.01$	S16°26.51	35°36.09	N14°44.49	93°5.82	509°2.82	Sirius	258° 26.72	-32 42.74 -16°45.11
19	90°59.08	123°28.22	7.01	130°0.54	25.92	50°38.10	44.64	108°8.00	2.71	Adhara	255°6.24	-29°0.48
20	106°1.54	138° 27.65	6.05	145°1.08	25.34	65°40.12	44.79	123°10.18	2.60	Procyon	244°51.37	5°9.71
21 22	121°4.00 136°6.47	153°27.08 168°26.51	· · 5.09 4.13	160° 1.61 175° 2.15	· · 24.75 24.16	80°42.14 95°44.15	• • 44.93 45.08	138° 12.35 153° 14.53	· · 2.48 2.37	Pollux	243°17.92	27°58.09
23	150 0.47 151°8.93	183° 25.94	3.17	175 2.15 190° 2.68	23.58	110°46.17	45.23	168° 16.71	2.26	Avior	234°14.58	-59°35.38
							_			Suhail	222°46.46	-43°31.94
Mer.	pass. 12:57	ν -0.6′ d-0	0.9′ m-3.88	ν 0.5′ d-0	0.6′ m1.25	$\nu^{2.0'} d0$.1′ m-2.15	$\nu^{2.2'} d^{-0}$.1′ m0.99	Miaplacidus	221°37.68	-69°49.08
										Alphard	217°48.15 207°34.86	-8°45.91 11°50.87
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	193°41.14	61°37.20
0	166° 11.40	198° 25.37	S 14°2.20	205° 3.22	S16°22.99	125°48.18	N14°45.37	183° 18.89	509°2.15	Denebola	182°25.33	14°26.10
1	181° 13.86	213°24.81	1.24	220°3.76	22.40	140°50.20	45.52	198°21.07	2.03	Gienah	175°44.00	-17°40.64
2	196° 16.32	228°24.24	14° 0.28	235° 4.29	21.82	155°52.22	45.67	213°23.25	1.92	Acrux	173°0.29	-63°13.92
3 4	211° 18.79 226° 21.25	243°23.67 258°23.10	13°59.31 58.34	250° 4.83 265° 5.36	· · 21.23 20.64	170°54.23 185°56.25	•• 45.81 45.96	228°25.42 243°27.60	· · 1.81 1.69	Gacrux	171°51.93	-57°14.87
5	241°23.72	273° 22.54	57.38	280° 5.90	20.04	200°58.26	46.11	258° 29.78	1.58	Alioth	166°13.04	55°49.53
6	256°26.18	288°21.97	\$13°56.41	295° 6.44	S16°19.46	216°0.28	N14° 46.25	273°31.96	S09°1.47	Spica	158°22.78	-11°17.34
7	271°28.65	303°21.40	55.44	310° 6.98	18.88	231°2.29	46.40	288°34.14	1.35	Alkaid	152°52.16 148°36.59	49°11.30 -60°29.23
8	286°31.11	318°20.84	54.48	325°7.51	18.29	246°4.31	46.55	303°36.32	1.24	Hadar Menkent	146 50.59 147°58.18	-00 29.23 -36°29.30
9	301°33.57	333°20.27	•• 53.51	340°8.05	•• 17.70	261°6.32	• • 46.69	318°38.49	• • 1.13	Arcturus	147 30.10 145°48.31	19° 3.18
10	316°36.04	348° 19.71	52.54	355°8.59	17.11	276°8.33	46.84	333°40.67	1.02	Rigil Kent.	139°40.89	-60°55.95
11	331°38.50	3°19.14	51.57	10° 9.13	16.52	291°10.35	46.99	348° 42.85	0.90	Kochab	$137^{\circ}19.07$	$74^{\circ}3.02$
12 13	346° 40.97 1° 43.43	18° 18.58 33° 18.02	\$13°50.60 49.62	25° 9.66 40° 10.20	\$16°15.93 15.34	306°12.36 321°14.38	N14° 47.13 47.28	3°45.03 18°47.21	\$09° 0.79 0.68	Zuben'ubi	136°56.61	$-16^{\circ}8.59$
14	16°45.89	48° 17.46	48.65	55°10.74	14.75	336°16.39	47.43	33°49.39	0.56	Alphecca	126°4.19	26°37.72
15	31° 48.36	63°16.89	• • 47.68	70°11.28	• • 14.16	351°18.40	• • 47.58	48°51.57	. 0.45	Antares	112°16.64	-26°29.13
16	46°50.82	78° 16.33	46.71	85°11.82	13.56	6°20.42	47.72	63°53.74	0.34	Atria Sabik	107°11.50 102°3.59	-69°4.00 -15°45.35
17	61°53.29	93°15.77	45.73	100°12.36	12.97	21°22.43	47.87	78°55.92	0.23	Shaula	96°11.36	-15 45.35 -37°7.21
18	76°55.75		S13°44.76	115°12.89	S16°12.38	36°24.44	N14°48.02	93°58.10	S09°0.11	Rasalhague	95°59.23	12°32.30
19	91°58.21	123°14.65	43.78	130°13.43	11.79	51°26.45	48.16	109°0.28	09°0.00	Eltanin	90°42.61	51°28.74
20	107°0.68 122°3.14	138° 14.09 153° 13.53	42.80 •• 41.83	145°13.97 160°14.51	11.20	66°28.47 81°30.48	48.31 •• 48.46	124°2.46 139°4.64	08°59.89 •• 59.78	Kaus Aust.	83°33.56	-34°22.35
21 22	122 3.14 137°5.61	168° 12.97	40.85	175° 15.05	· · 10.60 10.01	96°32.49	48.61	159 4.04 154°6.82	59.76	Vega	80°33.85	38°48.00
23	152°8.07	183°12.41	39.87	190°15.59	9.42	111°34.50	48.75	169°8.99	59.55	Nunki		-26°16.02
										Altair	62°0.84	8°55.71 -56°39.36
Wer.	pass. 12:53	ν -0.6′ d-1	L.0′ m-3.88	ν 0.5′ d -0).6′ m1.25	ν 2.0' d0	.1′ m-2.15	$\nu^{2.2'} d-0$.1′ m0.99	Peacock Deneb	53°7.23 49°26.66	-50 39.30 45°21.70
										Enif	33°39.78	9°58.96
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°34.20	-46°50.70
0	167° 10.54		\$13°38.89	205°16.13	\$16°8.82	126°36.51		184°11.17		Fomalhaut	15° 15.62	-29°29.79
1	182° 13.00 197° 15.46	213°11.29 228°10.74	37.91	220°16.67	8.23	141°38.53	49.05	199°13.35	59.32 50.31	Scheat	13°46.25	28°12.68
2	197° 15.46 212° 17.93	243° 10.74 243° 10.18	36.93 •• 35.95	235°17.21 250°17.75	7.64 • • 7.04	156°40.54 171°42.55	49.20 •• 49.34	214° 15.53 229° 17.71	59.21 •• 59.10	Markab	13°30.92	15°19.96
4	212 17.93 227°20.39	258° 9.62	34.97	265°18.29	6.45	171 42.55 186°44.56	49.49	244°19.89	58.99	Mar 07 Thu	SHA	Mer.pass
5	242°22.86	273°9.07	33.99	280°18.83	5.85	201°46.57	49.64	259°22.07	58.87	Venus	33°26.89	10:46
6	257°25.32		S13°33.01	295°19.37	\$16°5.26	216°48.58	N14°49.79	274°24.25	S08°58.76	Mars	39°38.15	10:20
7	272°27.78	303°7.96	32.02	310°19.92	4.66	231°50.59	49.93	289°26.43	58.65	Jupiter	319°47.49	15:38
8	287°30.25	318°7.40	31.04	325°20.46	4.07	246°52.60	50.08	304°28.60	58.54	Saturn	17°14.35	11:49
9	302°32.71	333°6.85	• • 30.05	340°21.00	• • 3.47	261°54.61	• • 50.23	319°30.78	• • 58.42	Mar 08 Fri	SHA	Mer.pass
10 11	317°35.18 332°37.64	348°6.29 3°5.74	29.07 28.08	355°21.54 10°22.08	2.87 2.28	276°56.62 291°58.63	50.38 50.52	334°32.96 349°35.14	58.31 58.20	Venus	32°13.98	10:47
12	347°40.10	18°5.19		25°22.62	\$16°1.68	307°0.64		4°37.32	508°58.08	Mars	38°51.82	10:19
13	2° 42.57	33°4.63	26.11	40°23.17	1.08	322°2.65	50.82	19°39.50	57.97	Jupiter	319°36.79	15:35
14	17° 45.03	48°4.08	25.12	55°23.71	16°0.49	337°4.66	50.97	34°41.68	57.86	Saturn	17°7.49	11:45
15	32°47.50	63°3.53	• • 24.13	70°24.25	$15^{\circ}59.89$	352°6.67	•• 51.11	49°43.86	•• 57.75	Mar 09 Sat	SHA	Mer.pass
16	47° 49.96	78°2.98	23.14	85°24.79	59.29	7°8.68	51.26	64°46.04	57.63	Venus	31°1.32	10:48
17	62°52.42	93°2.43	22.15	100°25.34	58.69	22°10.68	51.41	79°48.22	57.52	Mars	38°5.60	10:19
18	77°54.89			115°25.88	\$15°58.09	37°12.69	N14°51.56	94°50.39	\$08°57.41	1	319°25.98	15:31
19 20	92° 57.35 107° 59.82	123°1.33 138°0.78	20.17 19.18	130°26.42 145°26.97	57.49 56.89	52°14.70 67°16.71	51.71 51.85	109° 52.57 124° 54.75	57.30 57.18	Saturn	17°0.64	11:42
21	107 59.62 123°2.28	150 0.76 153° 0.23	19.16	145 20.97 160°27.51	56.30	82°18.72	• • 52.00	139°56.93	• • 57.07	Horizoi	ntal parallax	·
22	138°4.74	167°59.68	17.20	175°28.05	55.70	97°20.73	52.15	154°59.11	56.96		Venus:	0.1
23	153°7.21	182°59.13	16.20	190°28.60	55.10	112°22.73	52.30	170°1.29	56.85		Mars:	0.1
Mer	pass. 12:49	ν-0.6/ d.1	L.0′ m-3.88	ν0 5' d C	0.6′ m1.25	1/2 N/ 4N	.1′ m-2.14	1/2 2/ d. O	.1′ m1.00			
- 14161.	P333. 12.73	- 0.0 u-1				- 2.0 uU	2.17	- Z.Z U-U				

	0.10.0	-0.0023 360		011 -	- +09.1003	. 555	
h	Su	n 	-		Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	177°15.17 192°15.32	\$05° 10.27 9.30	222°15.14 236°38.89	4.7' 4.8'	\$25°11.35 25°2.66	-8.7' -8.9'	59.7' 59.8'
2	207°15.47	8.33	251°2.68	4.8'	24°53.80	-9.0'	59.8'
3	222°15.62	• • 7.35	265°26.51	4.9'	24°44.76	-9.2'	59.8'
4	237°15.77	6.38	279°50.39	4.9'	24°35.54	-9.4'	59.9'
5	252°15.92	5.40	294° 14.32	5.0'	24°26.14	-9.6'	59.9'
6 7	267°16.07 282°16.22	\$05°4.43 3.46	308°38.30 323°2.33	5.0' 5.1'	\$24°16.58 24°6.84	-9.7' -9.9'	59.9' 60.0'
8	297°16.37	2.48	337°26.41	5.1'	24 0.84 23°56.92	-9.9 -10.1'	60.0
9	312°16.52	• • 1.51	351°50.54	5.2'	23°46.84	-10.3'	60.0'
10	327°16.67	05°0.53	6° 14.72	5.2'	23°36.58	-10.4'	60.1'
11	342°16.82 357°16.97	04°59.56	20°38.96	5.3'	23°26.16	-10.6'	60.1'
12 13	357°16.97 12°17.12	\$04°58.58 57.61	35°3.26 49°27.61	5.4' 5.4'	\$23°15.57 23°4.81	-10.8' -10.9'	60.1' 60.2'
14	27°17.27	56.63	63°52.03	5.5'	22°53.89	-10.9	60.2
15	42°17.42	• • 55.66	78° 16.50	5.5'	22°42.81	-11.2'	60.2'
16	57°17.58	54.68	92°41.03	5.6'	22°31.56	-11.4'	60.3'
17	72°17.73	53.71 \$04° 52.73	107°5.62 121°30.28	5.7' 5.7'	22°20.15 \$22°8.59	-11.6'	60.3'
18 19	87°17.88 102°18.03	51.75	121° 30.28 135° 54.99	5.7° 5.8'	21°56.86	-11.7' -11.9'	60.3' 60.4'
20	102 10.03 117°18.18	50.78	150° 19.78	5.8'	21°44.98	-12.0'	60.4
21	132°18.34	• • 49.80	164°44.62	5.9'	21°32.94	-12.2'	60.4'
22	147°18.49	48.83	179°9.53	6.0'	21°20.75	-12.3'	60.5'
23	162°18.64	47.85	193°34.51	6.0'	21°8.41	-12.5'	60.5'
	SD = 16.1'	d = -1.0'		S	D = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°18.79	S04° 46.87	207° 59.55	ν 6.1'	\$20°55.92	-12.6'	60.5'
1	192°18.95	45.90	222°24.66	6.2'	20°43.28	-12.8'	60.5'
2	$207^{\circ}19.10$	44.92	236°49.83	6.2'	$20^{\circ}30.49$	-12.9'	60.6'
3	222°19.25	• • 43.94	251° 15.07	6.3'	20°17.56	-13.1'	60.6'
4 5	237°19.41 252°19.56	42.97 41.99	265° 40.38 280° 5.76	6.4' 6.4'	20°4.48 19°51.26	-13.2' -13.4'	60.6' 60.7'
6	267°19.71	\$04°41.01	280 5.76 294°31.21	6.5	\$19°37.90	-13.4	60.7
7	282°19.87	40.04	308° 56.72	6.6'	19°24.41	-13.6'	60.7
8	297°20.02	39.06	323°22.31	6.7'	$19^{\circ}10.77$	-13.8'	60.7'
9	312°20.18	• • 38.08	337°47.96	6.7'	18°57.00	-13.9'	60.8'
10	327°20.33 342°20.49	37.11	352°13.68 6°39.47	6.8'	18°43.10 18°29.06	-14.0'	60.8'
11 12	342°20.49 357°20.64	36.13 \$04°35.15	6° 39.47 21° 5.33	6.9' 6.9'	518° 14.90	-14.2' -14.3'	60.8' 60.8'
13	12°20.80	34.17	35°31.26	7.0'	18°0.61	-14.4'	60.9
14	27°20.95	33.19	49°57.26	7.1'	17°46.19	-14.5'	60.9'
15	42°21.11	• • 32.22	64°23.33	7.1'	17°31.65	-14.7'	60.9'
16	57°21.26 72°21.42	31.24	78° 49.47 93° 15.67	7.2'	17°16.98 17°2.20	-14.8'	60.9'
17 18	72 21.42 87°21.57	30.26 \$04° 29.28	93 15.67 107°41.95	7.3' 7.3'	\$16°47.30	-14.9' -15.0'	60.9' 61.0'
19	102°21.73	28.30	122°8.29	7.4	16°32.28		61.0'
20	117°21.88	27.33	136°34.70	7.5'	$16^{\circ}17.14$	-15.2'	61.0'
21	132°22.04	• • 26.35	151°1.18	7.5'	16°1.90	-15.4'	61.0'
22	147°22.20	25.37	165°27.72	7.6'	15°46.54	-15.5'	61.0'
23	162°22.35	24.39	179°54.34	7.7'	15°31.07	-15.6'	61.1'
	SD = 16.1'	d = -1.0'		S	D = 16.5'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	$177^{\circ}22.51$	S04°23.41	194°21.02	7.7'	S15°15.50	-15.7'	61.1'
1	192°22.67	22.43	208°47.76	7.8'	14°59.83	-15.8'	61.1'
2	207°22.82 222°22.98	21.45 •• 20.47	223° 14.57 237° 41.45	7.9' 7.9'	14°44.05 14°28.17	-15.9' -16.0'	61.1' 61.1'
3 4	222 22.98 237°23.14	19.49	252°8.39	7.9 8.0'	14 28.17 14°12.19	-16.0 -16.1'	61.1
5	252°23.29	18.52	266° 35.40	8.1'	$13^{\circ}56.12$	-16.2	61.2
6	267°23.45	S04°17.54	281°2.47	8.1'	\$13°39.95	-16.3'	61.2'
7	282°23.61	16.56	295°29.60	8.2'	13°23.69	-16.3'	61.2'
8 9	297°23.77 312°23.93	15.58 •• 14.60	309°56.79 324°24.05	8.3' 8.3'	13°7.34 12°50.91	-16.4' -16.5'	61.2' 61.2'
10	312 23.93 327°24.08	13.62	324 24.05 338°51.37	6.3 8.4'	12°34.38	-10.5 -16.6'	61.2
11	342°24.24	12.64	353° 18.74	8.4'	12°17.78	-16.7'	61.2'
12	357°24.40	S04°11.66	7°46.18	8.5'	S12°1.09	-16.8'	61.3'
13	12°24.56	10.68	22° 13.68	8.6'	11°44.32	-16.8'	61.3'
14 15	27°24.72 42°24.88	9.70 •• 8.72	36°41.23 51°8.84	8.6' 8.7'	11°27.48 11°10.56	-16.9' -17.0'	61.3' 61.3'
16	57°25.03	7.74	65°36.51	8.7'	10.50 10°53.56	-17.0 -17.1'	61.3
17	72°25.19	6.76	80°4.23	8.8'	10°36.50	-17.1'	61.3
18	87°25.35	S04°5.78	94°32.01	8.8'	\$10°19.37	-17.2'	61.3'
19	102°25.51	4.80	108° 59.84	8.9'	10°2.17 09°44.90	-17.3'	61.3'
20 21	117°25.67 132°25.83	3.81 · · 2.83	123°27.72 137°55.65	8.9' 9.0'	09°44.90 09°27.58	-17.3' -17.4'	61.3' 61.3'
21	132 25.83 147°25.99	1.85	157 55.05 152°23.64	9.0' 9.0'	09 27.58 09°10.19	-17.4 -17.4'	61.3
23	162°26.15	0.87	166° 51.67	9.1'	08°52.75	-17.5'	61.3'
	SD = 16.1'	d = -1.0'		S	D = 16.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	04:31	05:51	06:58	17:26	18:33	19:54
N 70°	04:40	05:52	06:53	17:31	18:31	19:44
68°	04:48	05:53	06:48	17:35	18:30	19:36
66°	04:54	05:54	06:45	17:38	18:29	19:29
64°	04:59	05:54	06:42	17:41	18:29	19:24
62°	05:03	05:55	06:39	17:44	18:28	19:20
60°	05:07	05:55	06:37	17:46	18:28	19:16
N 58°	05:10	05:55	06:34	17:48	18:27	19:13
56°	05:13	05:56	06:33	17:50	18:27	19:10
54°	05:15	05:56	06:31	17:51	18:27	19:08
52°	05:17	05:56	06:29	17:53	18:27	19:06
50°	05:18	05:56	06:28	17:54	18:27	19:04
45°	05:22	05:55	06:25	17:57	18:27	19:01
N 40°	05:24	05:55	06:22	18:00	18:27	18:58
35°	05:25	05:54	06:20	18:02	18:27	18:57
30°	05:26	05:54	06:18	18:04	18:28	18:56
20°	05:26	05:52	06:14	18:08	18:30	18:55
N 10°	05:25	05:50	06:11	18:11	18:32	18:56
0°	05:23	05:47	06:07	18:14	18:35	18:59
S 10°	05:18	05:43	06:04	18:17	18:38	19:03
20°	05:12	05:38	06:00	18:21	18:43	19:09
30°	05:04	05:32	05:56	18:25	18:49	19:17
35°	04:58	05:28	05:53	18:27	18:53	19:23
40°	04:51	05:23	05:51	18:30	18:57	19:29
45°	04:42	05:17	05:47	18:33	19:03	19:38
S 50°	04:31	05:10	05:43	18:37	19:10	19:49
52°	04:25	05:07	05:41	18:39	19:13	19:55
54°	04:19	05:03	05:39	18:41	19:17	20:01
56°	04:12	04:59	05:37	18:43	19:21	20:07
58°	04:04	04:54	05:34	18:46	19:26	20:15
S 60°	03:54	04:48	05:31	18:48	19:31	20:24

Lat.		Moonris	е		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°			08:26			15:03
N 70°		09:16	08:02		12:13	15:24
68°		08:27	07:44		13:00	15:40
66°	09:12	07:55	07:29	10:12	13:31	15:53
64°	07:57	07:31	07:17	11:26	13:53	16:03
62°	07:20	07:12	07:06	12:02	14:11	16:12
60°	06:53	06:56	06:57	12:27	14:25	16:20
N 58°	06:32	06:43	06:49	12:47	14:38	16:26
56°	06:15	06:31	06:42	13:04	14:49	16:32
54°	06:00	06:21	06:36	13:18	14:58	16:37
52°	05:48	06:12	06:30	13:30	15:06	16:42
50°	05:36	06:04	06:25	13:41	15:14	16:46
45°	05:13	05:46	06:13	14:04	15:29	16:55
N 40°	04:53	05:32	06:04	14:22	15:42	17:03
35°	04:37	05:20	05:56	14:37	15:53	17:09
30°	04:24	05:09	05:49	14:50	16:03	17:15
20°	04:00	04:50	05:36	15:12	16:19	17:24
N 10°	03:39	04:34	05:25	15:31	16:33	17:33
0°	03:20	04:19	05:15	15:48	16:46	17:40
S 10°	03:00	04:03	05:05	16:06	16:59	17:48
20°	02:39	03:47	04:53	16:24	17:12	17:56
30°	02:15	03:28	04:41	16:45	17:28	18:05
35°	02:01	03:17	04:33	16:58	17:37	18:11
40°	01:44	03:04	04:25	17:12	17:47	18:16
45°	01:24	02:49	04:15	17:28	17:58	18:23
S 50°	00:59	02:30	04:03	17:49	18:12	18:31
52°	00:47	02:21	03:57	17:58	18:19	18:35
54°	00:33	02:11	03:51	18:09	18:26	18:39
56°	00:17	01:59	03:44	18:21	18:34	18:43
58°		01:46	03:36	18:35	18:43	18:48
S 60°		01:31	03:27	18:51	18:54	18:54

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	16-3%	
07	10:59	10:52	12:11	09:34	22:04		
08	10:45	10:37	12:11	10:32	23:00		
09	10:30	10:22	12:10	11:28	23:54		

March 10, 11, 12 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	168°9.67	197°58.58 \$13°15.21	205°29.14 \$15°54.50	127°24.74 N14°52.45	185°3.47	
1	$183^{\circ}12.14$	212°58.04 14.21	220°29.68 53.89	142°26.75 52.59	200°5.65 56.62	Alpheratz 357°35.86 29°13.33 Ankaa 353°8.20 -42°10.65
2	198° 14.60	227°57.49 13.22	235° 30.23 53.29	157°28.75 52.74	215°7.83 56.51	Schedar 349°32.41 56°40.20
3	213° 17.06	242°56.94 · · 12.22	250°30.77 · · 52.69	172°30.76 · · 52.89	230°10.01 · · 56.40	Diphda 348°48.29 -17°51.42
4	228° 19.53	257°56.40 11.23	265°31.32 52.09	187°32.77 53.04	245°12.19 56.28	Achernar 335°21.13 -57°7.06
5 6	243°21.99 258°24.46	272°55.85 10.23 287°55.31 \$13°9.23	280°31.86 51.49 295°32.41 \$15°50.89	202°34.77 53.19 217°36.78 N14°53.34	260°14.37 56.17 275°16.54 \$08°56.06	Hamal 327°52.24 23°34.56
7	273°26.92	302°54.76 8.23	310°32.95 50.29	232°38.79 53.48	290° 18.72 55.95	Polaris 314°39.41 89°22.22
8	288°29.38	317°54.22 7.23	325°33.50 49.68	247°40.79 53.63	305°20.90 55.83	Acamar 315°12.51 -40°12.71
9	303°31.85	332°53.67 · · 6.23	340°34.04 · · 49.08	262°42.80 · · 53.78	320°23.08 · · 55.72	Menkar 314°7.05 4°10.97 Mirfak 308°29.50 49°56.94
10	318°34.31	347°53.13 5.23	355°34.59 48.48	277°44.80 53.93	335°25.26 55.61	Aldebaran 290°40.47 16°33.45
11	333°36.78	2°52.59 4.23	10°35.14 47.87	292°46.81 54.08	350°27.44 55.50	Rigel 281°4.53 -8°10.56
12 13	348°39.24 3°41.70	17°52.04 \$13°3.23 32°51.50 2.23	25°35.68 \$15°47.27 40°36.23 46.67	307°48.81 N14°54.23 322°50.82 54.37	5°29.62 \$08°55.38 20°31.80 55.27	Capella 280°22.92 46°1.48
14	18° 44.17	47°50.96 1.22	55°36.77 46.06	337°52.82 54.52	35°33.98 55.16	Bellatrix 278°23.61 6°22.23
15	33° 46.63	62°50.42 13°0.22	70°37.32 · · 45.46	352°54.83 · · 54.67	50°36.16 · · 55.05	Elnath 278°2.73 28°37.72
16	$48^{\circ}49.10$	77°49.88 12°59.22	85°37.87 44.85	7°56.83 54.82	65°38.34 54.93	Alnilam 275°38.40 -1°11.29 Betelgeuse 270°52.78 7°24.64
17	63°51.56	92°49.34 58.21	100°38.41 44.25	22°58.84 54.97	80°40.52 54.82	Betelgeuse 270°52.78 7°24.64 Canopus 263°52.56 -52°42.75
18	78°54.02	107°48.80 \$12°57.21	115°38.96 \$15°43.64	38°0.84 N14°55.12	95°42.70 S08°54.71	Sirius 258°26.73 -16°45.11
19	93°56.49	122°48.26 56.20	130°39.51 43.04	53°2.85 55.27	110°44.88 54.60	Adhara 255°6.26 -29°0.48
20 21	108°58.95 124°1.42	137°47.72 55.19 152°47.18 • 54.19	145°40.06 42.43 160°40.60 • 41.83	68° 4.85 55.41 83° 6.85 55.56	125°47.06 54.48 140°49.24 • 54.37	Procyon 244°51.38 5°9.71
22	139°3.88	167°46.64 53.18	175°41.15 41.22	98°8.86 55.71	155°51.42 54.26	Pollux 243°17.93 27°58.10
23	154°6.35	182°46.10 52.17	190°41.70 40.61	113°10.86 55.86	170°53.60 54.15	Avior 234°14.61 -59°35.39
_		-	ν0.5' d-0.6' m1.24	ν 2.0' d0.1' m-2.14		Suhail 222°46.48 -43°31.95
ivier.p	pass. 12:45	ν-0.5' d-1.0' m-3.88	νυ.ο α-υ.ο m1.24	ν∠.υ αυ.1 m-2.14	ν2.2' d-0.1' m1.00	Miaplacidus 221°37.71 -69°49.10 Alphard 217°48.16 -8°45.91
						Regulus 207°34.87 11°50.87
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.14 61°37.22
0	169°8.81	197° 45.56	205°42.25 \$15°40.01	128°12.86 N14°56.01	185°55.78	Denebola 182°25.33 14°26.10
1 2	184° 11.27 199° 13.74	212° 45.03 50.15 227° 44.49 49.14	220°42.80 39.40 235°43.34 38.79	143°14.87 56.16 158°16.87 56.31	200°57.96 53.92 216°0.14 53.81	Gienah 175°43.99 -17°40.65
3	214° 16.20	242°43.95 · · 48.13	250°43.89 · · 38.18	173°18.87 · · 56.46	231°2.31 · · 53.70	Acrux 173°0.28 -63°13.94
4	229° 18.67	257° 43.42 47.12	265°44.44 37.58	188°20.87 56.61	246°4.49 53.59	Gacrux 171°51.92 -57°14.88
5	$244^{\circ}21.13$	272°42.88 46.11	280°44.99 36.97	203°22.88 56.75	261°6.67 53.47	Alioth 166°13.02 55°49.54 Spica 158°22.77 -11°17.34
6	259°23.59	287°42.35 \$12°45.09	295°45.54 \$15°36.36	218°24.88 N14°56.90	276°8.85 \$08°53.36	Alkaid 152°52.13 49°11.31
7	274°26.06	302°41.81 44.08	310°46.09 35.75	233°26.88 57.05	291°11.03 53.25	Hadar 148°36.56 -60°29.24
8 9	289°28.52	317°41.28 43.07	325°46.64 35.14	248°28.88 57.20	306° 13.21 53.14	Menkent 147°58.17 -36°29.31
10	304°30.99 319°33.45	332°40.75 · · 42.05 347°40.21 41.04	340°47.19 · · 34.53 355°47.74 33.92	263°30.88 · · 57.35 278°32.89	321°15.39 · · 53.02 336°17.57 52.91	Arcturus 145°48.30 19°3.18
11	334°35.91	2°39.68 40.02	10°48.29 33.31	293°34.89 57.65	351°19.75 52.80	Rigil Kent. 139°40.87 -60°55.96
12	349°38.38	17°39.15 \$12°39.00	25°48.84 \$15°32.70	308°36.89 N14°57.80	6°21.93 \$08°52.69	Kochab 137°19.01 74°3.03 Zuben'ubi 136°56.59 -16°8.60
13	4°40.84	32°38.62 37.99	40°49.39 32.09	323°38.89 57.95	21°24.11 52.58	Zuben'ubi 136°56.59 -16°8.60 Alphecca 126°4.16 26°37.72
14	19°43.31	47°38.08 36.97	55°49.94 31.48	338°40.89 58.10	36°26.29 52.46	Antares 112°16.62 -26°29.13
15	34° 45.77	62°37.55 · · 35.95	70°50.49 · · 30.87	353°42.89 · · 58.24	51°28.47 · · 52.35	Atria 107°11.45 -69°4.00
16 17	49° 48.23 64° 50.70	77°37.02 34.93 92°36.49 33.91	85°51.04 30.26 100°51.59 29.65	8°44.89 58.39 23°46.89 58.54	66°30.65 52.24 81°32.83 52.13	Sabik 102°3.57 -15°45.36
18	79°53.16	107°35.96 S12°32.89	115°52.14 \$15°29.04	23°46.89 58.54 38°48.89 N14°58.69	96°35.01 S08°52.01	Shaula 96°11.34 -37°7.21
19	94°55.63	122°35.43 31.87	130°52.69 28.42	53°50.89 58.84	111°37.19 51.90	Rasalhague 95°59.21 12°32.30
20	109°58.09	137°34.90 30.85	145°53.24 27.81	68°52.89 58.99	126°39.37 51.79	Eltanin 90°42.59 51°28.73 Kaus Aust. 83°33.54 -34°22.35
21	125°0.55	152°34.38 · · 29.83	160°53.80 · · 27.20	83°54.89 · · 59.14	141°41.55 · · 51.68	Vega 80°33.83 38°48.00
22	140°3.02	167°33.85 28.81	175°54.35 26.59	98°56.89 59.29	156°43.73 51.57	Nunki 75°48.76 -26°16.02
23	155°5.48	182°33.32 27.79	190°54.90 25.97	113°58.89 59.44	171°45.91 51.45	Altair 62°0.83 8°55.70
Mer.p	oass. 12:41	ν -0.5 $'$ <i>d</i> -1.0 $'$ m-3.88	$ u 0.5' \ d$ -0.6' m1.24	$ u 2.0' \ d0.1' \ \text{m-}2.14$	$ u 2.2' \ d ext{-}0.1' \ \text{m}1.01$	Peacock 53°7.20 -56°39.36
						Deneb 49°26.64 45°21.69
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.77 9°58.95 Al Na'ir 27°34.19 -46°50.69
0	170°7.95	197°32.79 \$12°26.76	205°55.45 \$15°25.36	129°0.89 N14°59.59	186°48.09 \$08°51.34	Al Na'ir 27°34.19 -46°50.69 Fomalhaut 15°15.62 -29°29.79
1	185° 10.41	212°32.27 25.74	220°56.00 24.75	144°2.89 59.74	201°50.28 51.23	Scheat 13°46.25 28°12.67
2	200° 12.87	227°31.74 24.71	235°56.56 24.13	159°4.88 14°59.89	216°52.46 51.12	Markab 13°30.92 15°19.95
3 4	215° 15.34 230° 17.80	242°31.21 ·· 23.69 257°30.69 22.66	250°57.11 · · 23.52 265°57.66 22.90	174°6.88 15°0.04 189°8.88 0.19	231°54.64 · · 51.01 246°56.82 50.89	Mar 10 Sun SHA Mer.pass
4 5	230 17.80 245°20.27	257 30.09 22.00 272°30.16 21.64	280°58.22 22.29	189°8.88 0.19 204°10.88 0.34	240 50.82 50.89 261°59.00 50.78	Venus 29°48.91 10:48
6	260°22.73	287°29.64 \$12°20.61	295°58.77 \$15°21.67	219°12.88 N15°0.49	277°1.18 S08°50.67	Mars 37°19.47 10:18
7	275°25.19	302°29.11 19.58	310°59.32 21.06	234°14.88 0.64	292°3.36 50.56	Jupiter 319°15.07 15:28
8	290°27.66	317°28.59 18.55	325°59.88 20.44	249°16.87 0.79	307°5.54 50.45	Saturn 16°53.80 11:38
9	305°30.12	332°28.07 · · 17.52	341°0.43 · · 19.83	264°18.87 · · 0.94	322°7.72 · · 50.33	Mar 11 Mon SHA Mer.pass
10	320°32.59 335°35.05	347°27.54 16.49 2°27.02 15.46	356°0.98 19.21 11°1.54 18.59	279°20.87 1.09 294°22.87 1.24	337°9.90 50.22 352°12.08 50.11	Venus 28° 36.76 10:49
11 12	350°37.51	2°27.02 15.46 17°26.50 \$12°14.43	11°1.54 18.59 26°2.09 \$15°17.98	294°22.87 1.24 309°24.86 N15°1.39	352°12.08 50.11 7°14.26 \$08°50.00	Mars 36°33.44 10:17
13	5°39.98	32°25.98 13.40	41°2.65 17.36	324°26.86 1.53	22°16.44 49.89	Jupiter 319°4.05 15:25
14	20° 42.44	47°25.45 12.37	56°3.20 16.74	339°28.86 1.68	37°18.62 49.77	Saturn 16°46.97 11:35
15	35°44.91	62°24.93 · · 11.34	71°3.75 · · 16.13	354°30.85 · · 1.83	52°20.80 · · 49.66	Mar 12 Tue SHA Mer.pass
16	50° 47.37	77°24.41 10.31	86°4.31 15.51	9°32.85 1.98	67°22.98 49.55	Venus 27°24.85 10:50
17	65°49.83	92°23.89 9.27	101°4.86 14.89	24°34.84 2.13	82°25.16 49.44	Mars 35°47.51 10:16
18 19	80° 52.30 95° 54.76	107°23.37 \$12°8.24 122°22.85 7.20	116°5.42 \$15°14.27 131°5.97 13.65	39°36.84 N15°2.28 54°38.84 2.43	97°27.34 \$08°49.33 112°29.52 49.21	Jupiter 318° 52.94 15:22
20	95 54.70 110°57.23	137°22.33 6.17	131 5.97 13.05 146° 6.53 13.04	69°40.83 2.58	112 29.52 49.21 127°31.70 49.10	Saturn 16°40.15 11:31
21	125° 59.69	152°21.82 · · 5.13	161°7.09 · · 12.42	84°42.83 · · 2.73	142°33.89 · · 48.99	Horizontal parallax
22	141°2.15	167°21.30 4.10	176°7.64 11.80	99°44.82 2.88	157°36.07 48.88	Venus: 0.1
23	156°4.62	182°20.78 3.06	191°8.20 11.18	114°46.82 3.03	172°38.25 48.77	Mars: 0.1
Mer.p	pass. 12:37	ν-0.5' d-1.0' m-3.88	ν0.6' d-0.6' m1.24	ν2.0' d0.1' m-2.13	ν2.2' d-0.1' m1.01	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°26.31	S03°59.89	$181^{\circ}19.76$	9.1'	S 08°35.25	-17.6'	61.3'
1	192°26.47	58.91	195°47.89	9.2'	08°17.70	-17.6'	61.4'
2	207°26.63 222°26.79	57.93 •• 56.95	210° 16.06 224° 44.29	9.2' 9.3'	08°0.09 07°42.44	-17.7' -17.7'	61.4' 61.4'
4	237°26.95	55.97	239° 12.56	9.3'	07°24.74	-17.7'	61.4'
5	252°27.11	54.98	253°40.87	9.4'	$07^{\circ}6.99$	-17.8'	61.4'
6	267°27.27	S03°54.00	268°9.22	9.4'	506°49.20	-17.8'	61.4'
7 8	282°27.44 297°27.60	53.02 52.04	282°37.62 297°6.06	9.4' 9.5'	06°31.38 06°13.51	-17.9' -17.9'	61.4' 61.4'
9	312°27.76	• • 51.06	311°34.53	9.5'	05°55.61	-17.9	61.4'
10	327°27.92	50.08	326°3.05	9.6'	$05^{\circ}37.67$	-18.0'	61.4'
11	342°28.08 357°28.24	49.09 \$03°48.11	340°31.60 355°0.18	9.6' 9.6'	05°19.70 \$05°1.70	-18.0'	61.4'
12 13	12°28.40	47.13	9°28.81	9.6 9.7'	04°43.68	-18.0' -18.1'	61.4' 61.4'
14	27°28.57	46.15	23°57.46	9.7'	04°25.62	-18.1	61.3'
15	42°28.73	• • 45.17	38°26.15	9.7'	04°7.55	-18.1'	61.3'
16	57°28.89 72°29.05	44.18 43.20	52°54.87 67°23.62	9.7' 9.8'	03°49.45 03°31.34	-18.1' -18.1'	61.3' 61.3'
17 18	87°29.22	503°42.22	81°52.39	9.8'	503°13.21	-18.1'	61.3
19	102°29.38	41.24	96°21.20	9.8'	02°55.06	-18.2	61.3'
20	117°29.54	40.25	110°50.03	9.9'	02°36.90	-18.2'	61.3'
21	132°29.70	• • 39.27	125° 18.89 139° 47.77	9.9'	02°18.74	-18.2'	61.3'
22 23	147°29.87 162°30.03	38.29 37.30	139° 47.77 154° 16.67	9.9' 9.9'	02°0.56 01°42.38	-18.2' -18.2'	61.3' 61.3'
	SD = 16.1'	d = -1.0'			D = 16.7'		
	<u> </u>	u — -1.0		اد	J — 10.1		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°30.19 192°30.36	\$03°36.32	168° 45.60 183° 14.55	9.9'	501°24.19	-18.2'	61.3'
1 2	192°30.36 207°30.52	35.34 34.36	183°14.55 197°43.51	10.0' 10.0'	01°6.00 00°47.81	-18.2' -18.2'	61.3' 61.3'
3	222°30.69	33.37	212° 12.50	10.0'	00°29.63	-18.2'	61.2'
4	237°30.85	32.39	$226^{\circ}41.50$	10.0'	S00°11.44	-18.2'	61.2'
5	252°31.01	31.41 \$03°30.42	241°10.51	10.0'	N00°6.73	18.2'	61.2'
6 7	267°31.18 282°31.34	29.44	255°39.54 270°8.59	10.0' 10.1'	N00°24.90 00°43.05	18.2' 18.1'	61.2' 61.2'
8	297°31.51	28.46	284° 37.64	10.1	01°1.19	18.1	61.2'
9	312°31.67	• • 27.47	$299^{\circ}6.71$	10.1'	$01^{\circ}19.32$	18.1'	61.2'
10	327°31.84	26.49	313°35.79	10.1'	01°37.43	18.1'	61.1'
11 12	342°32.00 357°32.17	25.50 \$03°24.52	328°4.87 342°33.96	10.1' 10.1'	01°55.53 N02°13.60	18.1' 18.0'	61.1' 61.1'
13	12°32.33	23.54	357°3.06	10.1'	02°31.65	18.0'	61.1'
14	27°32.50	22.55	11°32.17	10.1'	02°49.67	18.0'	61.1'
15 16	42°32.66 57°32.83	· · 21.57 20.58	26°1.27 40°30.38	10.1' 10.1'	03°7.66 03°25.63	18.0' 17.9'	61.1' 61.0'
17	72°32.99	19.60	54° 59.49	10.1	03°43.57	17.9 17.9'	61.0'
18	87°33.16	S03° 18.62	69°28.60	10.1'	N04°1.47	17.9'	61.0'
19	102°33.32	17.63	83°57.71	10.1'	04° 19.34	17.8'	61.0'
20 21	117°33.49 132°33.66	16.65 •• 15.66	98° 26.82 112° 55.92	10.1' 10.1'	04°37.17 04°54.96	17.8' 17.8'	61.0' 60.9'
22	132 33.00 147°33.82	14.68	112 55.92 127°25.02	10.1	04 54.90 05°12.71	17.6 17.7'	60.9
23	162°33.99	13.69	141°54.12	10.1'	05°30.42	17.7'	60.9'
	SD = 16.1'	d = -1.0'		SI	D = 16.7'		
_			CIIA		Б.	,	
Tue 0	GHA 177°34.16	Dec \$03° 12.71	GHA 156° 23.21	u 10.1'	Dec N05° 48.09	d 17.6'	HP 60.9'
1	192°34.32	11.73	$170^{\circ}52.28$	10.1	06°5.70	17.6	60.8
2	207°34.49	10.74	185°21.36	10.1'	06°23.27	17.5'	60.8'
3	222°34.66	• • 9.76	199° 50.42 214° 19.46	10.0'	06°40.79	17.5'	60.8'
4 5	237°34.82 252°34.99	8.77 7.79	214°19.46 228°48.50	10.0' 10.0'	06°58.26 07°15.67	17.4' 17.4'	60.8' 60.8'
6	267°35.16	S03°6.80	243° 17.52	10.0'	N07°33.02	17.3	60.7'
7	282°35.33	5.82	257°46.53	10.0'	07°50.32	17.2'	60.7'
8	297°35.49	4.83	272° 15.53	10.0'	08°7.56	17.2'	60.7'
9 10	312°35.66 327°35.83	· · 3.85 2.86	286° 44.50 301° 13.46	10.0' 9.9'	08°24.74 08°41.85	17.1' 17.0'	60.6' 60.6'
11	342°36.00	1.87	315°42.40	9.9'	08° 58.90	17.0'	60.6
12	357°36.17	S03°0.89	330° 11.33	9.9'	N09°15.88	16.9'	60.6'
13	12°36.33	02°59.90	344°40.23	9.9'	09°32.79	16.8'	60.5'
14 15	27°36.50 42°36.67	58.92 •• 57.93	359°9.11 13°37.96	9.9' 9.8'	09°49.64 10°6.41	16.8' 16.7'	60.5' 60.5'
16	57°36.84	56.95	28°6.80	9.8'	10° 23.10	16.6'	60.4
17	72°37.01	55.96	42°35.61	9.8'	10°39.72	16.5'	60.4'
18	87°37.18	\$02°54.98	57°4.39	9.8'	N10°56.26 11°12.73	16.5'	60.4'
19 20	102°37.35 117°37.51	53.99 53.00	71°33.15 86°1.88	9.7' 9.7'	11°12.73 11°29.11	16.4' 16.3'	60.4' 60.3'
21	132°37.68	• • 52.02	100°30.58	9.7'	11°45.41	16.2	60.3
22	147°37.85	51.03	114°59.25	9.6'	12°1.63	16.1'	60.3'
23	162°38.02	50.05	129°27.90	9.6'	12° 17.76	16.0'	60.2'
	SD = 16.1'	d = -1.0'		SI	D = 16.6'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	04:14	05:35	06:42	17:40	18:47	20:09
N 70°	04:26	05:38	06:39	17:43	18:44	19:57
68°	04:35	05:41	06:36	17:46	18:41	19:48
66°	04:42	05:42	06:33	17:48	18:39	19:40
64°	04:48	05:44	06:31	17:50	18:37	19:34
62°	04:53	05:45	06:29	17:52	18:36	19:28
60°	04:58	05:46	06:28	17:53	18:35	19:24
N 58°	05:01	05:47	06:26	17:55	18:34	19:20
56°	05:05	05:48	06:25	17:56	18:33	19:17
54°	05:07	05:48	06:24	17:57	18:32	19:14
52°	05:10	05:49	06:22	17:58	18:32	19:11
50°	05:12	05:49	06:21	17:59	18:31	19:09
45°	05:16	05:50	06:19	18:01	18:31	19:05
N 40°	05:19	05:50	06:17	18:03	18:30	19:01
35°	05:21	05:50	06:16	18:05	18:30	18:59
30°	05:23	05:50	06:14	18:06	18:30	18:58
20°	05:24	05:49	06:11	18:09	18:31	18:56
N 10°	05:24	05:48	06:09	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:13	18:34	18:58
S 10°	05:19	05:43	06:04	18:16	18:37	19:01
20°	05:13	05:39	06:01	18:18	18:40	19:06
30°	05:06	05:34	05:58	18:21	18:45	19:13
35°	05:01	05:31	05:56	18:23	18:48	19:18
40°	04:54	05:27	05:54	18:25	18:52	19:24
45°	04:46	05:22	05:51	18:28	18:57	19:32
S 50°	04:36	05:15	05:48	18:31	19:03	19:42
52°	04:31	05:12	05:46	18:32	19:06	19:47
54°	04:26	05:09	05:45	18:34	19:09	19:52
56°	04:19	05:05	05:43	18:35	19:13	19:59
58°	04:12	05:01	05:41	18:37	19:17	20:06
S 60°	04:04	04:56	05:39	18:39	19:22	20:14

Lat.		Moonris	е		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	07:33	06:53	06:13	17:49	20:24	23:09
N 70°	07:24	06:54	06:23	17:54	20:17	22:45
68°	07:17	06:54	06:32	17:58	20:11	22:28
66°	07:11	06:55	06:39	18:02	20:07	22:14
64°	07:05	06:55	06:45	18:05	20:03	22:02
62°	07:01	06:56	06:50	18:07	20:00	21:52
60°	06:57	06:56	06:55	18:09	19:57	21:44
N 58°	06:53	06:56	06:59	18:11	19:54	21:37
56°	06:50	06:56	07:03	18:13	19:52	21:31
54°	06:47	06:57	07:06	18:14	19:50	21:25
52°	06:44	06:57	07:10	18:16	19:48	21:20
50°	06:42	06:57	07:12	18:17	19:46	21:15
45°	06:36	06:58	07:18	18:20	19:43	21:05
N 40°	06:32	06:58	07:24	18:22	19:40	20:57
35°	06:28	06:58	07:28	18:24	19:37	20:50
30°	06:25	06:59	07:32	18:25	19:35	20:44
20°	06:19	06:59	07:39	18:28	19:31	20:34
N 10°	06:13	07:00	07:45	18:31	19:28	20:24
0°	06:08	07:00	07:51	18:33	19:24	20:16
S 10°	06:03	07:01	07:57	18:35	19:21	20:07
20°	05:58	07:01	08:04	18:37	19:18	19:58
30°	05:52	07:02	08:11	18:40	19:14	19:48
35°	05:48	07:02	08:16	18:42	19:11	19:42
40°	05:44	07:03	08:20	18:43	19:09	19:35
45°	05:40	07:03	08:26	18:45	19:06	19:28
S 50°	05:34	07:04	08:33	18:47	19:02	19:18
52°	05:32	07:05	08:36	18:48	19:01	19:14
54°	05:29	07:05	08:40	18:49	18:59	19:09
56°	05:26	07:05	08:44	18:51	18:57	19:04
58°	05:22	07:06	08:48	18:52	18:55	18:58
S 60°	05:18	07:06	08:53	18:53	18:53	18:52

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-4%	
10	10:15	10:07	12:10	12:21	-:-		
11	09:59	09:51	12:10	13:12	00:47		
12	09:43	09:35	12:10	14:04	01:38		

March 13, 14, 15 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	171°7.08	197°20.26 \$12°2.02	206°8.75 \$15°10.56	129°48.81 N15°3.18	187°40.43	
1	$186^{\circ}9.55$	212°19.75 12°0.99	221°9.31 9.94	144°50.81 3.33	202°42.61 48.54	Alpheratz 357°35.86 29°13.32 Ankaa 353°8.21 -42°10.64
2	201°12.01	227°19.23 11°59.95	236° 9.87 9.32	159°52.80 3.49	217°44.79 48.43	Schedar 349°32.42 56°40.18
3	216° 14.47	242°18.71 · · 58.91	251°10.42 · · 8.70	174°54.80 · · 3.64	232°46.97 · · 48.32	Diphda 348°48.29 -17°51.41
4	231°16.94	257°18.20 57.87	266°10.98 8.08	189°56.79 3.79	247°49.15 48.21	Achernar 335°21.15 -57°7.05
5 6	246° 19.40 261° 21.87	272°17.68 56.83 287°17.17 \$11°55.79	281°11.54 7.46 296°12.10 \$15°6.83	204°58.78 3.94 220°0.78 N15°4.09	262°51.33 48.09 277°53.51 \$08°47.98	Hamal 327°52.25 23°34.56
7	276°24.33	302°16.65 54.75	311°12.65 6.21	235°2.77 4.24	292°55.69 47.87	Polaris 314°40.55 89°22.21
8	291°26.80	317°16.14 53.70	326°13.21 5.59	250°4.77 4.39	307° 57.88 47.76	Acamar 315°12.53 -40°12.70
9	$306^{\circ}29.26$	332°15.63 · · 52.66	341°13.77 · · 4.97	265°6.76 · · 4.54	323°0.06 · · 47.65	Menkar 314°7.06 4°10.97 Mirfak 308°29.52 49°56.94
10	321°31.72	347°15.11 51.62	356°14.33 4.35	280°8.75 4.69	338°2.24 47.54	Aldebaran 290°40.49 16°33.45
11	336°34.19	2°14.60 50.58	11°14.88 3.72	295°10.75 4.84	353°4.42 47.42	Rigel 281°4.55 -8°10.56
12	351°36.65	17°14.09 \$11°49.53	26°15.44 \$15°3.10	310°12.74 N15°4.99	8°6.60 \$08°47.31	Capella 280°22.94 46°1.47
13 14	6°39.12 21°41.58	32°13.58 48.49 47°13.06 47.44	41°16.00 2.48 56°16.56 1.85	325°14.73 5.14 340°16.72 5.29	23°8.78 47.20 38°10.96 47.09	Bellatrix 278°23.63 6°22.23
15	36° 44.04	62°12.55 · · 46.40	71°17.12 · · 1.23	355°18.72 · · 5.44	53°13.14 · · 46.98	Elnath 278° 2.75 28° 37.72
16	51°46.51	77°12.04 45.35	86°17.68 0.61	10°20.71 5.59	68°15.32 46.87	Alnilam 275°38.42 -1°11.29
17	66° 48.97	92°11.53 44.30	101°18.24 14°59.98	25°22.70 5.74	83°17.51 46.75	Betelgeuse 270°52.80 7°24.64
18	81°51.44	107°11.02 \$11°43.26	116°18.80 \$14°59.36	40°24.69 N15°5.89	98°19.69 S 08°46.64	Canopus 263°52.59 -52°42.75 Sirius 258°26.75 -16°45.12
19	96°53.90	122°10.51 42.21	131°19.36 58.73	55°26.68 6.04	113°21.87 46.53	Adhara 255°6.28 -29°0.49
20	111°56.36	137°10.00 41.16	146°19.92 58.11	70°28.68 6.19	128°24.05 46.42	Procyon 244°51.39 5°9.71
21 22	126°58.83	152°9.50 · · 40.11 167°8.99 39.06	161°20.47 · · · 57.48 176°21.03 56.86	85°30.67 · · 6.34	143°26.23 · · 46.31	Pollux 243°17.95 27°58.10
23	142°1.29 157°3.76	167°8.99 39.06 182°8.48 38.01	176°21.03 56.86 191°21.60 56.23	100°32.66 6.49 115°34.65 6.64	158°28.41 46.20 173°30.59 46.08	Avior 234°14.63 -59°35.40
						Suhail 222°46.49 -43°31.97
Mer.p	pass. 12:33	ν -0.5' d-1.0' m-3.88	ν0.6' d-0.6' m1.24	$\nu 2.0' \ d0.2' \ \text{m-}2.13$	$\nu 2.2' \ d$ -0.1' m1.01	Miaplacidus 221°37.74 -69°49.11
						Alphard 217°48.17 -8°45.91 Regulus 207°34.87 11°50.87
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.87 11°50.87 Dubhe 193°41.14 61°37.23
0	172°6.22	197°7.97 S 11°36.96	206°22.16 \$14°55.61	130°36.64 N15°6.80	188°32.78 S 08°45.97	Denebola 182°25.32 14°26.10
1	187°8.68	212°7.46 35.91	221°22.72 54.98	145°38.63 6.95	203°34.96 45.86	Gienah 175°43.99 -17°40.66
2	202°11.15	227°6.96 34.86	236°23.28 54.35	160°40.62 7.10	218° 37.14 45.75	Acrux 173°0.26 -63°13.95
3 4	217° 13.61 232° 16.08	242°6.45 · · 33.80 257°5.95 32.75	251°23.84 · · 53.73 266°24.40 53.10	175°42.61 · · 7.25 190°44.60 7.40	233°39.32 · · 45.64 248°41.50 45.53	Gacrux 171°51.91 -57°14.90
5	247° 18.54	272°5.44 31.70	281°24.96 52.47	205°46.59 7.55	263°43.68 45.41	Alioth 166°13.01 55°49.55
6	262°21.01	287°4.94 S11°30.64	296°25.52 \$14°51.85	220°48.58 N15°7.70	278°45.86 \$08°45.30	Spica 158°22.75 -11°17.35
7	277°23.47	302°4.43 29.59	311°26.08 51.22	235°50.57 7.85	293°48.05 45.19	Alkaid 152°52.12 49°11.32 Hadar 148°36.54 -60°29.26
8	292°25.93	317°3.93 28.53	326°26.64 50.59	250°52.56 8.00	308° 50.23 45.08	Menkent 147°58.15 -36°29.32
9	$307^{\circ}28.40$	332°3.42 · · 27.48	341°27.21 · · 49.96	265°54.55 · · 8.15	323°52.41 · · 44.97	Arcturus 145°48.29 19°3.18
10	322°30.86	347°2.92 26.42	356°27.77 49.33	280°56.54 8.30	338°54.59 44.86	Rigil Kent. 139°40.84 -60°55.97
11	337°33.33	2°2.42 25.37	11°28.33 48.70	295°58.53 8.46	353°56.77 44.74	Kochab 137°18.97 74°3.04
12	352°35.79	17°1.91 S11°24.31	26°28.89 \$14°48.08	311°0.52 N15°8.61	8°58.95 \$08°44.63	Zuben'ubi 136°56.58 -16°8.60
13 14	7°38.25 22°40.72	32°1.41 23.25 47°0.91 22.19	41°29.46 47.45 56°30.02 46.82	326°2.51 8.76 341°4.50 8.91	24°1.14 44.52 39°3.32 44.41	Alphecca 126°4.15 26°37.72
15	37°43.18	62°0.41 · · 21.13	71°30.58 · · 46.19	356°6.49 · · 9.06	54°5.50 · · 44.30	Antares 112°16.60 -26°29.13
16	52° 45.65	76°59.91 20.07	86°31.14 45.56	11°8.47 9.21	69°7.68 44.19	Atria 107°11.39 -69°4.00
17	67°48.11	91°59.41 19.01	101°31.71 44.93	26°10.46 9.36	84°9.86 44.08	Sabik 102°3.55 -15°45.36 Shaula 96°11.31 -37°7.21
18	82°50.57	106°58.91 S 11°17.95	116°32.27 \$14°44.30	41°12.45 N15°9.51	99°12.05 S 08°43.96	Shaula 96°11.31 -37°7.21 Rasalhague 95°59.19 12°32.30
19	97°53.04	121°58.41 16.89	131°32.83 43.67	56°14.44 9.66	114°14.23 43.85	Eltanin 90°42.56 51°28.73
20	112°55.50	136°57.91 15.83	146°33.40 43.03	71°16.43 9.82	129°16.41 43.74	Kaus Aust. 83°33.51 -34°22.34
21	127°57.97 143°0.43	151°57.41 · · 14.77 166°56.91 13.71	161°33.96 · · 42.40 176°34.53 41.77	86°18.41 · · 9.97 101°20.40 10.12	144°18.59 · · 43.63 159°20.77 43.52	Vega 80°33.80 38°48.00
22 23	143 0.43 158°2.90	166°56.91 13.71 181°56.41 12.64	176°34.53 41.77 191°35.09 41.14	101°20.40 10.12 116°22.39 10.27	159° 20.77 43.52 174° 22.96 43.41	Nunki 75°48.74 -26°16.02
						Altair 62°0.81 8°55.70
Mer.p	pass. 12:30	ν -0.5' d -1.1' m-3.88	ν0.6' d-0.6' m1.23	$\nu 2.0' \ d0.2' \ \text{m-}2.12$	$\nu 2.2' \ d$ -0.1' m1.02	Peacock 53°7.18 -56°39.34 Deneb 49°26.62 45°21.68
						Deneb 49°26.62 45°21.68 Enif 33°39.76 9°58.95
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°34.18 -46°50.68
0	173°5.36	196°55.91 \$11°11.58	206°35.65 \$14°40.51	131°24.38 N15°10.42	189°25.14	Fomalhaut 15°15.62 -29°29.78
1	188°7.82	211°55.41 10.52	221°36.22 39.88	146°26.36 10.57	204°27.32 43.18	Scheat 13°46.24 28°12.67
2	203° 10.29 218° 12.75	226°54.92 9.45 241°54.42 • 8.39	236°36.78 39.24 251°37.35 · · 38.61	161°28.35 10.72 176°30.34 · · 10.88	219°29.50 43.07 234°31.68 •• 42.96	Markab 13°30.92 15°19.95
3 4	216 12.75 233°15.22	256°53.92 7.32	266°37.91 37.98	170 30.34 1 10.86 191°32.32 11.03	249°33.87 42.85	Mar 13 Wed SHA Mer.pass
5	248° 17.68	271°53.43 6.25	281°38.48 37.34	206°34.31 11.18	264°36.05 42.74	Venus 26°13.18 10:51
6	263°20.14	286°52.93 S 11°5.19	296°39.04 \$14°36.71	221°36.29 N15°11.33	279°38.23 \$08°42.63	Mars 35°1.67 10:15
7	278°22.61	301°52.44 4.12	311°39.61 36.08	236°38.28 11.48	294° 40.41 42.52	Jupiter 318°41.73 15:19
8	293°25.07	316°51.94 3.05	326°40.18 35.44	251°40.27 11.63	309°42.60 42.41	Saturn 16°33.34 11:28
9	308°27.54	331°51.45 · · 1.98	341°40.74 · · 34.81	266°42.25 · · 11.78	324°44.78 · · 42.29	Mar 14 Thu SHA Mer.pass
10 11	323°30.00 338°32.47	346°50.95 11°0.92 1°50.46 10°59.85	356°41.31 34.17 11°41.87 33.54	281°44.24 11.94 296°46.22 12.09	339° 46.96 42.18 354° 49.14 42.07	Venus 25°1.75 10:52
12	358 32.47 353°34.93	1 50.46 10 59.85 16°49.97 \$10°58.78	26°42.44 \$14°32.90	311°48.21 N15°12.24	9°51.33 \$08°41.96	Mars 34°15.93 10:14
13	8°37.39	31°49.47 57.71	41°43.01 32.27	326°50.19 12.39	24°53.51 41.85	Jupiter 318°30.42 15:16
14	23°39.86	46°48.98 56.63	56°43.57 31.63	341°52.18 12.54	39°55.69 41.74	Saturn 16°26.55 11:24
15	38° 42.32	61°48.49 · · 55.56	71°44.14 · · 31.00	356°54.16 · · 12.69	54°57.87 · · 41.63	Mar 15 Fri SHA Mer.pass
16	53° 44.79	76°48.00 54.49	86°44.71 30.36	11°56.15 12.85	70°0.06 41.52	Venus 23°50.55 10:53
17	68° 47.25	91°47.51 53.42	101°45.27 29.73	26°58.13 13.00	85°2.24 41.40	Mars 33°30.29 10:13
18 19	83° 49.71 98° 52.18	106°47.02 \$10°52.35 121°46.53 51.27	116°45.84 \$14°29.09 131°46.41 28.45	42°0.11 N15°13.15 57°2.10 13.30	100°4.42 \$08°41.29 115°6.60 41.18	Jupiter 318°19.02 15:12
20	98 52.18 113°54.64	136°46.04 50.20	131°46.41 28.45 146°46.98 27.82	72°4.08 13.45	130°8.79 41.07	Saturn 16°19.78 11:21
21	113 54.04 128° 57.11	151° 45.55 · · 49.12	161°47.55 · · 27.18	87°6.07 · · 13.60	145°10.97 · · 40.96	Horizontal parallax
22	143°59.57	166°45.06 48.05	176°48.11 26.54	102°8.05 13.76	160°13.15 40.85	Venus: 0.1
23	159°2.04	181°44.57 46.97	191°48.68 25.90	117°10.03 13.91	175°15.34 40.74	Mars: 0.1
Mer r	pass. 12:26	ν-0.5' d-1.1' m-3.88	ν0.6' d-0.6' m1.23	ν2.0' d0.2' m-2.12	ν2.2' d-0.1' m1.02	

h	Su	n			Moon		
Wed	GHA 177°38.19	Dec \$02°49.06	GHA 143°56.51	u 9.6'	Dec N12°33.80	<i>d</i> 16.0'	HP 60.2'
1	192° 38.36	48.08	158°25.10	9.6'	12°49.75	15.9'	60.2
2	207°38.53	47.09	172°53.65	9.5'	13°5.62	15.8'	60.1
3	222°38.70	• • 46.10	187°22.17	9.5'	13°21.39	15.7'	60.1
4	237°38.87	45.12	201°50.65	9.5'	13°37.06	15.6'	60.1'
5	252°39.04	44.13	$216^{\circ}19.10$	9.4'	13°52.64	15.5'	60.0'
6	$267^{\circ}39.21$	S02°43.14	230°47.52	9.4'	N14°8.13	15.4'	60.0'
7	282°39.38	42.16	245°15.90	9.3'	14°23.51	15.3'	60.0'
8	297°39.55	41.17	259°44.25	9.3'	14°38.80 14°53.98	15.2'	59.9'
9 10	312°39.72 327°39.89	· · 40.19 39.20	274°12.55 288°40.82	9.3' 9.2'	14 53.98 15° 9.06	15.1' 15.0'	59.9' 59.9'
11	342°40.07	39.20	303°9.06	9.2' 9.2'	15 9.00 15°24.04	14.9'	59.9 59.8'
12	357° 40.24	502°37.23	317°37.25	9.2'	N15°38.90	14.8'	59.8'
13	12°40.41	36.24	332°5.41	9.1'	15°53.67	14.7'	59.8'
14	27°40.58	35.25	346°33.52	9.1'	16°8.32	14.5'	59.7'
15	42°40.75	• • 34.27	1°1.60	9.0'	16°22.86	14.4'	59.7'
16	57° 40.92	33.28	15°29.64	9.0'	16°37.29	14.3'	59.6'
17	72°41.09	32.29	29°57.63	9.0'	16°51.61	14.2'	59.6'
18	87°41.27	S02°31.31	44°25.58	8.9'	N17°5.81	14.1'	59.6' 59.5'
19 20	102°41.44 117°41.61	30.32 29.33	58°53.50 73°21.37	8.9' 8.8'	17°19.90 17°33.87	14.0' 13.8'	59.5' 59.5'
21	132°41.78	28.34	75 21.37 87°49.20	o.o 8.8'	17 33.67 17°47.71	13.7	59.5'
22	147°41.95	27.36	102°16.98	8.7'	18°1.44	13.6'	59.5'
23	162° 42.13	26.37	116°44.72	8.7'	18°15.05	13.5'	59.4
	SD = 16.1'						
	שט = 10.1′	d = -1.0'		5	D = 16.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177° 42.30 192° 42.47	S02°25.38	131°12.42 145°40.08	8.7'	N18°28.54 18°41.90	13.4'	59.3'
1 2	192°42.47 207°42.64	24.40 23.41	145°40.08 160°7.69	8.6' 8.6'	18°41.90 18°55.14	13.2' 13.1'	59.3' 59.3'
3	207 42.04 222° 42.82	22.42	174°35.26	8.5'	10 55.14 19°8.25	13.1	59.3 59.2'
4	237° 42.99	21.43	189°2.79	8.5'	19° 21.23	12.9'	59.2'
5	252°43.16	20.45	203°30.27	8.4'	19°34.08	12.7'	59.1'
6	267° 43.34	S02°19.46	217°57.71	8.4'	N19°46.80	12.6'	59.1'
7	282°43.51	18.47	232°25.10	8.4'	19°59.40	12.5'	59.1'
8	297°43.68	17.49	246°52.45	8.3'	20°11.85	12.3'	59.0'
9	312°43.86	• • 16.50	261°19.76	8.3'	20°24.18	12.2'	59.0'
10	327° 44.03	15.51	275°47.02	8.2'	20°36.37	12.1'	59.0'
11	342°44.20	14.52	290°14.24	8.2'	20°48.42	11.9'	58.9'
12 13	357° 44.38 12° 44.55	S02°13.54 12.55	304°41.42 319°8.55	8.1' 8.1'	N21°0.34 21°12.12	11.8' 11.6'	58.9' 58.8'
14	27° 44.72	12.55	333°35.64	8.0'	21°23.76	11.5'	58.8'
15	42°44.90	. 10.57	348°2.68	8.0'	21°35.26	11.4	58.8'
16	57° 45.07	9.58	2°29.69	8.0'	21°46.62	11.2'	58.7'
17	72°45.25	8.60	$16^{\circ}56.65$	7.9'	21°57.84	11.1'	58.7'
18	87°45.42	S02°7.61	31°23.57	7.9'	N22°8.91	10.9'	58.6'
19	102°45.60	6.62	45°50.44	7.8'	22°19.84		58.6'
20	117° 45.77	5.63	60°17.28	7.8'	22°30.63	10.6'	58.6'
21	132°45.94	• • 4.65	74°44.07	7.8'	22°41.27 22°51.76	10.5'	58.5
22	147°46.12 162°46.29	3.66 2.67	89°10.83 103°37.54	7.7'	22°51.76 23°2.10	10.3'	58.5'
23			103 37.54	7.7'		10.2'	58.4'
	SD = 16.1'	d = -1.0'		S	D = 16.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°46.47	S02°1.68	118°4.22	7.6'	N23°12.30	10.0'	58.4'
1	192°46.64	$02^{\circ}0.69$	132°30.85	7.6'	23°22.34	9.9'	58.4'
2	207°46.82	01°59.71	146°57.45	7.6'	23°32.24	9.7'	58.3'
3	222°47.00	• • 58.72	161°24.01	7.5'	23°41.98	9.6'	58.3'
4 5	237° 47.17 252° 47.35	57.73 56.74	175°50.53 190°17.02	7.5' 7.5'	23°51.57 24°1.01	9.4' 9.3'	58.2' 58.2'
6	252°47.35 267°47.52	50.74 S01°55.75	190°17.02 204°43.47	7.4	N24°10.30	9.3	58.2' 58.2'
7	282°47.70	54.77	219° 9.88	7.4 7.4'	24°19.43	9.1 9.0'	58.1'
8	297° 47.87	53.78	233°36.26	7.3'	24°28.41	8.8'	58.1
9	312°48.05	• • 52.79	248°2.61	7.3'	24°37.23	8.7'	58.0'
10	327°48.23	51.80	262°28.92	7.3'	24°45.89	8.5'	58.0'
11	342°48.40	50.81	276°55.21	7.3'	24°54.40	8.4'	58.0'
12	357°48.58	S01°49.83	291°21.46	7.2'	N25°2.75	8.2'	57.9'
13	12°48.76	48.84	305°47.68	7.2'	25°10.94	8.0'	57.9'
14 15	27°48.93 42°49.11	47.85 •• 46.86	320°13.88 334°40.04	7.2' 7.1'	25°18.98 25°26.85	7.9' 7.7'	57.8' 57.8'
15 16	42°49.11 57°49.28	45.87	334°40.04 349°6.18	7.1' 7.1'	25°26.85 25°34.57	7.7° 7.6°	57.8'
17	72°49.46	45.87 44.88	3°32.29	7.1'	25 34.57 25°42.12	7.0 7.4'	57.8 57.7'
18	87°49.64	S01°43.90	17°58.38	7.1'	N25°49.51	7.2	57.7
19	102°49.82	42.91	32°24.44	7.0'	25°56.75	7.1'	57.6'
20	117°49.99	41.92	46°50.49	7.0'	26°3.82	6.9'	57.6'
21	132°50.17	• • 40.93	61°16.51	7.0'	26°10.73	6.7'	57.6'
22	147°50.35	39.94	75°42.51	7.0'	26°17.47	6.6'	57.5'
23	162°50.52	38.95	90°8.49	7.0'	26°24.06	6.4'	57.5'
	SD = 16.1'	d = -1.0'		S	D = 15.9'		

Lat.		Twilight		Sunset	Twilight		
	Naut.	Civil	Sunrise	Juliset	Civil	Naut.	
N 72°	03:57	05:20	06:27	17:54	19:01	20:25	
N 70°	04:10	05:24	06:25	17:55	18:56	20:11	
68°	04:21	05:28	06:23	17:57	18:52	20:00	
66°	04:30	05:31	06:22	17:58	18:49	19:51	
64°	04:37	05:33	06:21	17:59	18:46	19:43	
62°	04:43	05:35	06:19	18:00	18:44	19:37	
60°	04:48	05:37	06:19	18:01	18:42	19:32	
N 58°	04:53	05:39	06:18	18:02	18:41	19:27	
56°	04:57	05:40	06:17	18:02	18:39	19:23	
54°	05:00	05:41	06:16	18:03	18:38	19:20	
52°	05:03	05:42	06:16	18:03	18:37	19:17	
50°	05:05	05:43	06:15	18:04	18:36	19:14	
45°	05:10	05:44	06:14	18:05	18:34	19:09	
N 40°	05:14	05:46	06:13	18:06	18:33	19:05	
35°	05:17	05:46	06:12	18:07	18:32	19:02	
30°	05:19	05:47	06:11	18:08	18:32	19:00	
20°	05:21	05:47	06:09	18:09	18:31	18:57	
N 10°	05:22	05:46	06:07	18:11	18:32	18:56	
0°	05:21	05:45	06:06	18:12	18:33	18:57	
S 10°	05:19	05:43	06:04	18:14	18:35	18:59	
20°	05:14	05:40	06:02	18:16	18:38	19:03	
30°	05:08	05:36	06:00	18:18	18:42	19:10	
35°	05:03	05:33	05:59	18:19	18:44	19:14	
40°	04:58	05:30	05:57	18:20	18:48	19:19	
45°	04:51	05:26	05:55	18:22	18:52	19:26	
S 50°	04:42	05:20	05:53	18:24	18:57	19:35	
52°	04:37	05:18	05:52	18:25	18:59	19:39	
54°	04:32	05:15	05:51	18:26	19:02	19:44	
56°	04:27	05:12	05:49	18:28	19:05	19:50	
58°	04:20	05:08	05:48	18:29	19:08	19:56	
S 60°	04:12	05:04	05:46	18:30	19:12	20:04	

Lat.		Moonris	е		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	05:19					
N 70°	05:45	04:28			01:55	
68°	06:05	05:22			01:02	
66°	06:21	05:55	04:46		00:30	03:34
64°	06:34	06:20	05:57		00:07	02:24
62°	06:45	06:40	06:33	23:48	•• ••	01:49
60°	06:55	06:56	06:59	23:33		01:24
N 58°	07:03	07:09	07:20	23:20		01:04
56°	07:11	07:21	07:37	23:09		00:47
54°	07:18	07:32	07:52	23:00		00:33
52°	07:24	07:41	08:04	22:51	•• ••	00:21
50°	07:29	07:49	08:16	22:44	•• ••	00:10
45°	07:41	08:07	08:39	22:27	23:48	
N 40°	07:51	08:22	08:58	22:14	23:30	
35°	08:00	08:34	09:14	22:03	23:15	
30°	08:07	08:45	09:28	21:53	23:02	•• ••
20°	08:21	09:04	09:52	21:36	22:40	23:42
N 10°	08:32	09:21	10:12	21:22	22:21	23:20
0°	08:43	09:37	10:32	21:08	22:03	22:59
S 10°	08:54	09:52	10:51	20:55	21:45	22:38
20°	09:06	10:09	11:12	20:41	21:26	22:16
30°	09:20	10:29	11:37	20:24	21:05	21:50
35°	09:28	10:41	11:51	20:15	20:52	21:35
40°	09:38	10:54	12:08	20:04	20:38	21:17
45°	09:48	11:10	12:28	19:52	20:20	20:56
S 50°	10:02	11:30	12:54	19:37	19:59	20:30
52°	10:08	11:39	13:06	19:29	19:49	20:17
54°	10:15	11:49	13:21	19:22	19:38	20:02
56°	10:23	12:01	13:37	19:13	19:25	19:45
58°	10:31	12:15	13:57	19:03	19:11	19:24
S 60°	10:42	12:32	14:23	18:52	18:53	18:58

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	10-28%		
13	09:27	09:19	12:09	14:56	02:29			
14	09:11	09:02	12:09	15:50	03:22			
15	08:54	08:46	12:09	16:45	04:17			

March 16, 17, 18 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	174°4.50	196°44.08 \$10°45.90	206°49.25 \$14°25.27	132°12.02 N15°14.06	190°17.52 S 08°40.63	
1	189°6.96	211°43.59 44.82	221°49.82 24.63	147°14.00 14.21	205°19.70 40.52	Alpheratz 357°35.85 29°13.31 Ankaa 353°8.21 -42°10.63
2	204°9.43	226°43.10 43.74	236°50.39 23.99	162°15.98 14.36	220°21.88 40.41	Schedar 349°32.41 56°40.17
3	219°11.89	241°42.62 · · 42.67	251°50.96 · · 23.35	177°17.96 · · 14.52	235°24.07 · · 40.29	Diphda 348°48.29 -17°51.40
4	234°14.36	256° 42.13 41.59	266°51.53 22.71	192°19.95 14.67	250°26.25 40.18	Achernar 335°21.16 -57°7.03
5 6	249° 16.82 264° 19.28	271°41.64 40.51 286°41.16 \$10°39.43	281°52.09 22.07 296°52.66 \$14°21.43	207°21.93 14.82 222°23.91 N15°14.97	265°28.43 40.07 280°30.62 \$08°39.96	Hamal 327°52.25 23°34.55
7	279°21.75	301°40.67 38.35	311°53.23 20.79	237°25.89 15.12	295°32.80 39.85	Polaris 314°41.42 89°22.20
8	294°24.21	316°40.18 37.27	326°53.80 20.15	252°27.88 15.28	310°34.98 39.74	Acamar 315°12.54 -40°12.69
9	309°26.68	331°39.70 · · 36.19	341°54.37 · · 19.51	267°29.86 · · 15.43	325°37.16 · · 39.63	Menkar 314°7.07 4°10.97
10	324°29.14	346°39.21 35.11	356°54.94 18.87	282°31.84 15.58	340°39.35 39.52	Mirfak 308°29.53 49°56.93
11	$339^{\circ}31.61$	1°38.73 34.03	11°55.51 18.23	297°33.82 15.73	355°41.53 39.41	Aldebaran 290° 40.50 16° 33.45 Rigel 281° 4.56 -8° 10.56
12	354°34.07	16°38.24 \$10°32.95	26°56.08 S 14°17.59	312°35.80 N15°15.88	10°43.71 S 08°39.30	Capella 280°22.95 46°1.47
13	9°36.53	31°37.76 31.87	41°56.65 16.95	327°37.78 16.04	25°45.90 39.18	Bellatrix 278°23.64 6°22.23
14	24°39.00	46°37.28 30.78	56°57.23 16.31	342°39.76 16.19	40°48.08 39.07	Elnath 278°2.76 28°37.71
15	39°41.46	61°36.80 · · 29.70 76°36.31 28.61	71°57.80 · · 15.67	357°41.75 · · 16.34 12°43.73 16.49	55°50.26 · · 38.96	Alnilam 275°38.43 -1°11.29
16 17	54° 43.93 69° 46.39	76°36.31 28.61 91°35.83 27.53	86°58.37 15.02 101°58.94 14.38	12°43.73 16.49 27°45.71 16.65	70°52.45 38.85 85°54.63 38.74	Betelgeuse 270°52.81 7°24.63
18	84° 48.85	106°35.35 \$10°26.45	116°59.51 S14°13.74	42°47.69 N15°16.80	100°56.81 \$08°38.63	Canopus 263°52.61 -52°42.76
19	99°51.32	121°34.87 25.36	132°0.08 13.10	57°49.67 16.95	115°59.00 38.52	Sirius 258°26.76 -16°45.12
20	114°53.78	136°34.39 24.27	147° 0.65 12.45	72°51.65 17.10	131°1.18 38.41	Adhara 255°6.29 -29°0.49
21	129°56.25	151°33.91 · · 23.19	162°1.23 · · 11.81	87°53.63 · · 17.26	146°3.36 · · 38.30	Procyon 244°51.40 5°9.71 Pollux 243°17.96 27°58.10
22	$144^{\circ}58.71$	166°33.43 22.10	177° 1.80 11.17	102°55.61 17.41	161°5.55 38.19	Pollux 243°17.96 27°58.10 Avior 234°14.65 -59°35.41
23	160°1.18	181°32.95 21.01	192°2.37 10.53	117°57.59 17.56	176°7.73 38.08	Suhail 222°46.50 -43°31.98
Mer r	pass. 12:22	ν-0.5' d-1.1' m-3.88	ν0.6' d-0.6' m1.23	ν 2.0' d0.2' m-2.12	$\nu 2.2' \ d$ -0.1' m1.02	Miaplacidus 221°37.76 -69°49.13
						Alphard 217°48.17 -8°45.92
c.	CIIA	CHV D	CHA D	CHA D	CHA D	Regulus 207°34.87 11°50.87
Sun 0	GHA 175°3.64	GHA Dec 196°32.47 \$10°19.93	GHA Dec 207°2.94 \$14°9.88	GHA Dec 132°59.57 N 15°17.71	GHA Dec 191°9.92 S 08°37.97	Dubhe 193°41.14 61°37.25
1	175 3.04 190°6.10	211°31.99 18.84	207 2.94 314 9.86 222°3.51 9.24	148°1.55 17.87	206°12.10 37.86	Denebola 182°25.32 14°26.10
2	205°8.57	226°31.51 17.75	237° 4.09 8.59	163°3.52 18.02	200 12.10 37.00 221°14.28 37.74	Gienah 175°43.97 -17°40.67
3	220° 11.03	241°31.03 · · 16.66	252° 4.66 · · 7.95	178°5.50 · · 18.17	236°16.47 · · · 37.63	Acrux 173°0.24 -63°13.97
4	235° 13.50	256°30.55 15.57	267° 5.23 7.30	193°7.48 18.32	251°18.65 37.52	Gacrux 171°51.89 -57°14.92 Alioth 166°12.99 55°49.56
5	$250^{\circ}15.96$	271°30.07 14.48	282°5.81 6.66	208°9.46 18.47	266°20.83 37.41	Alioth 166°12.99 55°49.56 Spica 158°22.74 -11°17.35
6	$265^{\circ}18.42$	286°29.60 \$10°13.39	297°6.38 \$14°6.01	223°11.44 N15°18.63	281°23.02 S 08°37.30	Alkaid 152°52.10 49°11.33
7	280°20.89	301°29.12 12.30	312° 6.95 5.37	238°13.42 18.78	296° 25.20 37.19	Hadar 148°36.50 -60°29.27
8	295°23.35	316°28.64 11.21	327°7.53 4.72	253°15.40 18.93	311°27.39 37.08	Menkent 147°58.13 -36°29.33
9	310°25.82	331°28.17 · · 10.11	342°8.10 · · 4.08	268°17.37 · · 19.09	326°29.57 · · 36.97	Arcturus 145°48.27 19°3.19
10	325°28.28	346°27.69 9.02	357° 8.68 3.43	283°19.35 19.24	341°31.75 36.86	Rigil Kent. 139°40.80 -60°55.99
11 12	340°30.75 355°33.21	1°27.21 7.93 16°26.74 \$10°6.83	12° 9.25 2.78 27° 9.82 \$14° 2.14	298°21.33 19.39 313°23.31 N15°19.54	356°33.94 36.75 11°36.12 \$08°36.64	Kochab 137°18.92 74°3.05
13	10°35.67	31°26.26 5.74	42°10.40 1.49	328°25.28 19.70	26°38.31 36.53	Zuben'ubi 136°56.55 -16°8.61
14	25°38.14	46°25.79 4.65	57°10.97 0.84	343°27.26 19.85	41°40.49 36.42	Alphecca 126°4.12 26°37.72
15	40°40.60	61°25.32 · · 3.55	72°11.55 14°0.20	358°29.24 · · 20.00	56° 42.67 · · · 36.31	Antares 112°16.57 -26°29.14
16	55° 43.07	76°24.84 2.46	87°12.12 13°59.55	13°31.22 20.15	71°44.86 36.20	Atria 107°11.33 -69°4.01 Sabik 102°3.52 -15°45.36
17	$70^{\circ}45.53$	91°24.37 1.36	102°12.70 58.90	28°33.19 20.31	86°47.04 36.09	Shaula 96°11.28 -37°7.21
18	85° 47.99	106°23.90 \$10°0.26	117°13.27 \$13°58.25	43°35.17 N15°20.46	101°49.23	Rasalhague 95°59.17 12°32.30
19	100° 50.46	121°23.42 09°59.17	132°13.85 57.60	58°37.15 20.61	116°51.41 35.86	Eltanin 90°42.52 51°28.73
20	115°52.92	136°22.95 58.07	147°14.43 56.96	73°39.12 20.77	131°53.59 35.75	Kaus Aust. 83°33.48 -34°22.34
21	130°55.39	151°22.48 · · 56.97	162°15.00 · · 56.31	88°41.10 · · 20.92	146°55.78 · · 35.64	Vega 80°33.78 38°48.00
22 23	145°57.85 161°0.32	166°22.01 55.87 181°21.54 54.77	177°15.58 55.66 192°16.15 55.01	103°43.08 21.07 118°45.05 21.22	161°57.96 35.53 177°0.15 35.42	Nunki 75°48.71 -26°16.01
						Altair 62°0.79 8°55.71
Mer.p	pass. 12:18	u-0.5 $'$ d-1.1 $'$ m-3.88	$ u 0.6' \ d$ -0.6' m1.23	$\nu 2.0' \ d0.2' \ \text{m-}2.11$	$ u 2.2' \ d$ -0.1' m1.02	Peacock 53°7.14 -56°39.33
						Deneb 49°26.60 45°21.68
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.74 9°58.95 Al Na'ir 27°34.16 -46°50.66
0	176°2.78	196°21.07 \$09°53.68	207°16.73 \$13°54.36	133°47.03 N15°21.38	192°2.33	Al Na'ir 27°34.16 -46°50.66 Fomalhaut 15°15.60 -29°29.76
1	191°5.24	211°20.60 52.58	222°17.31 53.71	148°49.00 21.53	207°4.52 35.20	Scheat 13°46.23 28°12.66
2	206°7.71	226°20.12 51.48	237°17.88 53.06	163°50.98 21.68	222°6.70 35.09	Markab 13°30.90 15°19.95
3	221°10.17	241°19.66 · · 50.38	252°18.46 · · 52.41	178°52.95 · · 21.84	237°8.89 · · 34.98	
4	236° 12.64	256°19.19 49.27	267°19.04 51.76	193°54.93 21.99	252°11.07 34.87	Mar 16 Sat SHA Mer.pass
5	251° 15.10	271°18.72 48.17	282°19.61 51.11	208°56.90 22.14	267°13.25 34.76	Venus 22°39.58 10:53 Mars 32°44.75 10:12
6 7	266° 17.56 281° 20.03	286°18.25 S09°47.07 301°17.78 45.97	297°20.19 \$13°50.46 312°20.77 49.81	223°58.88 N15°22.29 239°0.85 22.45	282°15.44 \$08°34.65 297°17.62 34.54	Jupiter 318°7.52 15:09
8	281 20.03 296°22.49	316°17.31 44.87	312 20.77 49.81 327°21.35 49.16	254°2.83 22.60	312°19.81 34.43	Saturn 16°13.02 11:17
9	311°24.96	331°16.84 · · 43.76	342°21.93 · · 48.50	269°4.80 · · 22.75	327°21.99 · · 34.32	
10	326°27.42	346°16.38 42.66	357°22.50 47.85	284°6.78 22.91	342°24.18 34.21	Mar 17 Sun SHA Mer.pass
11	341°29.89	1°15.91 41.55	12°23.08 47.20	299°8.75 23.06	357°26.36 34.10	Venus 21°28.83 10:54
12	356°32.35	16°15.44 \$09°40.45	27°23.66 \$13°46.55	314°10.72 N15°23.21	12°28.55 S 08°33.99	Mars 31°59.30 10:11
13	11°34.81	31°14.98 39.34	42°24.24 45.90	329°12.70 23.37	27°30.73 33.88	Jupiter 317°55.93 15:06 Saturn 16°6.28 11:14
14	26°37.28	46°14.51 38.24	57°24.82 45.24	344°14.67 23.52	42°32.92 33.77	
15	41°39.74	61°14.05 · · 37.13	72°25.40 · · 44.59	359°16.65 · · 23.67	57°35.10 · · 33.66	Mar 18 Mon SHA Mer.pass
16	56° 42.21	76°13.58 36.03	87°25.98 43.94	14°18.62 23.83	72°37.29 33.55	Venus 20°18.29 10:55
17	71°44.67	91°13.12 34.92	102°26.55 43.28	29°20.59 23.98	87°39.47 33.44	Mars 31°13.95 10:10
18 19	86° 47.13 101° 49.60	106°12.65 S09°33.81 121°12.19 32.70	117°27.13	44°22.56 N15°24.13 59°24.54 24.29	102°41.66	Jupiter 317° 44.25 15:03
20	101 49.00 116°52.06	136°11.72 31.60	147°28.29 41.32	74°26.51 24.44	132°46.03 33.11	Saturn 15°59.55 11:10
21	131°54.53	151°11.26 · · · 30.49	162°28.87 · · 40.67	89°28.48 · · 24.59	147°48.21 · · 33.00	Horizontal parallax
22	146° 56.99	166°10.80 29.38	177°29.45 40.01	104°30.46 24.75	162° 50.40 32.89	Venus: 0.1
23	$161^{\circ}59.46$	181°10.33 28.27	192°30.03 39.36	119°32.43 24.90	177°52.58 32.78	Mars: 0.1
Merr	pass. 12:14	ν-0.5' d-1.1' m-3.88	ν0.6' d-0.6' m1.23	ν2.0' d0.2' m-2.11	ν2.2' d-0.1' m1.03	
14161.		ν σ.σ u-1.1 III-J.00	ν σ.σ α-σ.σ III1.23	ν Δ.Ο	ν Δ.Δ. U=0.1 III1.UJ	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°50.70	S01°37.97	104°34.45	6.9'	N26°30.47	6.3'	57.4'
1 2	192°50.88 207°51.06	36.98 35.99	119°0.40 133°26.33	6.9' 6.9'	26°36.73 26°42.82	6.1' 5.9'	57.4' 57.4'
3	222°51.24	• • 35.00	147°52.24	6.9'	26°48.75	5.8'	57.3'
4	237°51.41	34.01	162°18.15	6.9'	26°54.51	5.6'	57.3'
5	252°51.59	33.02	176°44.04	6.9'	27°0.11 N27°5.55	5.4'	57.2'
6 7	267°51.77 282°51.95	S01°32.03 31.05	191°9.92 205°35.80	6.9' 6.9'	N27 5.55 27°10.82	5.3' 5.1'	57.2' 57.2'
8	297°52.13	30.06	220° 1.66	6.9'	27°15.92	4.9'	57.1
9	312° 52.30	• • 29.07	234°27.52	6.9'	27°20.86	4.8'	57.1'
10 11	327°52.48 342°52.66	28.08 27.09	248°53.38 263°19.23	6.9' 6.9'	27°25.63 27°30.24	4.6' 4.4'	57.1' 57.0'
12	357° 52.84	501°26.10	277°45.08	6.9	N27°34.68	4.3'	57.0'
13	12°53.02	25.11	292°10.93	6.9'	27°38.96	4.1'	57.0'
14	27°53.20	24.13	306°36.79	6.9'	27°43.07	3.9'	56.9'
15 16	42°53.38 57°53.56	· · 23.14 22.15	321°2.64 335°28.50	6.9' 6.9'	27°47.01 27°50.79	3.8' 3.6'	56.9' 56.8'
17	72°53.73	21.16	349°54.37	6.9'	27°54.40	3.4'	56.8'
18	87°53.91	S01°20.17	4°20.24	6.9'	N27°57.85	3.3'	56.8'
19 20	102°54.09 117°54.27	19.18 18.19	18°46.12 33°12.01	6.9' 6.9'	28°1.13 28°4.25	3.1' 3.0'	56.7' 56.7'
21	132° 54.45	. 17.21	47°37.92	6.9	28°7.20	2.8'	56.7
22	147°54.63	16.22	62°3.84	6.9'	28°9.98	2.6'	56.6'
23	162°54.81	15.23	76°29.77	6.9'	28°12.60	2.5'	56.6'
	SD = 16.1'	d = -1.0'		SI	O = 15.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	177°54.99	S01°14.24	90°55.72	7.0'	N28°15.06	2.3'	56.6
1	192°55.17	13.25	105°21.69	7.0'	28°17.35	2.1'	56.5'
2	207°55.35 222°55.53	12.26 •• 11.27	119°47.67 134°13.68	7.0' 7.0'	28°19.48 28°21.44	2.0' 1.8'	56.5' 56.5'
4	222 55.55 237°55.71	10.28	134 13.06 148°39.71	7.0 7.1'	28°23.24	1.6'	56.4'
5	252° 55.89	9.30	163° 5.77	7.1'	28°24.87	1.5'	56.4'
6	267° 56.07	S01°8.31	177°31.85	7.1'	N28°26.35	1.3'	56.4'
7 8	282°56.25 297°56.43	7.32 6.33	191°57.96 206°24.10	7.1' 7.2'	28°27.65 28°28.80	1.1' 1.0'	56.3' 56.3'
9	312°56.61	. 5.34	220°50.26	7.2'	28°29.79	0.8'	56.3
10	327° 56.79	4.35	235°16.46	7.2'	28°30.61	0.7'	56.2'
11	342°56.97 357°57.15	3.36 \$01°2.37	249°42.70 264°8.97	7.3' 7.3'	28°31.27 N28°31.77	0.5' 0.3'	56.2' 56.2'
12 13	12° 57.15	1.39	264°8.97 278°35.27	7.3'	N28°31.77 28°32.12	0.3	56.2 56.1
14	27° 57.52	01°0.40	293° 1.62	7.4'	28°32.30	0.0'	56.1'
15	42°57.70	00°59.41	307°28.00	7.4'	28°32.32	-0.1'	56.1'
16 17	57° 57.88 72° 58.06	58.42 57.43	321°54.42 336°20.89	7.5' 7.5'	28°32.18 28°31.89	-0.3' -0.5'	56.0' 56.0'
18	87°58.24	S00°56.44	350° 47.40	7.6'	N28°31.44	-0.6'	56.0'
19	102°58.42	55.45	5°13.95	7.6'	28°30.83	-0.8'	55.9'
20	117°58.60 132°58.79	54.46 •• 53.48	19°40.55 34°7.20	7.6' 7.7'	28°30.06 28°29.14	-0.9' -1.1'	55.9' 55.9'
21 22	132 56.79 147°58.97	52.49	48°33.90	7.7'	28°28.07	-1.1 -1.2'	55.8'
23	162° 59.15	51.50	63° 0.65	7.8'	28°26.83	-1.4'	55.8'
	SD = 16.1'	d = -1.0'		SI	D = 15.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°59.33	S00°50.51	77°27.45	7.9'	N28°25.45	-1.5'	55.8'
1	192°59.51	49.52	91°54.31	7.9'	28°23.91	-1.7'	55.7'
2	207°59.69 222°59.88	48.53 •• 47.54	106°21.22 120°48.19	8.0' 8.0'	28°22.22 28°20.38	-1.8' -2.0'	55.7' 55.7'
4	222 59.88 238°0.06	46.55	120 48.19 135°15.21	8.1'	28° 20.38 28° 18.39	-2.0 -2.1'	55.7'
5	253°0.24	45.57	149°42.29	8.1'	28°16.24	-2.3'	55.6'
6	268°0.42 283°0.61	S00°44.58 43.59	164° 9.43 178° 36.63	8.2' 8.3'	N28°13.95 28°11.51	-2.4' -2.6'	55.6' 55.6'
7 8	283°0.61 298°0.79	43.59 42.60	1/8°36.63 193°3.89	8.3'	28°11.51 28°8.92	-2.6° -2.7'	55.5'
9	313°0.97	• • 41.61	207°31.22	8.4'	28°6.18	-2.9	55.5'
10	328°1.15	40.62	221°58.61	8.5'	28°3.30	-3.0'	55.5'
11 12	343°1.34 358°1.52	39.63 \$00°38.64	236°26.07 250°53.59	8.5' 8.6'	28°0.27 N27°57.10	-3.2' -3.3'	55.5' 55.4'
13	13°1.70	37.66	265°21.18	8.7'	27°53.78	-3.5'	55.4'
14	28°1.88	36.67	279°48.83	8.7'	27°50.32	-3.6'	55.4'
15 16	43°2.07 58°2.25	· · 35.68 34.69	294°16.56 308°44.36	8.8' 8.9'	27°46.72 27°42.98	-3.7' -3.9'	55.4' 55.3'
16 17	58°2.25 73°2.43	34.69 33.70	308°44.36 323°12.22	8.9'	27°42.98 27°39.09	-3.9° -4.0'	55.3'
18	88°2.62	S00°32.71	337°40.16	9.0'	N27°35.07	-4.2'	55.3'
19	103°2.80	31.72	352°8.18 6°36.26	9.1'	27°30.91	-4.3'	55.3'
20 21	118°2.98 133°3.17	30.74 •• 29.75	6°36.26 21°4.42	9.2' 9.2'	27°26.61 27°22.18	-4.4' -4.6'	55.2' 55.2'
22	148°3.35	28.76	35°32.66	9.3'	27°17.60	-4.7'	55.2'
23	163°3.53	27.77	50° 0.97	9.4'	27°12.90	-4.8'	55.2'
	SD = 16.1'	d = -1.0'		SI	O = 15.2'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	03:38	05:04	06:11	18:07	19:15	20:43
N 70°	03:54	05:10	06:11	18:08	19:09	20:26
68°	04:07	05:15	06:11	18:08	19:03	20:12
66°	04:17	05:19	06:10	18:08	18:59	20:02
64°	04:26	05:23	06:10	18:08	18:55	19:53
62°	04:33	05:26	06:10	18:08	18:52	19:46
60°	04:39	05:28	06:09	18:08	18:50	19:39
N 58°	04:44	05:30	06:09	18:08	18:48	19:34
56°	04:48	05:32	06:09	18:08	18:46	19:30
54°	04:52	05:34	06:09	18:09	18:44	19:26
52°	04:56	05:35	06:09	18:09	18:42	19:22
50°	04:59	05:36	06:09	18:09	18:41	19:19
45°	05:05	05:39	06:08	18:09	18:38	19:13
N 40°	05:09	05:41	06:08	18:09	18:36	19:08
35°	05:13	05:42	06:07	18:10	18:35	19:04
30°	05:15	05:43	06:07	18:10	18:34	19:01
20°	05:19	05:44	06:06	18:10	18:32	18:58
N 10°	05:20	05:45	06:06	18:11	18:32	18:56
0°	05:20	05:44	06:05	18:11	18:32	18:56
S 10°	05:19	05:43	06:04	18:12	18:33	18:58
20°	05:15	05:41	06:03	18:13	18:35	19:01
30°	05:10	05:38	06:02	18:14	18:38	19:06
35°	05:06	05:36	06:01	18:15	18:40	19:10
40°	05:01	05:33	06:00	18:16	18:43	19:14
45°	04:55	05:30	05:59	18:17	18:46	19:20
S 50°	04:47	05:25	05:58	18:18	18:50	19:28
52°	04:43	05:23	05:57	18:18	18:52	19:32
54°	04:39	05:21	05:56	18:19	18:54	19:36
56°	04:33	05:18	05:56	18:20	18:57	19:41
58°	04:28	05:15	05:55	18:20	19:00	19:47
S 60°	04:21	05:12	05:54	18:21	19:03	19:53

Lat.		Moonris	e		Moonset	t .
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°						
64°						
62°	06:23	07.07	00.41	03:57	04.40	05.24
60°	07:09	07:37	08:41	03:11	04:42	05:34
N 58°	07:39	08:16	09:18	02:41	04:03	04:57
56° 54°	08:02 08:21	08:43 09:05	09:44 10:05	02:19 02:00	03:36 03:14	04:30 04:09
54 52°	08:21	09:05	10:05	02:00	03:14	04:09
50°	08:51	09.23	10:22	01:43	02:37	03:37
45°	09:19	10:08	11:07	01:03	02:41	03:07
N 40°	09:41	10:32	11:30	00:42	01:47	02:43
35°	10:00	10:52	11:49	00:42	01:27	02:43
30°	10:16	11:09	12:06	00:08	01:11	02:07
20°	10:43	11:37	12:34		00:42	01:39
N 10°	11:06	12:02	12:58		00:18	01:14
0°	11:28	12:25	13:20	23:56		00:52
S 10°	11:50	12:48	13:42	23:33		00:29
20°	12:14	13:12	14:06	23:09		00:04
30°	12:42	13:41	14:33	22:41	23:36	
35°	12:58	13:58	14:50	22:24	23:19	
40°	13:17	14:18	15:09	22:04	22:59	23:59
45°	13:40	14:42	15:32	21:41	22:35	23:37
S 50°	14:10	15:13	16:01	21:10	22:04	23:08
52°	14:25	15:29	16:15	20:56	21:48	22:54
54°	14:42	15:47	16:32	20:38	21:30	22:38
56°	15:03	16:09	16:52	20:17	21:08	22:18
58°	15:29	16:38	17:17	19:51	20:40	21:53
S 60°	16:06	17:20	17:51	19:14	19:58	21:20

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	38-59%	
16	08:37	08:29	12:08	17:42	05:14		
17	08:20	08:11	12:08	18:38	06:10		
18	08:03	07:54	12:08	19:33	07:06		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA		CHA	Dec	GHA	Dec		Dec		SHA	
Tue	177°1.92	196° 9.87	Dec \$09°27.16	GHA 207°30.61	\$13°38.70	134°34.40	N15° 25.05	GHA 192°54.77	S08°32.67			
0	177 1.92 192°4.38	211°9.41	26.05	207 30.01 222°31.19	38.05	134 34.40 149°36.37	25.21	207° 56.95	32.56	Alpheratz	357°35.84	
1 2	192 4.36 207°6.85	211 9.41 226°8.95	24.94	222 31.19 237°31.77	37.39	149 30.37 164°38.34	25.21	207 50.95 222°59.14	32.45	Ankaa	353°8.20	-
3	207 0.83 222°9.31	241°8.49	• • 23.83	252°32.36	36.74	179°40.32	25.51	238°1.32	• • 32.34	Schedar	349°32.41	
3 4	222 9.31 237°11.78	256°8.03	22.71	267°32.94	36.08	179 40.32 194°42.29	25.67	250 1.52 253°3.51	32.23	Diphda	348°48.28	-
5	252° 14.24	271°7.57	21.60	282°33.52	35.43	209°44.26	25.82	268°5.69	32.23	Achernar	335°21.17	
6	267° 16.70	271 7.57 286°7.10	S09°20.49	202 33.52 297°34.10	\$13°34.77	209 44.20 224°46.23	N15° 25.97	283°7.88	508°32.01	Hamal	327°52.25	
7	282° 19.17	301°6.64	19.38	312°34.68	34.11	239°48.20	26.13	298° 10.07	31.90	Polaris	314°42.40	
8	202 19.17 297°21.63	316° 6.19	18.26	327°35.26	33.46	254°50.17	26.28	313° 12.25	31.79	Acamar	315°12.55	-
9	312°24.10	331° 5.73	10.20	342°35.84	• • 32.80	269°52.14	. 26.43	328° 14.44	•• 31.68	Menkar	314°7.07	
10	312 24.10 327°26.56	346° 5.27	16.03	357°36.43	32.14	284°54.11	26.59	343° 16.62	31.57	Mirfak	308°29.54	
11	342°29.02	1°4.81	14.92	12°37.01	31.48	299°56.08	26.74	358° 18.81	31.46	Aldebaran	290°40.51	
12	357°31.49	16°4.35	S09°13.80	27°37.59	\$13°30.83	314°58.05	N15° 26.89	13°20.99	\$1.40 \$08°31.35	Rigel	281°4.57	
	12° 33.95	31°3.89		42°38.17		330°0.02		28°23.18	31.24	Capella	280°22.97	
13	12 33.95 27°36.42	46°3.43	12.69	42 38.17 57°38.76	30.17	345°1.99	27.05	28 23.18 43°25.36		Bellatrix	278°23.64	
14 15	42° 38.88	40 3.43 61°2.98	11.57 •• 10.46	72°39.34	29.51 •• 28.85	0°3.96	27.20 •• 27.35	43 25.30 58°27.55	31.13 · · 31.02	Elnath	278°2.77	
	57° 41.35	76°2.52	9.34	87°39.92	28.19	15°5.93	27.51	73°29.74		Alnilam	275°38.44	
16	72°43.81	91°2.06	9.34 8.22	102°40.50	27.54	30°7.90	27.51	88°31.92	30.91 30.80	Betelgeuse	270°52.82	
17	87° 46.27	91 2.00 106°1.61			\$13°26.88	45°9.87	N15° 27.82		508°30.69	Canopus	263°52.64	-
18	102° 48.74	100 1.01 121°1.15	\$09°7.10 5.99	117°41.09 132°41.67	26.22	45 9.67 60°11.84		103°34.11 118°36.29	30.58	Sirius	258°26.77	-
19 20	102 46.74 117°51.20	121 1.15 136°0.70		132 41.07 147°42.25	25.56	75°13.81	27.97 28.12	116 30.29 133°38.48		Adhara	255°6.30	
	117 51.20 132°53.67	150 0.70 151°0.24	4.87	147 42.25 162°42.84			. 28.28	133 36.46 148°40.67	30.47	Procyon	244°51.41	
21	132 53.07 147°56.13		• • 3.75	102 42.84 177°43.42	• • 24.90	90°15.78		148 40.67 163°42.85	• • 30.36	Pollux	243°17.96	
22		165°59.79	2.63		24.24	105°17.75	28.43		30.25	Avior	234°14.68	-
23	162°58.59	180°59.33	1.51	192°44.01	23.58	120°19.72	28.58	178°45.04	30.14	Suhail	222°46.51	-
Mer.p	pass. 12:10	ν -0.5 $'$ d-1	.1′ m-3.88	ν 0.6′ d-0	.7′ m1.22	$\nu 2.0' \ d0.$	2′ m-2.11	$\nu 2.2' \ d-0$.1' m1.03	Miaplacidus	221°37.80	-
								-		Alphard	217°48.17	
10/ 1	CILA	CIIA	Б	CIIA	ь.	CIIA	Б	CILA	Б	Regulus	207°34.87	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.14	
0	178°1.06	195°58.88	S09°0.39	207°44.59	\$13°22.92	135°21.69	N15°28.74	193°47.22	S08°30.03	Denebola	182°25.31	
1	193°3.52	210°58.42	08°59.27	222°45.17	22.26	150°23.66	28.89	208°49.41	29.92	Gienah	175°43.96	-
2	208°5.99	225°57.97	58.15	237°45.76	21.60	165°25.62	29.05	223°51.60	29.81	Acrux	173°0.23	-
3	223°8.45	240°57.52	• • 57.02	252°46.34	• • 20.93	180°27.59	29.20	238°53.78	• • 29.70	Gacrux	171°51.87	-
4	238° 10.92	255°57.06	55.90	267°46.93	20.27	195°29.56	29.35	253°55.97	29.60	Alioth	166°12.98	
5	253° 13.38	270°56.61	54.78	282°47.51	19.61	210°31.53	29.51	268°58.16	29.49	Spica	158°22.72	-
6	268° 15.84	285°56.16	S08°53.66	297°48.10	\$13°18.95	225°33.50	N15°29.66	284°0.34	S08°29.38	Alkaid	152°52.08	
7	283° 18.31	300°55.71	52.53	312°48.68	18.29	240°35.46	29.81	299°2.53	29.27	Hadar	148°36.47	-
8	298°20.77	315°55.25	51.41	327°49.27	17.63	255°37.43	29.97	314°4.71	29.16	Menkent	147°58.10	-
9	313°23.24	330°54.80	• • 50.29	342°49.86	• • 16.96	270°39.40	• • 30.12	329°6.90	• • 29.05	Arcturus	145°48.25	
10	328°25.70	345°54.35	49.16	357°50.44	16.30	285°41.36	30.28	344°9.09	28.94	Rigil Kent.	139°40.77	-
11	343°28.16	0°53.90	48.04	12°51.03	15.64	300°43.33	30.43	359°11.27	28.83	Kochab	137°18.88	
12	358° 30.63	15°53.45	S08°46.91	27°51.61	S13°14.98	315°45.30	N15°30.58	14° 13.46	S08°28.72	Zuben'ubi	136°56.53	
13	13°33.09	30°53.00	45.79	42°52.20	14.31	330°47.27	30.74	29° 15.65	28.61	Alphecca	126°4.10	
14	28° 35.56	45°52.55	44.66	57°52.79	13.65	345°49.23	30.89	44°17.83	28.50	Antares	112°16.54	-
15	43°38.02	60°52.10	• • 43.53	72°53.37	• • 12.99	0°51.20	· · 31.05	59° 20.02	• • 28.39	Atria	107°11.26	
16	58° 40.48	75°51.65	42.41	87°53.96	12.32	15°53.16	31.20	74°22.21	28.28	Sabik	102°3.49	-
17	73°42.95	90°51.20	41.28	102°54.55	11.66	30°55.13	31.35	89°24.39	28.17	Shaula	96°11.24	
18	88° 45.41	105°50.76	S08°40.15	117°55.13	S13°10.99	45°57.10	N15°31.51	104° 26.58	508°28.06	Rasalhague	95°59.14	
19	103°47.88	120°50.31	39.02	132°55.72	10.33	60°59.06	31.66	119°28.77	27.95	Eltanin	90°42.49	
20	118° 50.34	135°49.86	37.89	147°56.31	9.66	76°1.03	31.82	134°30.95	27.84	Kaus Aust.	83°33.45	-
21	133°52.80	150°49.41	• • 36.76	162°56.90	• • 9.00	91°2.99	• • 31.97	149°33.14	• • 27.74	Vega	80°33.75	
22	148°55.27	165°48.97	35.63	177°57.48	8.33	106°4.96	32.12	164°35.33	27.63	Nunki	75°48.68	-
23	163°57.73	180°48.52	34.50	192°58.07	7.67	121°6.92	32.28	179°37.52	27.52	Altair	62°0.76	
Mer.p	pass. 12:06	ν -0.5' d-1	.1′ m-3.88	ν 0.6′ d-0	.7′ m1.22	$\nu 2.0' \ d0.$	2′ m-2.10	$\nu 2.2' \ d-0$.1′ m1.03	Peacock	53°7.10	-
				-						Deneb	49°26.57	
			_		_		_		_	Enif	33°39.73	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}34.14$	
0	179°0.20	195°48.07	S08°33.37	207°58.66	S13°7.00	136°8.89	N15°32.43	194°39.70	S08°27.41	Fomalhaut	15°15.59	-
1	194°2.66	210°47.63	32.24	222°59.25	6.34	151°10.85	32.59	209°41.89	27.30	Scheat	13°46.22	
2	209°5.13	225° 47.18	31.11	237°59.84	5.67	166°12.82	32.74	224° 44.08	27.19	Markab	13°30.89	
3	224°7.59	240°46.74	• • 29.98	253°0.43	• • 5.00	181°14.78	• • 32.90	239°46.26	• • 27.08	M 10 T	CIIA	_
4	239° 10.05	255°46.29	28.85	268°1.01	4.34	196°16.75	33.05	254°48.45	26.97	Mar 19 Tue	SHA 10°7.05	
5	254° 12.52	270°45.85	27.72	283°1.60	3.67	211°18.71	33.20	269°50.64	26.86	Venus	19°7.95	
6	269° 14.98		\$08°26.58	298°2.19	\$13°3.00		N15°33.36	284°52.83	S08°26.75	Mars	30°28.69	
7	284° 17.45	300°44.96	25.45	313°2.78	2.34	241°22.64	33.51	299°55.01	26.64	Jupiter	317°32.48	
8	299° 19.91	315°44.51	24.32	328° 3.37	1.67	256°24.60	33.67	314°57.20	26.53	Saturn	15°52.85	_
9	314°22.37	330°44.07	• • 23.18	343°3.96	•• 1.00	271°26.57	• • 33.82	329°59.39	• • 26.43	Mar 20 Wed	SHA	
10	329°24.84	345°43.63	22.05	358° 4.55	13°0.33	286°28.53	33.97	345°1.57	26.32	Venus	17°57.82	
11	344°27.30	0°43.18	20.92	13°5.14	12°59.67	301°30.50	34.13	0°3.76	26.21	Mars	29°43.53	
12	359°29.77	15° 42.74	S08°19.78	28° 5.73	\$12°59.00	316°32.46	N15°34.28	15°5.95	S08°26.10	Jupiter	317°20.63	
13	14°32.23	30°42.30	18.64	43°6.32	58.33	331°34.42	34.44	30°8.14	25.99	Saturn	15°46.17	
14	29°34.69	45°41.86	17.51	58° 6.91	57.66	346°36.39	34.59	45° 10.32	25.88			=
15	44°37.16	60°41.41	• • 16.37	73°7.50	• • 56.99	1°38.35	• • 34.75	60° 12.51	• • 25.77	Mar 21 Thu	SHA	
16	59°39.62	75°40.97	15.24	88°8.09	56.32	16°40.31	34.90	75° 14.70	25.66	Venus	16°47.88	
17	74° 42.09	90°40.53	14.10	103°8.68	55.65	31°42.27	35.06	90°16.89	25.55	Mars	28°58.46	
18	89°44.55	105°40.09	S08°12.96		\$12°54.98	46°44.24	N15° 35.21	105° 19.08	S08°25.45	Jupiter	317°8.69	
19	104° 47.01	120°39.65	11.82	133° 9.86	54.31 52.64	61°46.20	35.36	120°21.26	25.34	Saturn	15°39.50	_
20	119°49.48	135°39.21	10.69	148°10.46	53.64	76°48.16	35.52	135°23.45	25.23	Horizor	ital parallax	
21	134°51.94	150°38.77	· · 9.55	163°11.05	· · 52.97	91°50.12	• • 35.67	150°25.64	• • 25.12	11011201	Venus:	
22	149°54.41	165°38.33	8.41	178°11.64	52.30 51.63	106°52.09	35.83	165°27.83	25.01		Mars:	
23	164° 56.87	180°37.89	7.27	193°12.23	51.63	121°54.05	35.98	180°30.01	24.90		141013.	_
Mer.p	pass. 12:02	ν -0.4′ d-1	.1′ m-3.88	ν 0.6′ d-0	.7′ m1.22	$\nu 2.0' \ d0.$	2′ m-2.10	ν 2.2′ d-0	.1′ m1.03			

Dec 29°13.31 -42°10.61 56°40.16 -17°51.39 $\text{-}57^{\circ}7.02$ $23^{\circ}34.55$ $89^{\circ}22.19$ -40°12.68 4°10.97 49°56.92 16°33.45 -8°10.56 $46^{\circ}1.47$ $6^{\circ}22.23$ 28°37.71 -1°11.29 $7^{\circ}24.63$ -52°42.76 -16°45.12 -29°0.50 5°9.71 27°58.10 -59°35.42 -43°31.99 -69°49.15 -8°45.93 11°50.87 $61^{\circ}37.26$ $14^{\circ}26.10$ -17°40.68 $\textbf{-63}^{\circ}13.99$ -57°14.93 55°49.57 -11°17.36 49°11.34 -60°29.29 -36°29.34 $19^{\circ}3.19$ -60°56.00 $74^{\circ}3.06$ $-16^{\circ}8.61$ 26°37.72 -26°29.14 -69°4.01 -15°45.36 $\text{-}37^{\circ}7.21$ $12^{\circ}32.30$ 51°28.73 -34°22.34 38°47.99 -26°16.01 8°55.71 -56°39.32 $45^{\circ}21.67$ $9^{\circ}58.95$ -46°50.65 -29°29.75 28°12.66 15°19.94 Mer.pass 10:56 10:10 15:00 11:07 Mer.pass 10:56 10:09 14:57 11:03 Mer.pass 10:57 10:08 14:53 11:00

 $0.1 \\ 0.1$

	0.10.0	-0.0091 360		511 —	+09.1931		
h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 3.72 193° 3.90	\$00°26.78 25.79	64°29.35 78°57.82	9.5' 9.5'	N27°8.06 27°3.09	-5.0' -5.1'	55.1' 55.1'
1 2	193 3.90 208° 4.08	25.79 24.80	93°26.36	9.5 9.6'	27 3.09 26°57.98	-5.1 -5.2'	55.1'
3	223° 4.27	• • 23.82	107°54.98	9.7'	26°52.74	-5.4'	55.1'
4	238° 4.45	22.83	122°23.68	9.8'	26°47.38	-5.5'	55.0'
5	253° 4.63	21.84	136°52.47	9.9'	26°41.88	-5.6'	55.0'
6	268°4.82	S00°20.85	151°21.33	9.9'	N26°36.26	-5.7'	55.0'
7	283°5.00	19.86	165°50.27	10.0'	26°30.51	-5.9'	55.0'
8	298° 5.19	18.87	180°19.29	10.1'	26°24.64	-6.0'	55.0'
9	313°5.37	• • 17.89	194°48.39 209°17.58	10.2'	26°18.64 26°12.51	-6.1'	54.9'
10 11	328° 5.55 343° 5.74	16.90 15.91	209°17.58 223°46.85	10.3' 10.4'	26°12.51 26°6.26	-6.2' -6.4'	54.9' 54.9'
12	358° 5.92	500°14.92	238°16.20	10.4	N25°59.89	-0.4 -6.5'	54.9
13	13° 6.11	13.93	252°45.64	10.5	25°53.40	-6.6'	54.8'
14	28° 6.29	12.94	267°15.16	10.6'	25°46.79	-6.7'	54.8'
15	43°6.48	• • 11.96	281°44.76	10.7'	25°40.06	-6.8'	54.8'
16	58° 6.66	10.97	296°14.44	10.8'	25°33.22	-7.0'	54.8'
17	73°6.85	9.98	310°44.22	10.9'	25°26.25	-7.1'	54.8'
18	88°7.03	S00°8.99	325°14.07	10.9'	N25°19.17	-7.2'	54.7'
19	103°7.22 118°7.40	8.00	339°44.01	11.0'	25°11.98	-7.3'	54.7'
20 21	118° 7.40 133° 7.59	7.02 • • 6.03	354°14.04 8°44.15	11.1' 11.2'	25°4.67 24°57.25	-7.4' -7.5'	54.7' 54.7'
21	133 7.59 148° 7.77	5.04	8 44.15 23°14.34	11.2	24 57.25 24°49.72	-7.5' -7.6'	54.7'
23	163°7.96	4.05	37°44.62	11.4'	24°42.07	-7.8'	54.7'
-	SD = 16.1'				O = 15.0'		
	$3\nu = 10.1'$	d = -1.0'		51	J = 15.0′		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°8.14	S00°3.06	52°14.99	11.5'	N24°34.32	-7.9'	54.6'
1	193°8.33	2.08	66°45.44	11.5'	24°26.46	-8.0'	54.6'
2	208° 8.51 223° 8.70	1.09 \$00°0.10	81°15.97 95°46.59	11.6'	24°18.49 24°10.41	-8.1'	54.6'
3 4	223°8.70 238°8.88	N00°0.89	95°46.59 110°17.30	11.7' 11.8'	24°10.41 24°2.23	-8.2' -8.3'	54.6' 54.6'
5	253° 9.07	1.88	124°48.09	11.9'	23°53.94	-8.4'	54.5
6	268° 9.25	N00°2.86	139°18.96	12.0'	N23°45.55	-8.5'	54.5'
7	283° 9.44	3.85	153°49.92	12.0'	23°37.06	-8.6'	54.5'
8	298° 9.62	4.84	168°20.97	12.1'	23°28.47	-8.7'	54.5'
9	313° 9.81	• • 5.83	182°52.09	12.2'	23°19.78	-8.8'	54.5'
10	328°10.00	6.82	197°23.31	12.3'	23°10.98	-8.9'	54.5'
11	343°10.18 358°10.37	7.80	211°54.60	12.4'	23°2.09	-9.0'	54.5'
12 13	358° 10.37 13° 10.55	N00°8.79 9.78	226°25.99 240°57.45	12.5' 12.5'	N22°53.10 22°44.02	-9.1' -9.2'	54.4' 54.4'
14	28°10.74	9.76 10.77	255°29.00	12.6'	22°34.84	-9.2 -9.3'	54.4'
15	43°10.92	. 11.75	270°0.63	12.7'	22°25.56	-9.4'	54.4'
16	58°11.11	12.74	284°32.34	12.8'	22°16.20	-9.5'	54.4'
17	73°11.30	13.73	299°4.14	12.9'	22°6.74	-9.6'	54.4'
18	88°11.48	N00°14.72	313°36.01	13.0'	N21°57.19	-9.6'	54.3'
19	103°11.67	15.70	328°7.97		21°47.55	-9.7'	54.3'
20	118°11.86	16.69	342°40.01	13.1'	21°37.82	-9.8'	54.3'
21	133°12.04 148°12.23	· · 17.68 18.67	357°12.13 11°44.33	13.2' 13.3'	21°28.00 21°18.09	-9.9' -10.0'	54.3' 54.3'
22 23	146 12.23 163°12.41	19.65	26°16.61	13.4'	21 16.09 21°8.10	-10.0	54.3'
23	SD = 16.1'		20 10.01			-10.1	
	SD = 16.1	d = -1.0'		51	O = 14.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 12.60	N00°20.64	40°48.97	13.4'	N20°58.02	-10.2'	54.3'
1	193°12.79	21.63	55°21.41	13.5'	20°47.86	-10.2'	54.3'
2 3	208°12.97 223°13.16	22.61 •• 23.60	69°53.93 84°26.52	13.6' 13.7'	20°37.62 20°27.29	-10.3' -10.4'	54.2' 54.2'
3 4	223°13.16 238°13.35	24.59	98°59.19	13.7'	20°27.29 20°16.88	-10.4 -10.5'	54.2'
5	253° 13.53	25.58	113°31.94	13.8'	20°10.88	-10.5	54.2'
6	268°13.72	N00°26.56	128°4.77	13.9'	N19°55.83	-10.6'	54.2'
7	283°13.91	27.55	142°37.67	14.0'	19°45.18	-10.7'	54.2'
8	298°14.09	28.54	157° 10.65	14.1'	19°34.46	-10.8'	54.2'
9	313°14.28	• • 29.52	171°43.70	14.1'	19°23.66	-10.9'	54.2'
10	328°14.47	30.51	186°16.82	14.2'	19°12.78	-11.0'	54.2'
11 12	343°14.65 358°14.84	31.50 N00°32.48	200°50.02 215°23.29	14.3' 14.3'	19°1.83 N18°50.81	-11.0' -11.1'	54.1' 54.1'
13	13° 15.03	33.47	215 23.29 229°56.63	14.3 14.4'	18°39.71	-11.1 -11.2'	54.1'
14	28°15.22	34.46	244°30.04	14.5	18° 28.55	-11.2'	54.1'
15	43°15.40	• • 35.44	259°3.53	14.6'	18°17.31	-11.3'	54.1'
16	58°15.59	36.43	273°37.08	14.6'	$18^{\circ}6.00$	-11.4'	54.1'
17	73°15.78	37.42	$288^{\circ}10.71$	14.7'	$17^{\circ}54.62$	-11.4'	54.1'
18	88°15.96	N00°38.40	302°44.40	14.8'	N17°43.17	-11.5'	54.1'
19	103°16.15	39.39	317°18.16	14.8'	17°31.66	-11.6'	54.1'
20 21	118°16.34 133°16.53	40.38 •• 41.36	331°51.98 346°25.88	14.9' 15.0'	17°20.08 17°8.44	-11.6' -11.7'	54.1' 54.1'
21	133° 16.53 148° 16.71	42.35	346°25.88 0°59.84	15.0° 15.0°	17°8.44 16°56.73	-11.7' -11.8'	54.1' 54.1'
23	163°16.90	43.34	15°33.86	15.1'	16°44.96	-11.8'	54.0'
-	SD = 16.0'	d = 1.0'			D = 14.8'		
	JU = 10.0	u — 1.0		اد	J — 14.0		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	03:18	04:48	05:56	18:21	19:30	21:01
N 70°	03:38	04:56	05:57	18:20	19:21	20:41
68°	03:52	05:02	05:58	18:19	19:15	20:25
66°	04:04	05:08	05:59	18:18	19:09	20:13
64°	04:14	05:12	05:59	18:17	19:05	20:03
62°	04:22	05:16	06:00	18:16	19:01	19:55
60°	04:29	05:19	06:00	18:16	18:57	19:48
N 58°	04:35	05:22	06:01	18:15	18:54	19:42
56°	04:40	05:24	06:01	18:15	18:52	19:36
54°	04:44	05:26	06:01	18:14	18:50	19:32
52°	04:48	05:28	06:02	18:14	18:48	19:28
50°	04:52	05:30	06:02	18:14	18:46	19:24
45°	04:59	05:33	06:02	18:13	18:42	19:17
N 40°	05:04	05:36	06:03	18:12	18:39	19:11
35°	05:08	05:38	06:03	18:12	18:37	19:07
30°	05:12	05:40	06:03	18:12	18:36	19:03
20°	05:16	05:42	06:04	18:11	18:33	18:59
N 10°	05:19	05:43	06:04	18:11	18:32	18:56
0°	05:19	05:43	06:04	18:11	18:31	18:55
S 10°	05:19	05:43	06:04	18:10	18:31	18:56
20°	05:16	05:42	06:04	18:10	18:32	18:58
30°	05:12	05:40	06:04	18:10	18:34	19:02
35°	05:09	05:38	06:03	18:11	18:36	19:05
40°	05:05	05:36	06:03	18:11	18:38	19:09
45°	04:59	05:34	06:03	18:11	18:40	19:14
S 50°	04:52	05:30	06:02	18:11	18:43	19:21
52°	04:49	05:29	06:02	18:11	18:45	19:25
54°	04:45	05:27	06:02	18:12	18:47	19:28
56°	04:40	05:25	06:02	18:12	18:49	19:33
58°	04:35	05:22	06:01	18:12	18:51	19:38
S 60°	04:29	05:19	06:01	18:12	18:54	19:43

Lat.		Moonris	е	Moonset			
Lat.	Tue	Wed	Thu	Tue	Wed	Thu	
N 72°							
N 70°			10:54			08:33	
68°			11:49			07:37	
66°		09:57	12:21		07:52	07:03	
64°		10:51	12:45		06:57	06:38	
62°	09:32	11:23	13:04	06:33	06:25	06:18	
60°	10:11	11:47	13:19	05:53	06:00	06:02	
N 58°	10:38	12:06	13:32	05:26	05:41	05:49	
56°	11:00	12:21	13:43	05:04	05:24	05:37	
54°	11:17	12:35	13:53	04:46	05:10	05:26	
52°	11:32	12:47	14:01	04:31	04:58	05:17	
50°	11:45	12:57	14:09	04:18	04:47	05:09	
45°	12:11	13:19	14:26	03:51	04:25	04:51	
N 40°	12:32	13:36	14:39	03:29	04:06	04:36	
35°	12:50	13:50	14:50	03:11	03:51	04:24	
30°	13:05	14:03	15:00	02:56	03:37	04:13	
20°	13:30	14:25	15:17	02:29	03:14	03:54	
N 10°	13:52	14:43	15:32	02:07	02:54	03:38	
0°	14:12	15:00	15:45	01:45	02:36	03:23	
S 10°	14:32	15:18	15:59	01:24	02:17	03:07	
20°	14:54	15:36	16:14	01:01	01:56	02:50	
30°	15:18	15:57	16:30	00:34	01:33	02:31	
35°	15:33	16:09	16:40	00:18	01:19	02:20	
40°	15:50	16:23	16:51	••••	01:03	02:06	
45°	16:10	16:40	17:03		00:43	01:51	
S 50°	16:35	17:00	17:19		00:19	01:32	
52°	16:48	17:10	17:26		00:07	01:23	
54°	17:02	17:21	17:34	23:54	•• ••	01:12	
56°	17:18	17:33	17:43	23:38		01:01	
58°	17:37	17:47	17:53	23:19		00:47	
S 60°	18:01	18:04	18:04	22:56	••••	00:31	

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
- ",	00 ^h	12 ^h	Pass	Upper	Lower	9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	68-84%
19	07:45	07:36	12:08	20:24	07:59	
20	07:27	07:19	12:07	21:12	08:48	
21	07:10	07:01	12:07	21:56	09:34	

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	179°59.34	195°37.45	508° 6.13	208°12.82	\$12°50.96	136°56.01	N15° 36.14	195°32.20	S08°24.79			
1	195°1.80	210°37.01	4.99	223°13.41	50.29	151°57.97	36.29	210°34.39	24.68	Alpheratz	357°35.84	29°13.30
2	210°4.26	225°36.58	3.85	238°14.01	49.62	166°59.93	36.45	225°36.58	24.57	Ankaa	353°8.20	-42°10.60
3	225°6.73	240°36.14	2.71	253°14.60	• • 48.95	182°1.89	• • 36.60	240°38.77	• • 24.47	Schedar	349° 32.41	56°40.15
4	240°9.19	255°35.70	1.57	$268^{\circ}15.19$	48.28	197°3.85	36.75	255°40.96	24.36	Diphda	348°48.28	-17°51.39
5	$255^{\circ}11.66$	270°35.26	$08^{\circ}0.43$	283°15.78	47.60	212°5.81	36.91	270°43.14	24.25	Achernar Hamal	335°21.18 327°52.26	-57°7.00 23°34.55
6	$270^{\circ}14.12$	285°34.82	507°59.28	298°16.38	S12°46.93	227°7.78	N15°37.06	285°45.33	508°24.14	Polaris	314° 43.56	89°22.18
7	$285^{\circ}16.58$	300°34.39	58.14	313°16.97	46.26	242°9.74	37.22	300°47.52	24.03	Acamar	315° 12.57	-40°12.67
8	300° 19.05	315°33.95	57.00	328°17.56	45.59	257°11.70	37.37	315°49.71	23.92	Menkar	314°7.08	4°10.97
9	315°21.51	330°33.51	• • 55.86	343°18.16	• • 44.91	272°13.66	• • 37.53	330°51.90	• • 23.81	Mirfak	308°29.55	49°56.92
10	330°23.98	345°33.08	54.71	358°18.75	44.24	287°15.62	37.68	345°54.08	23.71	Aldebaran	290°40.52	16°33.45
11	345° 26.44	0°32.64	53.57	13°19.34	43.57	302°17.58	37.84	0°56.27	23.60	Rigel	281°4.58	-8°10.56
12	0°28.90	15°32.21	S07°52.42	28°19.94	\$12°42.90	317°19.54	N15° 37.99	15°58.46	S08°23.49	Capella	280°22.99	46°1.47
13 14	15°31.37 30°33.83	30°31.77 45°31.34	51.28 50.14	43°20.53 58°21.12	42.22 41.55	332°21.50 347°23.46	38.15 38.30	31°0.65 46°2.84	23.38 23.27	Bellatrix	278°23.66	6°22.23
15	45° 36.30	60°30.90	. 48.99	73°21.72	. 40.87	2°25.42	• • 38.45	61°5.03	. 23.16	Elnath	278°2.78	28°37.71
16	60°38.76	75°30.47	47.84	88°22.31	40.20	17°27.38	38.61	76°7.22	23.05	Alnilam	275°38.45	-1°11.29
17	75°41.22	90°30.04	46.70	103°22.91	39.53	32°29.34	38.76	91°9.40	22.95	Betelgeuse	270°52.83	7°24.64
18	90°43.69	105°29.60	S07°45.55	118°23.50	S12°38.85	47°31.29	N15° 38.92	106°11.59	S08°22.84	Canopus	263°52.67	-52°42.76
19	105°46.15	120°29.17	44.40	133°24.10	38.18	62°33.25	39.07	121°13.78	22.73	Sirius	258°26.79	-16°45.12
20	120°48.62	135°28.74	43.26	148°24.69	37.50	77°35.21	39.23	136° 15.97	22.62	Adhara	255°6.32	-29° 0.50
21	$135^{\circ}51.08$	150°28.30	• • 42.11	163°25.29	• • 36.83	92°37.17	• • 39.38	151° 18.16	• • 22.51	Procyon	244°51.42 243°17.98	5° 9.71 27° 58.11
22	$150^{\circ}53.54$	165°27.87	40.96	178°25.88	36.15	107°39.13	39.54	$166^{\circ}20.35$	22.40	Pollux Avior	243 17.98 234°14.71	-59°35.43
23	$165^{\circ}56.01$	180°27.44	39.81	193°26.48	35.47	122°41.09	39.69	181°22.54	22.30	Suhail	234 14.71 222°46.53	-39 35.43 -43°32.00
Mar	pass. 11:58	ν -0.4' d-1.	1′ m_3 88	ν0.6' d-0	.7′ m1.22	v2 0' d0	.2′ m-2.10	1/2 2' d-0	.1′ m1.04	Miaplacidus	221°37.84	-69°49.16
- IVICI.	pass. 11.30	ν-0.4 u-1.		νο.σ u-σ	7.7 1111.22	ν2.0 do	.2 111-2.10	ν2.2 u -0	.1 1111.04	Alphard	217°48.18	-8°45.93
										Regulus	207°34.87	11°50.87
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.14	61°37.27
0	180°58.47	195°27.01	S07°38.67	208°27.07	\$12°34.80	137°43.05	N15° 39.85	196°24.73	S08°22.19	Denebola	182°25.30	14°26.11
1	196°0.94	210°26.57	37.52	223°27.67	34.12	152°45.00	40.00	211°26.92	22.08	Gienah	175°43.96	-17°40.68
2	211°3.40	225°26.14	36.37	238°28.27	33.45	167°46.96	40.16	226°29.10	21.97	Acrux	173°0.23	-63°14.01
3	226°5.86	240°25.71	• • 35.22	253°28.86	• • 32.77	182°48.92	• • 40.31	241°31.29	• • 21.86	Gacrux	171°51.87	-57°14.95
4	241°8.33	255°25.28 270°24.85	34.07	268°29.46 283°30.05	32.09	197°50.88 212°52.84	40.47	256°33.48 271°35.67	21.75	Alioth	$166^{\circ}12.96$	55°49.59
5 6	256° 10.79 271° 13.26		32.92 \$07°31.77	298°30.65	31.42 \$12°30.74	212 52.04 227°54.79	40.62 N15° 40.78	286° 37.86	21.65 \$08°21.54	Spica	158°22.71	-11°17.36
7	286° 15.72	300°23.99	30.62	313°31.25	30.06	242°56.75	40.93	301°40.05	21.43	Alkaid	152°52.06	49°11.35
8	301°18.18	315°23.56	29.46	328°31.84	29.38	257°58.71	41.09	316°42.24	21.43	Hadar	148°36.45	-60°29.30
9	316° 20.65	330°23.13	28.31	343°32.44	28.71	273°0.66	• • 41.24	331°44.43	• • 21.21	Menkent	147°58.09	-36°29.35
10	331°23.11	345°22.70	27.16	358°33.04	28.03	288°2.62	41.40	346°46.62	21.10	Arcturus	145°48.23	19°3.19
11	346°25.58	0°22.27	26.01	13°33.64	27.35	303°4.58	41.55	1°48.81	21.00	Rigil Kent.	139°40.74	-60°56.02
12	1°28.04		507°24.86	28°34.23	S12°26.67	318°6.54	N15°41.71	16°51.00	S08°20.89	Kochab Zuben'ubi	137° 18.83 136° 56.52	74°3.07 -16°8.62
13	$16^{\circ}30.50$	$30^{\circ}21.42$	23.70	43°34.83	25.99	333°8.49	41.86	31°53.19	20.78	Alphecca	126°4.08	26°37.73
14	$31^{\circ}32.97$	45°20.99	22.55	58°35.43	25.32	$348^{\circ}10.45$	42.02	46°55.38	20.67	Antares	112° 16.51	-26°29.15
15	$46^{\circ}35.43$	$60^{\circ}20.56$	•• 21.39	73°36.03	• • 24.64	3°12.40	• • 42.17	61°57.57	• • 20.56	Atria	107° 11.21	-69°4.02
16	61°37.90	75°20.14	20.24	88°36.63	23.96	18°14.36	42.33	76°59.76	20.46	Sabik	102°3.47	-15°45.36
17	76°40.36	90°19.71	19.09	103°37.22	23.28	33°16.32	42.48	92°1.95	20.35	Shaula	96°11.22	-37°7.22
18	91°42.82	105°19.28	S07°17.93	118°37.82	\$12°22.60	48°18.27	N15° 42.64	107°4.14	S08°20.24	Rasalhague	95°59.12	12°32.30
19	106° 45.29	120° 18.85	16.78	133°38.42	21.92	63°20.23	42.79	122°6.33	20.13	Eltanin	90°42.46	51°28.73
20	121° 47.75 136° 50.22	135° 18.43	15.62	148°39.02	21.24	78°22.18	42.95	137°8.52 152°10.71	20.02	Kaus Aust.	83°33.42	-34°22.34
21 22	150 50.22 151°52.68	150°18.00 165°17.58	· · 14.46 13.31	163°39.62 178°40.22	· · 20.56 19.88	93°24.14 108°26.09	· · 43.10 43.26	167° 12.90	· · 19.92 19.81	Vega	80°33.72	38°47.99
23	166° 55.15	180° 17.15	12.15	170° 40.22 193° 40.82	19.00	123°28.05	43.41	182° 15.09	19.70	Nunki	75° 48.65	-26°16.01
										Altair	62°0.74	8°55.70
Mer.	pass. 11:54	ν -0.4′ d-1.	1' m-3.88	ν 0.6′ d-0	.7′ m1.21	$\nu 2.0' \ d0$.2′ m-2.09	$\nu 2.2' \ d-0$.1' m 1.04	Peacock	53°7.07	-56°39.31
										Deneb	49°26.55	45°21.66 9°58.95
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.71	9 58.95 -46°50.64
0	181°57.61	195°16.73			S12°18.52	138°30.00		197° 17.28	508°19.59	Al Na'ir Fomalhaut	27°34.12 15°15.58	-40 50.04 -29°29.74
1	$197^{\circ}0.07$	$210^{\circ}16.30$	9.84	223°42.02	17.84	153°31.96	43.72	$212^{\circ}19.47$	19.48	Scheat	13°46.21	28°12.65
2	212°2.54	$225^{\circ}15.88$	8.68	238°42.61	17.15	$168^{\circ}33.91$	43.88	$227^{\circ}21.66$	19.38	Markab	13° 30.88	15°19.94
3	227°5.00	240°15.45	• • 7.52	253°43.21	• • 16.47	183°35.87	• • 44.03	242°23.85	• • 19.27			
4	242°7.47	255° 15.03	6.36	268°43.81	15.79	198°37.82	44.19	257°26.04	19.16	Mar 22 Fri	SHA	Mer.pass
5	257°9.93	270°14.61	5.20	283°44.41	15.11	213°39.78	44.34	272°28.23	19.05	Venus	15°38.12	10:58
6	272° 12.39	285°14.18	\$07°4.05	298°45.01	\$12°14.43	228°41.73	N15°44.50	287°30.42	S08°18.95	Mars	28° 13.49	10:07
7	287° 14.86	300°13.76	2.89	313°45.62	13.75	243°43.69	44.65	302°32.61	18.84	Jupiter Saturn	316°56.67 15°32.87	14:50 10:56
8	302° 17.32	315°13.34	1.73	328°46.22	13.06	258°45.64	44.81	317°34.80	18.73	Saturn	15 32.07	10:50
9 10	317° 19.79 332° 22.25	330°12.91 345°12.49	07°0.57 06°59.41	343°46.82 358°47.42	· · 12.38 11.70	273°47.59 288°49.55	• • 44.96 45.12	332°36.99 347°39.18	· · 18.62 18.51	Mar 23 Sat	SHA	Mer.pass
11	347°24.71	0°12.07	58.25	13°48.02	11.70	303°51.50	45.12 45.27	2°41.37	18.41	Venus	14°28.53	10:59
12	2°27.18		506°57.08	28°48.62	\$12°10.33	318°53.45	N15°45.43	17°43.56	S08°18.30	Mars	27°28.60	10:06
13	17° 29.64	30°11.22	55.92	43°49.22	9.65	333°55.41	45.58	32°45.75	18.19	Jupiter	316°44.57	14:47
14	32°32.11	45°10.80	54.76	58°49.82	8.97	348°57.36	45.74	47°47.94	18.08	Saturn	15°26.25	10:53
15	47°34.57	$60^{\circ}10.38$	• • 53.60	73°50.42	• • 8.28	3°59.31	• • 45.89	62°50.13	•• 17.98	Mar 24 Sun	SHA	Mer.pass
16	62°37.03	75°9.96	52.44	88°51.03	7.60	19°1.27	46.05	77°52.32	17.87	Venus	13° 19.12	10:59
17	$77^{\circ}39.50$	90°9.54	51.27	103°51.63	6.91	34°3.22	46.20	92°54.51	17.76	Mars	26°43.81	10:05
18	92°41.96		S06°50.11	118°52.23	\$12°6.23	49°5.17		107°56.70	S08°17.65	Jupiter	$316^{\circ}32.39$	14:44
19	107°44.43	120°8.70	48.95	133°52.83	5.54	64°7.12	46.51	122°58.89	17.55	Saturn	15° 19.67	10:49
20	122° 46.89	135°8.28	47.78	148°53.43	4.86	79°9.08	46.67	138°1.08	17.44	Harita	ntal parallax	
21	137° 49.35	150°7.86	· · 46.62	163°54.04	• • 4.17	94°11.03	· · 46.82	153°3.28	17.33	11011201	Venus:	0.1
22 23	152° 51.82 167° 54.28	165°7.44 180°7.02	45.46 44.20	178°54.64	3.49 2.80	109°12.98 124°14.93	46.98 47.13	168°5.47 183°7.66	17.22 17.12		Mars:	0.1
			44.29	193°55.24					17.12			
Mer.	pass. 11:50	ν -0.4′ d-1.	.2′ m-3.88	ν 0.6′ d-0	0.7′ m1.21	$\nu 2.0' d0$.2′ m-2.09	$\nu 2.2' \ d-0$.1′ m1.04			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 17.09	N00°44.32	30°7.95	15.2'	N16°33.12	-11.9'	54.0'
1	193° 17.28 208° 17.46	45.31	44°42.10 59°16.31	15.2'	16°21.22 16°9.27	-12.0'	54.0'
2	200 17.40 223° 17.65	46.30 •• 47.28	73°50.59	15.3' 15.3'	15° 57.25	-12.0' -12.1'	54.0' 54.0'
4	238° 17.84	48.27	88°24.93	15.4'	15°45.17	-12.1'	54.0'
5	253° 18.03	49.25	102°59.32	15.5'	15°33.04	-12.2'	54.0'
6	268° 18.22 283° 18.40	N00°50.24 51.23	117°33.78 132°8.29	15.5' 15.6'	N15°20.84 15°8.60	-12.2' -12.3'	54.0' 54.0'
7 8	283 18.40 298° 18.59	51.23 52.21	132 8.29 146°42.87	15.6'	15 8.00 14°56.29	-12.3 -12.4'	54.0'
9	313° 18.78	• • 53.20	161°17.50	15.7'	14°43.93	-12.4'	54.0'
10	328° 18.97	54.18	175°52.18	15.7'	14°31.52	-12.5'	54.0'
11 12	343° 19.16 358° 19.34	55.17 N00°56.16	190°26.92 205°1.72	15.8' 15.8'	14°19.05 N14°6.53	-12.5' -12.6'	54.0' 54.0'
13	13° 19.53	57.14	219°36.57	15.0	13°53.96	-12.6'	54.0'
14	28° 19.72	58.13	234°11.47	16.0'	13°41.34	-12.7'	54.0'
15	43° 19.91	00°59.11	248°46.43	16.0'	13°28.67	-12.7'	54.0'
16 17	58° 20.10 73° 20.28	01°0.10 1.08	263°21.43 277°56.49	16.1' 16.1'	13°15.96 13°3.19	-12.8' -12.8'	53.9' 53.9'
18	88° 20.47	N01°2.07	292°31.59	16.2	N12°50.38	-12.0	53.9
19	103°20.66	3.05	307°6.74	16.2'	12°37.52	-12.9'	53.9'
20	118° 20.85	4.04	321°41.94	16.2'	12°24.61	-13.0'	53.9'
21	133°21.04 148°21.22	• • 5.02	336°17.19 350°52.48	16.3'	12°11.66 11°58.67	-13.0'	53.9'
22 23	148°21.22 163°21.41	6.01 7.00	350°52.48 5°27.82	16.3' 16.4'	11°58.67 11°45.63	-13.0' -13.1'	53.9' 53.9'
	SD = 16.0'	d = 1.0'	- 3 21.02		D = 14.7'	20.1	- 3.3
	3D - 10.0°	u — 1.0		اد	J = 14.7°		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.60	N01°7.98	20°3.20	16.4'	N11°32.55	-13.1'	53.9'
1 2	193°21.79 208°21.98	8.97 9.95	34°38.62 49°14.09	16.5' 16.5'	11°19.43 11°6.27	-13.2' -13.2'	53.9' 53.9'
3	223°22.17	• • 10.94	63°49.60	16.5'	10°53.07	-13.2'	53.9'
4	238°22.36	11.92	78°25.15	16.6'	$10^{\circ}39.82$	-13.3'	53.9'
5	253°22.54	12.91	93°0.73	16.6'	10°26.55	-13.3'	53.9'
6 7	268° 22.73 283° 22.92	N01°13.89 14.87	107°36.36 122°12.02	16.7' 16.7'	N10°13.23 09°59.88	-13.4' -13.4'	53.9' 53.9'
8	298°23.11	15.86	136°47.72	16.7'	09°46.49	-13.4'	53.9'
9	313°23.30	• • 16.84	151°23.46	16.8'	$09^{\circ}33.07$	-13.5'	53.9'
10	328° 23.49	17.83	165°59.23	16.8'	09°19.61 09°6.12	-13.5'	53.9'
11 12	343°23.68 358°23.86	18.81 N01°19.80	180°35.03 195°10.87	16.8' 16.9'	N08°52.59	-13.5' -13.6'	53.9' 53.9'
13	13° 24.05	20.78	209°46.74	16.9'	08°39.04	-13.6'	53.9'
14	28° 24.24	21.77	224°22.63	16.9'	08°25.45	-13.6'	53.9'
15 16	43°24.43 58°24.62	· · 22.75 23.73	238°58.56 253°34.52	17.0' 17.0'	08°11.83 07°58.18	-13.6' -13.7'	53.9' 53.9'
17	73° 24.81	23.73 24.72	255 54.52 268°10.51	17.0'	07 56.16 07°44.51	-13.7'	53.9'
18	88°25.00	N01°25.70	282°46.52	17.0'	N07°30.80	-13.7'	53.9'
19	103°25.19	26.69	297°22.56	17.1'	07°17.07	-13.8'	53.9'
20 21	118° 25.38 133° 25.56	27.67 •• 28.65	311°58.63 326°34.72	17.1' 17.1'	07°3.31 06°49.53	-13.8' -13.8'	53.9' 53.9'
22	148° 25.75	29.64	341°10.83	17.1	06°35.72	-13.8'	53.9'
23	163°25.94	30.62	355°46.96	17.2'	$06^{\circ}21.89$	-13.9'	53.9'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'		
Sun	GHA 178° 26.13	Dec N01°31.61	GHA 10°23.12	u 17.2'	Dec N06°8.03	d -13.9'	HP 53.9'
0 1	178° 26.13 193° 26.32	32.59	24°59.30	17.2'	05°54.15	-13.9' -13.9'	53.9' 53.9'
2	208° 26.51	33.57	39°35.49	17.2'	$05^{\circ}40.25$	-13.9'	53.9'
3	223°26.70	• • 34.56	54°11.71	17.2'	05°26.33	-13.9'	53.9'
4 5	238° 26.89 253° 27.08	35.54 36.52	68°47.94 83°24.19	17.2' 17.3'	05°12.38 04°58.42	-14.0' -14.0'	53.9' 53.9'
6	268°27.27	N01°37.51	98°0.46	17.3'	N04°44.44	-14.0'	53.9'
7	283°27.46	38.49	112°36.73	17.3'	04°30.44	-14.0'	53.9'
8	298° 27.64	39.47	127°13.03	17.3'	04°16.42	-14.0'	53.9'
9 10	313°27.83 328°28.02	· · 40.46 41.44	141°49.33 156°25.65	17.3' 17.3'	04°2.39 03°48.34	-14.0' -14.1'	53.9' 53.9'
11	343°28.21	42.42	171°1.98	17.3'	03°34.27	-14.1	53.9'
12	358° 28.40	N01°43.40	185°38.31	17.3'	N03°20.19	-14.1'	53.9'
13	13°28.59 28°28.78	44.39 45.27	200°14.66	17.4'	03°6.10	-14.1'	53.9'
14 15	28°28.78 43°28.97	45.37 •• 46.35	214°51.02 229°27.38	17.4' 17.4'	02°51.99 02°37.88	-14.1' -14.1'	53.9' 53.9'
16	58°29.16	47.34	244°3.74	17.4	02°23.75	-14.1	53.9'
17	73° 29.35	48.32	258°40.11	17.4'	02°9.61	-14.2'	54.0'
18	88°29.54	N01°49.30	273°16.49	17.4'	N01°55.46	-14.2'	54.0'
19 20	103°29.73 118°29.92	50.28 51.27	287°52.87 302°29.25	17.4' 17.4'	01°41.30 01°27.13	-14.2' -14.2'	54.0' 54.0'
21	133°30.11	• • 52.25	317°5.63	17.4	01°12.95	-14.2'	54.0'
22	148°30.29	53.23	331°42.01	17.4'	00°58.77	-14.2'	54.0'
23	163°30.48	54.21	346°18.39	17.4'	00°44.58	-14.2'	54.0'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:57	04:31	05:41	18:35	19:45	21:22
N 70°	03:20	04:41	05:43	18:32	19:34	20:57
68°	03:37	04:49	05:45	18:29	19:26	20:39
66°	03:51	04:56	05:47	18:27	19:19	20:25
64°	04:02	05:01	05:49	18:26	19:14	20:13
62°	04:11	05:06	05:50	18:24	19:09	20:04
60°	04:19	05:10	05:51	18:23	19:05	19:56
N 58°	04:26	05:13	05:52	18:22	19:01	19:49
56°	04:31	05:16	05:53	18:21	18:58	19:43
54°	04:36	05:19	05:54	18:20	18:55	19:38
52°	04:41	05:21	05:55	18:19	18:53	19:33
50°	04:45	05:23	05:55	18:18	18:51	19:29
45°	04:53	05:28	05:57	18:17	18:46	19:21
N 40°	04:59	05:31	05:58	18:15	18:43	19:14
35°	05:04	05:34	05:59	18:14	18:40	19:09
30°	05:08	05:36	06:00	18:13	18:37	19:05
20°	05:14	05:39	06:01	18:12	18:34	19:00
N 10°	05:17	05:41	06:02	18:11	18:32	18:56
0°	05:18	05:42	06:03	18:10	18:30	18:54
S 10°	05:19	05:43	06:04	18:09	18:30	18:54
20°	05:17	05:43	06:05	18:08	18:30	18:55
30°	05:14	05:42	06:05	18:07	18:31	18:58
35°	05:11	05:41	06:06	18:06	18:32	19:01
40°	05:08	05:39	06:06	18:06	18:33	19:04
45°	05:03	05:37	06:07	18:05	18:35	19:09
S 50°	04:57	05:35	06:07	18:05	18:37	19:15
52°	04:54	05:34	06:07	18:04	18:38	19:17
54°	04:51	05:32	06:08	18:04	18:39	19:21
56°	04:47	05:31	06:08	18:04	18:41	19:24
58°	04:42	05:29	06:08	18:03	18:42	19:29
S 60°	04:37	05:27	06:08	18:03	18:44	19:34

Lat.		Moonris	е		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	13:05	15:22	17:21	07:52	07:01	06:25
N 70°	13:34	15:34	17:24	07:21	06:46	06:19
68°	13:56	15:45	17:27	06:58	06:34	06:14
66°	14:12	15:53	17:28	06:40	06:24	06:10
64°	14:26	16:00	17:30	06:26	06:15	06:06
62°	14:37	16:06	17:32	06:13	06:08	06:03
60°	14:47	16:11	17:33	06:02	06:02	06:00
N 58°	14:55	16:15	17:34	05:53	05:56	05:58
56°	15:02	16:19	17:35	05:45	05:51	05:56
54°	15:09	16:23	17:36	05:38	05:46	05:54
52°	15:15	16:26	17:37	05:31	05:42	05:52
50°	15:20	16:29	17:37	05:25	05:38	05:50
45°	15:31	16:36	17:39	05:12	05:30	05:46
N 40°	15:41	16:41	17:40	05:02	05:23	05:43
35°	15:49	16:45	17:41	04:52	05:17	05:41
30°	15:56	16:49	17:42	04:44	05:12	05:38
20°	16:08	16:56	17:44	04:30	05:03	05:34
N 10°	16:18	17:02	17:45	04:18	04:55	05:30
0°	16:28	17:08	17:47	04:06	04:47	05:27
S 10°	16:37	17:13	17:48	03:54	04:40	05:23
20°	16:48	17:19	17:50	03:42	04:31	05:19
30°	16:59	17:26	17:52	03:27	04:22	05:15
35°	17:06	17:30	17:53	03:19	04:16	05:12
40°	17:14	17:34	17:54	03:09	04:10	05:10
45°	17:23	17:39	17:55	02:58	04:03	05:06
S 50°	17:33	17:46	17:57	02:44	03:54	05:02
52°	17:38	17:48	17:57	02:37	03:49	05:00
54°	17:44	17:51	17:58	02:30	03:45	04:58
56°	17:50	17:55	17:59	02:22	03:40	04:56
58°	17:56	17:58	18:00	02:12	03:34	04:53
S 60°	18:04	18:02	18:01	02:02	03:28	04:51

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-98%	
22	06:52	06:43	12:07	22:38	10:17		
23	06:34	06:25	12:06	23:17	10:58		
24	06:15	06:06	12:06	23:56	11:37		

h	Aries	Ven	ıus	M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	
0	182° 56.75		506°43.13	208°55.85	\$12°2.12	139°16.88	N15° 47.29	198° 9.85	S08°17.01		ЗПА	
1	197°59.21	210°6.19	41.96	223°56.45	1.43	154°18.83	47.45	213° 12.04	16.90	Alpheratz	357°35.84	
2	213°1.67	225°5.77	40.80	238°57.05	0.75	169°20.79	47.60	228° 14.23	16.79	Ankaa	353°8.20	-
3	228°4.14	240°5.35	• • 39.63	253°57.65	12°0.06	184°22.74	• • 47.76	243° 16.42	. 16.69	Schedar	349°32.42	
4	243°6.60	255°4.93	38.46	268°58.26	11°59.37	199°24.69	47.91	258° 18.61	16.58	Diphda	348°48.29	
5	258°9.07	270°4.52	37.30	283°58.86	58.69	214°26.64	48.07	273°20.81	16.47	Achernar	335°21.19	
6	273°11.53		S06°36.13	298°59.47	S11°58.00	229°28.59	N15° 48.22	288° 23.00	S08°16.36	Hamal	327°52.27	
7	288° 13.99	300°3.68	34.96	314° 0.07	57.31	244°30.54	48.38	303°25.19	16.26	Polaris	314°44.64	
8	303°16.46	315°3.26	33.80	329° 0.67	56.63	259°32.49	48.53	318° 27.38	16.15	Acamar	315°12.58	-
9	318° 18.92	330°2.85	• • 32.63	344°1.28	• • 55.94	274°34.44	• • 48.69	333° 29.57	• • 16.04	Menkar	314°7.09	
10	333°21.39	345°2.43	31.46	359°1.88	55.25	289°36.39	48.84	348°31.76	15.94	Mirfak	308° 29.57	
11	348° 23.85	0°2.02	30.29	14°2.49	54.56	304°38.34	49.00	3°33.95	15.83	Aldebaran	290°40.54	
12	3°26.31	15°1.60	S06°29.12	29°3.09	S11°53.88	319°40.29	N15°49.15	18° 36.15	S08°15.72	Rigel	281°4.60	
13	18°28.78	30°1.18	27.95	44°3.70	53.19	334°42.24	49.31	33°38.34	15.61	Capella	280°23.01 278°23.68	
14	33°31.24	45°0.77	26.78	59°4.30	52.50	349°44.19	49.47	48°40.53	15.51	Bellatrix Elnath	278°2.80	
15	48°33.71	60°0.35	• • 25.61	$74^{\circ}4.91$	• • 51.81	4°46.14	• • 49.62	63°42.72	•• 15.40	Alnilam	275°38.47	
16	63°36.17	74°59.94	24.44	89°5.51	51.12	19°48.09	49.78	78°44.91	15.29	Betelgeuse	270°52.85	
17	78°38.63	89°59.53	23.27	104°6.12	50.43	34°50.04	49.93	93°47.10	15.19	Canopus	263°52.69	
18	93°41.10		S06°22.10	119°6.72	S11°49.74	49°51.99	N15°50.09	108°49.30	S08°15.08	Sirius	258°26.81	
19	108°43.56	119°58.70	20.93	134°7.33	49.06	64°53.94	50.24	123°51.49	14.97	Adhara	255°6.34	
20	123°46.03	134°58.28	19.76	149°7.94	48.37	79°55.89	50.40	138°53.68	14.86	Procyon	244°51.44	
21	138° 48.49	149°57.87	• • 18.59	164°8.54	• • 47.68	94°57.84	• • 50.55	153° 55.87	• • 14.76	Pollux	243° 18.00	
22	153°50.95	164°57.46	17.42	179° 9.15	46.99	109°59.79	50.71	168° 58.06	14.65	Avior	234°14.74	
23	168°53.42	179°57.04	16.25	194° 9.75	46.30	125°1.74	50.86	184°0.26	14.54	Suhail	222°46.54	
Mer.n	pass. 11:46	ν -0.4' d-1.2	2′ m-3.88	$\nu 0.6' d-0$.7′ m1.21	$\nu 2.0' d0.$	2′ m-2.09	$\nu 2.2' \ d-0$.1' m1.04	Miaplacidus	221°37.87	
										Alphard	217°48.19	
										Regulus	207°34.88	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.15	
0	183°55.88		S06°15.07	209°10.36	S11°45.61	140°3.68	N15°51.02	199°2.45	508°14.44	Denebola	182°25.31	
1	198°58.35	209°56.22	13.90	224°10.97	44.92	155°5.63	51.18	214°4.64	14.33	Gienah	175°43.96	
2	214°0.81	224°55.81	12.73	239°11.57	44.23	170°7.58	51.33	229°6.83	14.22	Acrux	173°0.22	
3	229°3.27	239°55.40	• • 11.56	254°12.18	• • 43.53	185°9.53	• • 51.49	244°9.03	• • 14.12	Gacrux	171°51.87	
4	244°5.74	254°54.98	10.38	269°12.79	42.84	200°11.48	51.64	259°11.22	14.01	Alioth	166°12.96	
5	259°8.20	269°54.57	9.21	284°13.40	42.15	215°13.42	51.80	274°13.41	13.90	Spica	$158^{\circ}22.71$	
6	274° 10.67	284°54.16	S06°8.03	299°14.00	\$11°41.46	230°15.37	N15°51.95	289° 15.60	S08°13.80	Alkaid	152°52.05	
7	289°13.13	299°53.75	6.86	314°14.61	40.77	245°17.32	52.11	304°17.80	13.69	Hadar	148°36.43	
8	304° 15.59	314°53.34	5.68	329°15.22	40.08	260°19.27	52.26	319° 19.99	13.58	Menkent	147°58.08	
9	319° 18.06	329°52.93	• • 4.51	344°15.83	• • 39.39	275°21.21	• • 52.42	334°22.18	• • 13.47	Arcturus	145°48.22	
10	334°20.52	344°52.52	3.33	359°16.43	38.69	290°23.16	52.58	349°24.37	13.37	Rigil Kent.	139°40.72	
11	349°22.99	359°52.11	2.16	14°17.04	38.00	305°25.11	52.73	4°26.57	13.26	Kochab	$137^{\circ}18.79$	
12	4°25.45	14°51.70	S06°0.98	29°17.65	S11°37.31	320°27.06	N15°52.89	19°28.76	S08°13.15	Zuben'ubi	$136^{\circ}56.51$	
13	19°27.91 34°30.38	29°51.29 44°50.88	05°59.81	44°18.26 59°18.87	36.62	335°29.00 350°30.95	53.04	34°30.95 49°33.14	13.05	Alphecca	126°4.06	
14			58.63	74°19.48	35.92		53.20		12.94 •• 12.83	Antares	$112^{\circ}16.50$	
15	49°32.84 64°35.31	59° 50.47 74° 50.06	56.28	74 19.48 89°20.09	· · 35.23 34.54	5°32.90 20°34.84	· · 53.35 53.51	64°35.34 79°37.53		Atria	$107^{\circ}11.16$	
16 17	79°37.77	89°49.65	55.10	104°20.70	33.84	20 34.64 35°36.79	53.67	94°39.72	12.73 12.62	Sabik	102°3.45	
18	94° 40.23		S05°53.92	119°21.30	S11°33.15	50°38.73	N15° 53.82	109°41.92	S08°12.51	Shaula	96° 11.20	
19	109° 42.70	119° 48.84	52.74	134°21.91	32.46	65°40.68	53.98	109 41.92 124°44.11	12.41	Rasalhague	95°59.10	
20	124° 45.16	134°48.43	51.57	149°22.52	31.76	80°42.63	54.13	139°46.30	12.30	Eltanin	90°42.43	
21	139° 47.63	149° 48.02	• • 50.39	164°23.13	• • 31.07	95°44.57	54.29	154°48.50	. 12.19	Kaus Aust.	83°33.40	
22	154° 50.09	164° 47.61	49.21	179°23.74	30.37	110°46.52	54.44	169° 50.69	12.09	Vega	80°33.70	
23	169°52.56	179° 47.21	48.03	194°24.35	29.68	125°48.46	54.60	184°52.88	11.98	Nunki	75°48.63	
										Altair	62°0.73	
Mer.p	bass. 11:42	ν -0.4' d-1.2	2′ m-3.88	ν 0.6′ d-0	.7' m1.21	$\nu 1.9' d0.$.2′ m-2.08	$\nu 2.2' \ d-0$	0.1' m 1.04	Peacock	53°7.04	
										Deneb	49°26.53	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.70	
0	184°55.02		S05°46.85	209°24.96	S11°28.98	140°50.41	N15° 54.76	199°55.08	S08°11.88	Al Na'ir	27°34.10	
1	199°57.48	209°46.39	45.67	224°25.57	28.29	155°52.35	54.91	214° 57.27	11.77	Fomalhaut Scheat	15° 15.57 13° 46.20	
2	214°59.95	224°45.99	44.49	239°26.18	27.59	170°54.30	55.07	229°59.46	11.66	Markab	13° 40.20 13° 30.88	
3	230°2.41	239°45.58	• • 43.31	254°26.79	• • 26.90	185°56.24	• • 55.22	245°1.66	• • 11.56	ividikab		=
4	245°4.88	$254^{\circ}45.17$	42.13	269°27.40	26.20	200°58.19	55.38	260°3.85	11.45	Mar 25 Mon	SHA	
5	260°7.34	269°44.77	40.95	284°28.02	25.51	216°0.13	55.53	275°6.04	11.34	Venus	$12^{\circ}9.86$	
6	275°9.80	284°44.36	S05°39.77	299°28.63	S11°24.81	231°2.08	N15°55.69	290°8.24	S08°11.24	Mars	$25^{\circ}59.10$	
7	$290^{\circ}12.27$	299°43.96	38.59	314°29.24	24.12	246°4.02	55.85	$305^{\circ}10.43$	11.13	Jupiter	316°20.14	
8	$305^{\circ}14.73$	314°43.55	37.40	329°29.85	23.42	261°5.97	56.00	$320^{\circ}12.62$	11.02	Saturn	15° 13.10	
9	320° 17.20	329°43.15	• • 36.22	344°30.46	• • 22.72	276°7.91	•• 56.16	335°14.82	• • 10.92	Mar 26 Tuo	SHA	_
10	$335^{\circ}19.66$	344°42.74	35.04	359°31.07	22.03	291°9.86	56.31	$350^{\circ}17.01$	10.81	Mar 26 Tue Venus	3HA 11°0.75	
11	$350^{\circ}22.12$	359°42.34	33.86	14°31.68	21.33	306°11.80	56.47	5° 19.21	10.71	Mars	25° 14.48	
12	5°24.59		S05°32.68	29°32.30	S11°20.63	321°13.74	N15° 56.63	20°21.40	508°10.60	Jupiter	25 14.48 316°7.80	
13	20°27.05	29°41.53	31.49	44°32.91	19.94	336°15.69	56.78	35°23.59	10.49	Saturn	15°6.57	
14	35°29.52	44°41.12	30.31	59°33.52	19.24	351°17.63	56.94	50°25.79	10.39			=
15	50°31.98	59°40.72	• • 29.13	74°34.13	• • 18.54	6°19.57	• • 57.09	65° 27.98	• • 10.28	Mar 27 Wed	SHA	
16	65°34.44	74°40.32	27.94	89°34.74	17.84	21°21.52	57.25	80°30.18	10.17	Venus	9°51.78	
17	80°36.91	89°39.91	26.76	104°35.36	17.14	36°23.46	57.40	95°32.37	10.07	Mars	24°29.94	
18	95°39.37		S05°25.57	119°35.97	S11°16.45	51°25.40	N15°57.56	110°34.56	\$08° 9.96	Jupiter	315°55.39	
19	110°41.84	119°39.11	24.39	134°36.58	15.75	66°27.35	57.72	125°36.76	9.86	Saturn	15°0.06	_
20	125° 44.30	134°38.70	23.20	149°37.20	15.05	81°29.29	57.87	140°38.95	9.75	Horizon	ntal parallax	_
21	140° 46.76 155° 49.23	149°38.30 164°37.90	• • 22.02	164°37.81 179°38.42	14.35	96°31.23 111°33.17	· · 58.03	155°41.15	· · 9.64	71011201	Venus:	
22 23	155° 49.23 170° 51.69	164° 37.90 179° 37.50	20.83 19.65	179°38.42 194°39.03	13.65	111° 33.17 126° 35.12	58.18 58.34	170° 43.34 185° 45.54	9.54 9.43		Mars:	
					12.95							-
Mer.p	bass. 11:38	ν -0.4' d-1.2	2′ m-3.88	ν 0.6′ d-0	.7′ m1.20	ν 1.9′ d0.	.2′ m-2.08	$\nu 2.2' \ d-0$	0.1′ m1.05			

Dec $29^{\circ}13.29$ -42°10.58 56°40.13 -17°51.38 $\textbf{-57}^{\circ}6.98$ $23^{\circ}34.54$ $89^{\circ}22.17$ -40°12.66 4°10.97 49°56.91 16°33.45 -8°10.55 $46^{\circ}1.47$ $6^{\circ}22.23$ 28°37.71 -1°11.29 $7^{\circ}24.64$ -52°42.76 -16°45.12 -29°0.50 5°9.71 27°58.11 -59°35.44 -43°32.01 -69°49.17 -8°45.93 11°50.88 61°37.29 $14^{\circ}26.11$ -17°40.69 $-63^{\circ}14.03$ -57°14.97 55°49.60 -11°17.37 49°11.36 -60°29.32 -36°29.36 $19^{\circ}3.19$ -60°56.03 $74^{\circ}3.08$ $-16^{\circ}8.62$ 26°37.73 -26°29.15 -69°4.03 -15°45.37 $\text{-37}^{\circ}\text{7.22}$ $12^{\circ}32.30$ 51°28.73 -34°22.34 38°47.99 -26°16.01 8°55.70 -56°39.30 $45^{\circ}21.65$ $9^{\circ}58.94$ -46°50.63 -29°29.73 28°12.64 15°19.94 Mer.pass 11:00 10:04 14:41 10:46 Mer.pass 11:01 10:03 14:38 10:42 Mer.pass 11:01 10:02 14:35 10:39

 $0.1 \\ 0.1$

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.67	N01°55.19	0°54.77	17.4'	N00°30.39	-14.2'	54.0'
1 2	193°30.86 208°31.05	56.18 57.16	15°31.14 30°7.51	17.4' 17.4'	00°16.19 N00°1.99	-14.2' -14.2'	54.0' 54.0'
3	208 31.05 223°31.24	58.14	44° 43.88	17.4	500° 12.22	14.2	54.0'
4	238°31.43	$01^{\circ}59.12$	59°20.23	17.4'	$00^{\circ}26.42$	14.2'	54.0'
5	253°31.62	02°0.10	73° 56.59	17.3'	00°40.63	14.2'	54.0'
6 7	268°31.81 283°32.00	N02°1.08 2.07	88°32.93 103°9.26	17.3' 17.3'	\$00°54.84 01°9.05	14.2' 14.2'	54.0' 54.0'
8	298°32.19	3.05	103 9.20 117° 45.59	17.3	01°23.26	14.2'	54.0'
9	313°32.38	• • 4.03	$132^{\circ}21.90$	17.3'	$01^{\circ}37.47$	14.2'	54.0'
10	328°32.57	5.01	146°58.20	17.3'	01°51.67	14.2'	54.0'
11 12	343°32.76 358°32.95	5.99 N02°6.97	161°34.49 176°10.77	17.3' 17.3'	02°5.87 \$02°20.07	14.2' 14.2'	54.0' 54.1'
13	13°33.14	7.95	190°47.03	17.2'	02°34.26	14.2'	54.1'
14	28°33.33	8.93	$205^{\circ}23.27$	17.2'	$02^{\circ}48.45$	14.2'	54.1'
15	43°33.52	• • 9.92	219°59.50	17.2'	03°2.63	14.2'	54.1'
16 17	58°33.70 73°33.89	10.90 11.88	234°35.71 249°11.89	17.2' 17.2'	03°16.81 03°30.97	14.2' 14.2'	54.1' 54.1'
18	88°34.08	N02°12.86	263°48.06	17.1'	S03°45.13	14.1'	54.1'
19	103°34.27	13.84	$278^{\circ}24.21$	17.1'	03°59.28	14.1'	54.1'
20	118°34.46	14.82	293°0.34	17.1'	04° 13.42	14.1'	54.1'
21 22	133°34.65 148°34.84	· · 15.80 16.78	307°36.44 322°12.52	17.1' 17.1'	04°27.55 04°41.66	14.1' 14.1'	54.1' 54.1'
22	148° 34.84 163° 35.03	16.78 17.76	322°12.52 336°48.57	17.1 17.0'	04°41.66 04°55.77	14.1'	54.1'
	SD = 16.0'	d=1.0'			D = 14.7'		
	3D - 10.0°	u = 1.0		اد	J = 14.1°		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.22	N02° 18.74	351°24.60	17.0'	S05°9.86	14.1'	54.1'
1 2	193°35.41 208°35.60	19.72 20.70	6°0.60 20°36.58	17.0' 16.9'	05°23.93 05°38.00	14.1' 14.0'	54.2' 54.2'
3	208°35.60 223°35.79	20.70	20° 36.58 35° 12.52	16.9'	05° 52.04	14.0' 14.0'	54.2'
4	238°35.98	22.66	49° 48.43	16.9'	06°6.07	14.0'	54.2'
5	253°36.17	23.64	$64^{\circ}24.31$	16.9'	$06^{\circ}20.08$	14.0'	54.2'
6	268°36.36	N02°24.62	79°0.17	16.8'	S06°34.07	14.0'	54.2'
7 8	283°36.55 298°36.74	25.60 26.58	93°35.98 108°11.77	16.8' 16.7'	06°48.05 07°2.00	14.0' 13.9'	54.2' 54.2'
9	313°36.93	27.56	100 11.77 122° 47.51	16.7'	07 2.00 07°15.93	13.9'	54.2'
10	328°37.12	28.54	137°23.23	16.7'	07°29.85	13.9'	54.2'
11	343°37.31	29.52	151°58.90	16.6'	07°43.74	13.9'	54.2'
12	358°37.50	N02°30.49	166°34.54 181°10.14	16.6'	\$07°57.60 08°11.44	13.8'	54.3'
13 14	13°37.69 28°37.87	31.47 32.45	181° 10.14 195° 45.69	16.6' 16.5'	08° 11.44 08° 25.26	13.8' 13.8'	54.3' 54.3'
15	43°38.06	33.43	210°21.21	16.5'	08°39.05	13.8'	54.3'
16	58°38.25	34.41	$224^{\circ}56.68$	16.4'	$08^{\circ}52.82$	13.7'	54.3'
17	73°38.44	35.39	239°32.12	16.4'	09°6.55	13.7'	54.3'
18 19	88°38.63 103°38.82	N02°36.37 37.35	254°7.50 268°42.85	16.3' 16.3'	\$09°20.26 09°33.94	13.7' 13.6'	54.3' 54.3'
20	118°39.01	38.32	283° 18.14		09° 47.59	13.6'	54.3'
21	133°39.20	• • 39.30	297°53.39	16.2'	$10^{\circ}1.21$	13.6'	54.4'
22	148°39.39	40.28	312°28.59	16.2'	10° 14.79	13.6'	54.4'
23	163°39.58	41.26	327°3.75	16.1'	10°28.34	13.5'	54.4'
	SD = 16.0'	d = 1.0'		SI	D = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.77	N02°42.24	341°38.85	16.1'	S10°41.86	13.5'	54.4'
1 2	193°39.96 208°40.15	43.21 44.19	356° 13.90 10° 48.90	16.0' 15.9'	10°55.35 11°8.80	13.4' 13.4'	54.4' 54.4'
3	208°40.15 223°40.34	44.19 •• 45.17	25°23.85	15.9' 15.9'	11°8.80 11°22.21	13.4	54.4'
4	238°40.53	46.15	39° 58.74	15.8'	11°35.59	13.3'	54.4'
5	253°40.72	47.13	54° 33.58	15.8'	11°48.92	13.3'	54.4'
6	268°40.91	N02°48.10	69°8.36	15.7'	\$12°2.22 12°15.48	13.3'	54.5'
7 8	283°41.10 298°41.28	49.08 50.06	83°43.09 98°17.76	15.7' 15.6'	12°15.48 12°28.69	13.2' 13.2'	54.5' 54.5'
9	313°41.47	• • 51.04	112°52.37	15.6'	12° 41.87	13.1	54.5'
10	328°41.66	52.01	$127^{\circ}26.92$	15.5'	12°55.00	13.1'	54.5'
11	343°41.85	52.99	142°1.41	15.4'	13°8.09	13.0'	54.5'
12 13	358°42.04 13°42.23	N02°53.97 54.94	156°35.83 171°10.20	15.4' 15.3'	\$13°21.13 13°34.13	13.0' 12.9'	54.5' 54.5'
13 14	13 42.23 28°42.42	54.94 55.92	171 10.20 185°44.50	15.3 15.2'	13 34.13 13°47.07	12.9'	54.5 54.6'
15	43°42.61	• • 56.90	$200^{\circ}18.74$	15.2'	$13^{\circ}59.98$	12.9'	54.6'
16	58°42.80	57.87	214°52.91	15.1'	14°12.83	12.8'	54.6'
17	73°42.99	58.85	229°27.02	15.0'	14°25.63	12.8'	54.6'
18 19	88°43.18 103°43.37	N02°59.83 03°0.80	244°1.06 258°35.03	15.0' 14.9'	\$14°38.38 14°51.09	12.7' 12.6'	54.6' 54.6'
20	118°43.56	1.78	273°8.94	14.8'	15°3.73	12.6'	54.6'
21	133°43.74	• • 2.75	287° 42.77	14.8'	$15^{\circ}16.33$	12.5'	54.7'
22	148°43.93	3.73	302° 16.53	14.7'	15° 28.87	12.5'	54.7'
23	163°44.12	4.71	316°50.22	14.6'	15°41.35	12.4'	54.7'
	SD = 16.0'	d = 1.0'		SI	D = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:33	04:14	05:25	18:49	20:00	21:44
N 70°	03:01	04:26	05:29	18:44	19:48	21:15
68°	03:21	04:36	05:33	18:40	19:38	20:54
66°	03:37	04:43	05:36	18:37	19:30	20:37
64°	03:49	04:50	05:38	18:35	19:23	20:24
62°	04:00	04:55	05:40	18:32	19:17	20:13
60°	04:09	05:00	05:42	18:30	19:13	20:04
N 58°	04:16	05:04	05:44	18:28	19:08	19:57
56°	04:23	05:08	05:45	18:27	19:05	19:50
54°	04:28	05:11	05:47	18:26	19:01	19:44
52°	04:33	05:14	05:48	18:24	18:58	19:39
50°	04:38	05:16	05:49	18:23	18:56	19:34
45°	04:47	05:22	05:51	18:21	18:50	19:25
N 40°	04:54	05:26	05:53	18:19	18:46	19:18
35°	05:00	05:29	05:55	18:17	18:42	19:12
30°	05:04	05:32	05:56	18:15	18:39	19:07
20°	05:11	05:36	05:59	18:13	18:35	19:01
N 10°	05:15	05:39	06:00	18:11	18:32	18:56
0°	05:18	05:42	06:02	18:09	18:29	18:53
S 10°	05:19	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:05	18:27	18:53
30°	05:16	05:43	06:07	18:03	18:27	18:55
35°	05:14	05:43	06:08	18:02	18:27	18:57
40°	05:11	05:42	06:09	18:01	18:28	18:59
45°	05:07	05:41	06:11	18:00	18:29	19:03
S 50°	05:02	05:40	06:12	17:58	18:30	19:08
52°	04:59	05:39	06:13	17:57	18:31	19:10
54°	04:57	05:38	06:13	17:57	18:32	19:13
56°	04:53	05:37	06:14	17:56	18:33	19:16
58°	04:50	05:36	06:15	17:55	18:34	19:20
S 60°	04:45	05:34	06:16	17:54	18:35	19:24

Lat.		Moonris	е		Moonse	t
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	19:19	21:24		05:54	05:21	04:41
N 70°	19:12	21:06	23:18	05:55	05:30	05:00
68°	19:08	20:53	22:49	05:56	05:37	05:16
66°	19:04	20:42	22:28	05:57	05:43	05:28
64°	19:00	20:33	22:11	05:58	05:49	05:39
62°	18:57	20:25	21:57	05:58	05:53	05:48
60°	18:55	20:18	21:46	05:59	05:57	05:56
N 58°	18:52	20:12	21:36	05:59	06:01	06:03
56°	18:50	20:07	21:27	06:00	06:04	06:09
54°	18:48	20:03	21:19	06:00	06:07	06:15
52°	18:47	19:58	21:12	06:01	06:10	06:20
50°	18:45	19:55	21:06	06:01	06:12	06:24
45°	18:42	19:46	20:53	06:02	06:17	06:34
N 40°	18:39	19:40	20:42	06:02	06:22	06:42
35°	18:37	19:34	20:33	06:03	06:25	06:49
30°	18:35	19:29	20:25	06:03	06:29	06:56
20°	18:32	19:20	20:11	06:04	06:35	07:07
N 10°	18:29	19:13	19:59	06:05	06:40	07:16
0°	18:26	19:06	19:47	06:06	06:45	07:25
S 10°	18:23	18:59	19:36	06:06	06:50	07:35
20°	18:20	18:51	19:25	06:07	06:55	07:44
30°	18:17	18:43	19:11	06:08	07:01	07:56
35°	18:15	18:38	19:03	06:08	07:04	08:02
40°	18:13	18:33	18:55	06:09	07:08	08:10
45°	18:10	18:26	18:45	06:09	07:13	08:18
S 50°	18:07	18:19	18:32	06:10	07:19	08:29
52°	18:06	18:16	18:27	06:10	07:21	08:34
54°	18:05	18:12	18:20	06:11	07:24	08:39
56°	18:03	18:08	18:14	06:11	07:27	08:45
58°	18:01	18:03	18:06	06:12	07:31	08:52
S 60°	17:59	17:58	17:57	06:12	07:34	09:00

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%	
25	05:57	05:48	12:06	-:-	12:16		
26	05:39	05:30	12:06	00:35	12:55		
27	05:21	05:12	12:05	01:16	13:36		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	$185^{\circ}54.16$	194°37.10	S05°18.46	209°39.65	S11°12.25	141°37.06	N15°58.50	200°47.73	S08°9.33	Alpheratz	357°35.84	29°13.29
1	200° 56.62	209°36.69	17.28	224°40.26	11.55	156°39.00	58.65	215°49.93	9.22	Ankaa	353°8.20	-42°10.57
2	215°59.08	224°36.29	16.09	239°40.88	10.86	171°40.94	58.81	230°52.12	9.11	Schedar	349°32.42	56°40.12
3	231°1.55	239°35.89	• • 14.90	254°41.49	10.16	186°42.89	58.96	245°54.31	• • 9.01	Diphda	348°48.29	-17°51.37
4 5	246°4.01 261°6.48	254° 35.49 269° 35.09	13.72 12.53	269°42.10 284°42.72	9.46 8.76	201°44.83 216°46.77	59.12 59.28	260° 56.51 275° 58.70	8.90 8.80	Achernar	$335^{\circ}21.20$	-57°6.97
6	276°8.94	284° 34.69	S05°11.34	299°43.33	\$11°8.06	231°48.71	N15°59.43	291°0.90	S08°8.69	Hamal	327°52.27	23°34.53
7	291° 11.41	299°34.29	10.15	314°43.95	7.35	246°50.65	59.59	306°3.09	8.59	Polaris	314°45.44	89°22.15
8	306° 13.87	314°33.89	8.97	329°44.56	6.65	261°52.59	59.74	321°5.29	8.48	Acamar	315°12.59	-40°12.65
9	321°16.33	329°33.49	• • 7.78	344°45.18	• • 5.95	276°54.53	15°59.90	336°7.48	• • 8.37	Menkar Mirfak	314°7.10 308°29.59	4°10.97 49°56.90
10	336° 18.80	344°33.09	6.59	359°45.79	5.25	291°56.47	16°0.06	351°9.68	8.27	Aldebaran	290°40.55	16°33.44
11	351°21.26	359°32.69	5.40	14°46.41	4.55	306°58.42	0.21	6°11.87	8.16	Rigel	281°4.62	-8°10.55
12	6°23.73	14°32.29	S05° 4.21	29°47.02	S11°3.85	322°0.36	N16°0.37	21°14.07	S08°8.06	Capella	280°23.03	46°1.46
13	21°26.19 36°28.65	29°31.89 44°31.49	3.02 1.83	44°47.64 59°48.25	3.15 2.45	337°2.30 352°4.24	0.52	36° 16.26 51° 18.46	7.95	Bellatrix	278°23.69	6°22.23
14 15	50 26.05 51°31.12	59° 31.09	05° 0.64	74°48.87	. 1.74	7°6.18	0.68 •• 0.84	66°20.65	7.84 •• 7.74	Elnath	278°2.82	28°37.71
16	66°33.58	74°30.70	04°59.45	89°49.48	1.04	22°8.12	0.99	81°22.85	7.63	Alnilam	275°38.49	-1°11.29
17	81°36.05	89°30.30	58.26	104°50.10	11°0.34	37°10.06	1.15	96° 25.05	7.53	Betelgeuse	270°52.86	7°24.64
18	96°38.51	104°29.90	S04°57.07	119°50.72	S10°59.64	52°12.00	N16°1.30	111°27.24	S08°7.42	Canopus	263°52.72	-52°42.76
19	111°40.97	$119^{\circ}29.50$	55.88	134°51.33	58.94	67°13.94	1.46	$126^{\circ}29.44$	7.32	Sirius Adhara	258°26.82 255°6.36	-16°45.12 -29°0.50
20	126° 43.44	$134^{\circ}29.10$	54.69	149°51.95	58.23	82°15.88	1.62	141°31.63	7.21	Procyon	244°51.45	-29 0.50 5°9.71
21	141°45.90	149°28.71	• • 53.50	164°52.57	• • 57.53	97°17.82	• • 1.77	156° 33.83	• • 7.11	Pollux	243°18.01	27°58.11
22	156° 48.37	164°28.31	52.31	179°53.18	56.83	112°19.76	1.93	171°36.02	7.00	Avior	234°14.76	-59°35.45
23	171°50.83	179°27.91	51.12	194°53.80	56.12	127°21.70	2.08	186°38.22	6.89	Suhail	222°46.56	-43°32.02
Mer.	pass. 11:34	ν -0.4' d-1	.2′ m-3.88	ν 0.6′ d-0	.7′ m1.20	ν 1.9′ d0.	2′ m-2.08	$\nu 2.2' \ d-0.0$	1' m 1.05	Miaplacidus	221°37.91	-69°49.18
										Alphard	217°48.20	-8°45.93
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.89	11°50.88
0	186°53.29	194° 27.51	S04°49.93	209°54.42	\$10°55.42	142°23.64	N16°2.24	201°40.41	S08°6.79	Dubhe	193°41.16	61°37.30
1	201°55.76	209°27.12	48.73	224°55.03	54.72	157°25.57	2.40	216° 42.61	6.68	Denebola	182°25.31	14°26.12
2	216°58.22	224°26.72	47.54	239°55.65	54.01	172°27.51	2.55	231°44.81	6.58	Gienah	175°43.96 173°0.22	-17°40.69 -63°14.04
3	232°0.69	239°26.33	• • 46.35	254°56.27	• • 53.31	187°29.45	• • 2.71	246°47.00	• • 6.47	Acrux Gacrux	173 0.22 171°51.86	-63 14.04 -57°14.98
4	247°3.15	254° 25.93	45.16	269°56.89	52.60	202°31.39	2.87	261°49.20	6.37	Alioth	166°12.96	55°49.62
5	262°5.62	269°25.53	43.96	284°57.50	51.90	217°33.33	3.02	276°51.39	6.26	Spica	158°22.70	-11°17.37
6	277°8.08	284°25.14	S04°42.77	299°58.12	S10°51.20	232°35.27	N16°3.18	291°53.59	508°6.16	Alkaid	152°52.04	49°11.37
7	292° 10.54	299°24.74	41.58	314°58.74	50.49	247°37.21	3.33	306°55.79	6.05	Hadar	148°36.41	-60°29.33
8 9	307° 13.01 322° 15.47	314°24.35 329°23.95	40.38 •• 39.19	329°59.36 344°59.98	49.79	262°39.14 277°41.08	3.49	321°57.98 337°0.18	5.95	Menkent	147°58.07	-36°29.37
10	322 15.47 337°17.94	329 23.95 344°23.56	37.99	0°0.59	•• 49.08 48.38	277 41.08 292°43.02	· · 3.65 3.80	352°2.37	• • 5.84 5.74	Arcturus	145°48.21	19°3.20
11	352°20.40	359° 23.16	36.80	15° 1.21	40.36 47.67	307°44.96	3.96	7°4.57	5.63	Rigil Kent.	139°40.70	-60°56.04
12	7°22.86	14°22.77	S04°35.61	30° 1.83	S10°46.96	322°46.90	N16°4.11	22°6.77	S08°5.53	Kochab	137°18.75	74°3.10
13	22°25.33	29°22.37	34.41	45°2.45	46.26	337°48.83	4.27	37°8.96	5.42	Alphecca	136°56.49 126°4.05	-16°8.63 26°37.74
14	37°27.79	44°21.98	33.22	60°3.07	45.55	352°50.77	4.43	52°11.16	5.32	Antares	120 4.03 112° 16.48	-26°29.15
15	52°30.26	59°21.58	• • 32.02	75°3.69	• • 44.85	7°52.71	• • 4.58	67° 13.36	• • 5.21	Atria	107°11.11	-69°4.03
16	67°32.72	74°21.19	30.82	90°4.31	44.14	22°54.65	4.74	82° 15.55	5.11	Sabik	102°3.43	-15°45.36
17	82°35.18	89°20.80	29.63	105°4.93	43.43	37°56.58	4.90	97°17.75	5.00	Shaula	$96^{\circ}11.17$	-37°7.22
18	97°37.65	104°20.40	S04°28.43	120°5.55	\$10°42.73	52°58.52	N16°5.05	112°19.95	\$08°4.90	Rasalhague	95°59.08	12°32.30
19 20	112° 40.11 127° 42.58	119°20.01 134°19.62	27.24 26.04	135°6.17 150°6.79	42.02 41.31	68°0.46 83°2.39	5.21 5.36	127°22.14 142°24.34	4.79 4.69	Eltanin	90°42.40	51°28.73
21	142° 45.04	149° 19.02	• • 24.84	165°7.41	• • 40.61	98°4.33	5.52	157° 26.54	• • 4.58	Kaus Aust.	83°33.38	-34°22.34
22	157° 47.51	164° 18.83	23.65	180° 8.03	39.90	113°6.27	5.68	172° 28.73	4.48	Vega	80°33.68	38°47.99
23	172° 49.97	179°18.44	22.45	195°8.65	39.19	128°8.20	5.83	187°30.93	4.37	Nunki Altair	75°48.61 62°0.71	-26°16.01 8°55.70
N/a==	11.21	0 4/ -/ 1	.2′ m-3.88	0 6/ -/ 0	.7′ m1.20		2′ m-2.07	$\nu 2.2' \ d-0$	1/ 1 OF	Peacock	53°7.01	-56°39.29
ivier.	pass. 11:31	ν-0.4 α-1	.2 111-3.00	ν 0.0 a -0	7.7 M1.20	ν1.9 d0.	2 m-2.07	ν2.2 α-0.	1 M1.05	Deneb	49°26.51	45°21.65
										Enif	33°39.69	9°58.94
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°34.09	$-46^{\circ}50.61$
0	187°52.43		S04°21.25		\$10°38.48	143°10.14	N16°5.99	202°33.13	S08°4.27	Fomalhaut	$15^{\circ}15.56$	-29°29.72
1 2	202°54.90 217°57.36	209°17.65 224°17.26	20.05 18.86	225°9.89 240°10.51	37.78 37.07	158°12.08 173°14.01	6.15 6.30	217°35.33 232°37.52	4.16 4.06	Scheat	13°46.19	28°12.64
3	232°59.83	239° 16.87	10.00	255°11.13	36.36	173 14.01 188°15.95	. 6.46	232 37.52 247°39.72	• 3.95	Markab	13°30.87	15°19.93
4	248°2.29	254° 16.48	16.46	270°11.75	35.65	203°17.88	6.61	262°41.92	3.85	Mar 28 Thu	SHA	Mer.pass
5	263°4.75	269°16.09	15.26	285°12.37	34.94	218°19.82	6.77	277°44.11	3.74	Venus	8°42.94	11:02
6	278°7.22		S04°14.06	300°12.99	S 10°34.24	233°21.75	N16°6.93	292°46.31	508°3.64	Mars	23°45.49	10:01
7	293°9.68	299°15.30	12.86	315°13.61	33.53	248°23.69	7.08	307°48.51	3.53	Jupiter	315°42.90	14:32
8	308° 12.15	$314^{\circ}14.91$	11.66	330°14.23	32.82	263°25.63	7.24	322°50.71	3.43	Saturn	14°53.57	10:35
9	323° 14.61	329° 14.52	• • 10.47	345°14.86	• • 32.11	278°27.56	• • 7.40	337°52.90	• • 3.32	Mar 29 Fri	SHA	Mer.pass
10	338° 17.07	344°14.13	9.27	0°15.48	31.40	293°29.50	7.55	352°55.10	3.22	Venus	7°34.22	11:02
11	353°19.54	359°13.74	8.07	15°16.10	30.69	308°31.43	7.71	7°57.30	3.11	Mars	23°1.12	10:00
12 13	8°22.00 23°24.47	14°13.35 29°12.96	\$04°6.87 5.67	30°16.72 45°17.34	\$10°29.98 29.27	323°33.36 338°35.30	N16°7.86 8.02	22°59.50 38°1.69	\$08°3.01 2.90	Jupiter	$315^{\circ}30.34$	14:29
13 14	23 24.47 38°26.93	29 12.96 44°12.57	5.07 4.47	45 17.34 60°17.96	29.27 28.56	353° 35.30 353° 37.23	8.02 8.18	53°3.89	2.90	Saturn	14°47.12	10:32
15	58° 20.93 53° 29.40	59° 12.18	• • 3.26	75°18.59	•• 27.85	8°39.17	. 8.33	68°6.09	• • 2.69	Mar 30 Sat	SHA	Mer.pass
16	68°31.86	74° 11.79	2.06	90°19.21	27.14	23°41.10	8.49	83°8.29	2.59	Venus	5ПА 6°25.61	11:03
17	83°34.32	89°11.40	04° 0.86	105°19.83	26.43	38°43.04	8.65	98° 10.49	2.49	Mars	22°16.83	09:59
18	98°36.79	104°11.01	S03°59.66	120°20.46	\$10°25.72	53°44.97	N16°8.80	113° 12.68	S08°2.38	Jupiter	315°17.71	14:25
19	113°39.25	119° 10.62	58.46	135°21.08	25.01	68°46.90	8.96	128° 14.88	2.28	Saturn	14°40.69	10:28
20	128° 41.72	134°10.23	57.26	150°21.70	24.30	83°48.84	9.11	143° 17.08	2.17			
21	143° 44.18	149°9.84	• • 56.06	165°22.32	• • 23.59	98°50.77	• • 9.27	158° 19.28	• • 2.07	Horizoi	ntal parallax	0.1
22	158° 46.64	164°9.45	54.85 53.65	180°22.95	22.87	113°52.71	9.43	173°21.48	1.96		Venus: Mars:	0.1 0.1
23	173°49.11	179°9.07	53.65	195°23.57	22.16	128°54.64	9.58	188°23.67	1.86			V
Mer.	pass. 11:27	ν -0.4' d-1	.2′ m-3.88	ν 0.6′ d-0	.7′ m1.20	ν 1.9′ d0.	2′ m-2.07	$\nu 2.2' \ d-0$	1′ m1.05			

h	Su						
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 44.31	N03°5.68	331°23.84	14.5'	S15°53.78	12.4'	54.7'
1 2	193°44.50 208°44.69	6.66 7.63	345°57.39 0°30.86	14.5' 14.4'	16°6.14 16°18.45	12.3' 12.2'	54.7' 54.7'
3	208 44.09 223° 44.88	· · 8.61	15° 4.26	14.4	16°30.70	12.2'	54.8'
4	238°45.07	9.58	29°37.58	14.2'	$16^{\circ}42.89$	12.1'	54.8'
5	253° 45.26	10.56	44°10.83	14.2'	16°55.02	12.1'	54.8'
6 7	268° 45.45 283° 45.64	N03°11.53 12.51	58°44.00 73°17.09	14.1' 14.0'	\$17°7.08 17°19.08	12.0' 11.9'	54.8' 54.8'
8	298° 45.82	13.48	87°50.10	13.9'	17°31.01	11.9'	54.8'
9	313°46.01	• • 14.46	102°23.03	13.9'	17°42.88	11.8'	54.9'
10	328° 46.20 343° 46.39	15.43	116°55.88 131°28.65	13.8' 13.7'	17°54.68 18°6.41	11.7'	54.9'
11 12	358° 46.58	16.41 N03°17.38	131 20.05 146°1.34	13.6'	S18°18.07	11.7' 11.6'	54.9' 54.9'
13	13° 46.77	18.36	160°33.94	13.5'	18°29.66	11.5'	54.9'
14	28° 46.96	19.33	175°6.46	13.4'	18°41.18	11.4'	54.9'
15 16	43° 47.15 58° 47.34	· · 20.30 21.28	189°38.90 204°11.26	13.4' 13.3'	18°52.62 19°4.00	11.4' 11.3'	55.0' 55.0'
17	73° 47.52	22.25	218°43.52	13.2'	19°15.29	11.2'	55.0'
18	88°47.71	N03°23.23	233°15.70	13.1'	S19°26.51	11.1'	55.0'
19 20	103°47.90 118°48.09	24.20 25.17	247°47.80 262°19.81	13.0' 12.9'	19°37.65 19°48.72	11.1' 11.0'	55.0' 55.0'
20	118 48.09 133°48.28	26.15	202 19.81 276°51.72	12.9	19 48.72 19°59.70	10.9	55.1'
22	148° 48.47	27.12	291°23.56	12.7'	20°10.60	10.8'	55.1'
23	163°48.66	28.09	305°55.30	12.7'	20°21.42	10.7'	55.1'
	SD = 16.0'	d = 1.0'		SE	0 = 14.9'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 48.84	N03°29.07	320°26.95	12.6'	\$20°32.16	10.7'	55.1'
1	193°49.03	30.04	334°58.51	12.5'	20°42.81	10.6'	55.1'
2	208°49.22 223°49.41	31.01 •• 31.98	349°29.98 4°1.36	12.4' 12.3'	20°53.38 21°3.86	10.5' 10.4'	55.2' 55.2'
4	238° 49.60	32.96	18°32.64	12.2'	21°14.25	10.4	55.2'
5	253°49.79	33.93	33°3.84	12.1'	$21^{\circ}24.55$	10.2'	55.2'
6	268°49.97 283°50.16	N03°34.90	47°34.94 62°5.95	12.0'	\$21°34.76 21°44.88	10.1'	55.2'
7 8	283°50.16 298°50.35	35.87 36.85	62°5.95 76°36.86	11.9' 11.8'	21°44.88 21°54.91	10.0' 9.9'	55.3' 55.3'
9	313° 50.54	37.82	91°7.68	11.7'	22°4.84	9.8'	55.3'
10	328° 50.73	38.79	105°38.41	11.6'	22°14.68	9.7'	55.3'
11 12	343°50.92 358°51.10	39.76 N03°40.73	120° 9.04 134° 39.57	11.5' 11.4'	22°24.42 5 22°34.06	9.6' 9.5'	55.3' 55.4'
13	13°51.29	41.71	134 39.57 149°10.02	11.4	22°43.61	9.5 9.4'	55.4'
14	28°51.48	42.68	163°40.36	11.2'	22°53.05	9.3'	55.4'
15	43°51.67 58°51.86	• • 43.65	178°10.61	11.2'	23°2.39 23°11.63	9.2'	55.4'
16 17	73°52.04	44.62 45.59	192°40.76 207°10.82	11.1' 11.0'	23°11.63 23°20.77	9.1' 9.0'	55.4' 55.5'
18	88° 52.23	N03°46.56	221°40.78	10.9'	S23°29.80	8.9'	55.5'
19	103°52.42	47.53	236°10.64	10.8'	23°38.72	8.8'	55.5'
20 21	118° 52.61 133° 52.80	48.50 •• 49.48	250°40.41 265°10.08	10.7' 10.6'	23°47.54 23°56.25	8.7' 8.6'	55.5' 55.5'
22	148° 52.98	50.45	279°39.65	10.5'	24°4.85	8.5'	55.6'
23	163°53.17	51.42	294°9.12	10.4'	24°13.33	8.4'	55.6'
	SD = 16.0'	d = 1.0'		SE	0 = 15.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	178°53.36	N03°52.39	308°38.50	10.3'	S24°21.71	8.3'	55.6'
1	193°53.55	53.36	323°7.78	10.2'	24°29.97	8.1'	55.6'
2	208° 53.74 223° 53.92	54.33 •• 55.30	337°36.97 352°6.06	10.1' 10.0'	24°38.11 24°46.14	8.0' 7.9'	55.7' 55.7'
4	238°54.11	56.27	6°35.05	9.9'	24°54.05	7.8'	55.7'
5	253°54.30	57.24	21°3.94	9.8'	25°1.84	7.7'	55.7'
6 7	268° 54.49 283° 54.67	N03°58.21 03°59.18	35°32.74 50°1.44	9.7' 9.6'	\$25°9.52 25°17.07	7.6' 7.4'	55.8' 55.8'
8	203 54.07 298°54.86	03 59.16 04° 0.15	64°30.05	9.6 9.5'	25°24.49	7.4 7.3'	55.8'
9	313°55.05	• • 1.11	78°58.56	9.4'	25°31.80	7.2'	55.8'
10	328° 55.24 343° 55.42	2.08	93°26.97 107°55.29	9.3' 9.2'	25°38.98 25°46.03	7.1'	55.9'
11 12	343°55.42 358°55.61	3.05 N04°4.02	107°55.29 122°23.52	9.2	25°46.03 \$25°52.96	6.9' 6.8'	55.9' 55.9'
13	13°55.80	4.99	$136^{\circ}51.65$	9.0'	25°59.75	6.7'	55.9'
14	28°55.98	5.96	151°19.69	8.9'	26°6.42	6.5'	56.0'
15 16	43° 56.17 58° 56.36	· · 6.93 7.90	165°47.63 180°15.48	8.9' 8.8'	26°12.96 26°19.36	6.4' 6.3'	56.0' 56.0'
17	73° 56.55	8.86	194°43.24	8.7'	26°25.63	6.1	56.0'
18	88° 56.73	N04° 9.83	209°10.91	8.6'	S26°31.76	6.0'	56.1'
19 20	103° 56.92 118° 57.11	10.80 11.77	223°38.49 238°5.98	8.5' 8.4'	26°37.76 26°43.63	5.9' 5.7'	56.1' 56.1'
21	133°57.29	• • 12.74	250° 33.37	8.3'	26°49.35	5. <i>1</i> '	56.1
22	148°57.48	13.70	267° 0.68	8.2'	26°54.93	5.4'	56.2'
23	163°57.67	14.67	281°27.90	8.1'	27°0.38	5.3'	56.2'
	SD = 16.0'	d = 1.0'	-	SE	0 = 15.2'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:06	03:57	05:09	19:03	20:16	22:12
N 70°	02:40	04:11	05:15	18:56	20:02	21:34
68°	03:04	04:22	05:20	18:51	19:50	21:09
66°	03:22	04:31	05:24	18:47	19:41	20:50
64°	03:37	04:39	05:28	18:43	19:33	20:35
62°	03:48	04:45	05:31	18:40	19:26	20:23
60°	03:58	04:51	05:33	18:38	19:20	20:13
N 58°	04:07	04:56	05:35	18:35	19:15	20:04
56°	04:14	05:00	05:37	18:33	19:11	19:57
54°	04:20	05:03	05:39	18:31	19:07	19:50
52°	04:26	05:07	05:41	18:29	19:04	19:45
50°	04:31	05:10	05:42	18:28	19:01	19:40
45°	04:41	05:16	05:46	18:24	18:54	19:29
N 40°	04:49	05:21	05:48	18:22	18:49	19:21
35°	04:55	05:25	05:51	18:19	18:45	19:15
30°	05:00	05:29	05:53	18:17	18:41	19:09
20°	05:08	05:34	05:56	18:14	18:36	19:01
N 10°	05:13	05:38	05:59	18:11	18:32	18:56
0°	05:17	05:41	06:01	18:08	18:29	18:53
S 10°	05:18	05:43	06:04	18:05	18:26	18:51
20°	05:19	05:44	06:06	18:03	18:25	18:50
30°	05:17	05:45	06:09	18:00	18:23	18:51
35°	05:16	05:45	06:11	17:58	18:23	18:53
40°	05:14	05:45	06:12	17:56	18:23	18:54
45°	05:11	05:45	06:14	17:54	18:23	18:57
S 50°	05:07	05:44	06:17	17:52	18:24	19:01
52°	05:05	05:44	06:18	17:51	18:24	19:03
54°	05:02	05:44	06:19	17:49	18:25	19:06
56°	05:00	05:43	06:20	17:48	18:25	19:08
58°	04:56	05:42	06:21	17:47	18:26	19:11
S 60°	04:53	05:41	06:23	17:45	18:26	19:15

Lat.		Moonris	e		Moonset	t
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	00:02			03:31		
N 70°				04:16		
68°		01:24		04:47	03:46	
66°		00:32		05:09	04:39	
64°	••••	00:00	02:15	05:28	05:12	04:40
62°	23:37		01:27	05:43	05:36	05:28
60°	23:19		00:57	05:55	05:56	05:58
N 58°	23:03		00:35	06:06	06:12	06:22
56°	22:50		00:16	06:16	06:25	06:41
54°	22:39	•• ••	00:01	06:24	06:37	06:57
52°	22:29	23:47		06:32	06:48	07:10
50°	22:20	23:36	•• ••	06:39	06:57	07:22
45°	22:01	23:12		06:53	07:17	07:47
N 40°	21:46	22:52	23:59	07:06	07:33	80:80
35°	21:34	22:36	23:40	07:16	07:47	08:24
30°	21:22	22:23	23:24	07:25	07:59	08:39
20°	21:04	21:59	22:57	07:41	08:20	09:04
N 10°	20:47	21:39	22:34	07:55	08:38	09:25
0°	20:32	21:20	22:13	08:09	08:55	09:45
S 10°	20:17	21:02	21:52	08:22	09:12	10:05
20°	20:01	20:42	21:29	08:36	09:30	10:27
30°	19:43	20:19	21:03	08:52	09:51	10:52
35°	19:32	20:06	20:47	09:02	10:04	11:07
40°	19:20	19:51	20:29	09:13	10:18	11:24
45°	19:06	19:33	20:08	09:26	10:35	11:45
S 50°	18:49	19:11	19:41	09:41	10:56	12:11
52°	18:41	19:00	19:27	09:49	11:06	12:24
54°	18:32	18:48	19:12	09:57	11:18	12:39
56°	18:22	18:34	18:55	10:06	11:31	12:56
58°	18:10	18:18	18:33	10:17	11:46	13:17
S 60°	17:57	17:59	18:06	10:29	12:05	13:44

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	188° 51.57	194°8.68 \$03°52.45	210°24.20 \$10°21.45	143°56.57 N16°9.74	203°25.87	
1	203°54.04	209°8.29 51.25	225°24.82 20.74	158°58.51 9.90	218° 28.07 1.65	Alpheratz 357°35.82 29°13.28
2	218° 56.50	224°7.90 50.04	240°25.44 20.03	174°0.44 10.05	233°30.27 1.55	Ankaa 353°8.19 -42°10.55
3	233°58.97	239°7.51 · · 48.84	255°26.07 · · 19.32	189°2.37 · · 10.21	248°32.47 · · 1.44	Schedar 349°32.40 56°40.11
4	249°1.43	254°7.13 47.64	270°26.69 18.60	204°4.30 10.37	263°34.67 1.34	Diphda 348°48.28 -17°51.36 Achernar 335°21.20 -57°6.95
5	264°3.89	269°6.74 46.44	285°27.32 17.89	219°6.24 10.52	278°36.86 1.23	Hamal 327°52.27 23°34.53
6	279°6.36	284°6.35 S03°45.23	300°27.94 \$10°17.18	234°8.17 N16°10.68	293°39.06	Polaris 314°46.01 89°22.14
7	294°8.82	299°5.96 44.03	315°28.56 16.47	249°10.10 10.83	308° 41.26 1.02	Acamar 315°12.60 -40°12.64
8 9	309° 11.29 324° 13.75	314°5.58 42.82 329°5.19 • 41.62	330°29.19 15.75	264°12.03 10.99 279°13.97 · · 11.15	323°43.46 0.92	Menkar 314°7.10 4°10.97
10	339° 16.21	329°5.19 · · 41.62 344°4.80 40.42	345°29.81 · · 15.04 0°30.44 14.33	279°13.97 · · 11.15 294°15.90 11.30	338°45.66 · · 0.82 353°47.86 0.71	Mirfak 308°29.59 49°56.89
11	354° 18.68	359°4.42 39.21	15°31.06 13.61	309°17.83 11.46	8°50.06 0.61	Aldebaran 290°40.56 16°33.44
12	9°21.14	14°4.03	30°31.69 \$10°12.90	324°19.76 N16°11.62	23°52.26	Rigel 281°4.63 -8°10.55
13	24°23.61	29°3.64 36.80	45°32.31 12.19	339°21.69 11.77	38°54.46 0.40	Capella 280°23.04 46°1.46 Bellatrix 278°23.70 6°22.23
14	39°26.07	44°3.26 35.60	60°32.94 11.47	354°23.63 11.93	53°56.65 0.30	Bellatrix 278°23.70 6°22.23 Elnath 278°2.83 28°37.71
15	54°28.54	59°2.87 · · 34.39	75°33.57 · · 10.76	9°25.56 · · 12.09	68°58.85 · · 0.19	Alnilam 275°38.49 -1°11.29
16	69°31.00	74°2.49 33.18	90°34.19 10.04	24°27.49 12.24	84°1.05 0.09	Betelgeuse 270°52.87 7°24.63
17	84°33.46	89°2.10 31.98	105°34.82 9.33	39°29.42 12.40	99°3.25 07°59.98	Canopus 263°52.75 -52°42.76
18 19	99°35.93 114°38.39	104°1.71 S03°30.77 119°1.33 29.57	120°35.44 \$10°8.61 135°36.07 7.90	54°31.35 N16°12.56 69°33.28 12.71	114°5.45 S07°59.88 129°7.65 59.78	Sirius 258°26.83 -16°45.13
20	129° 40.86	134°0.94 28.36	150°36.70 7.18	84°35.21 12.87	144°9.85 59.67	Adhara 255° 6.37 -29° 0.50
21	144° 43.32	149°0.56 · · 27.15	165°37.32 · · 6.47	99°37.14 · · 13.02	159°12.05 · · 59.57	Procyon 244°51.46 5°9.71
22	159° 45.78	164°0.17 25.95	180°37.95 5.75	114°39.07 13.18	174°14.25 59.46	Pollux 243°18.02 27°58.11
23	174°48.25	178°59.79 24.74	195°38.58 5.04	129°41.01 13.34	189° 16.45 59.36	Avior 234°14.79 -59°35.46 Suhail 222°46.57 -43°32.03
Meri	pass. 11:23	ν-0.4' d-1.2' m-3.88	ν0.6' d-0.7' m1.19	ν1.9' d0.2' m-2.07	$\nu 2.2' \ d$ -0.1' m1.05	Miaplacidus 221°37.94 -69°49.19
- IVICI.	pass. 11.25	ν-0. 4		V1.9 GO.2 III-2.07		Alphard 217°48.20 -8°45.94
						Regulus 207°34.89 11°50.88
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.17 61°37.31
0	189°50.71	193°59.40 \$03°23.53	210°39.20 \$10°4.32	144°42.94 N16°13.49	204°18.65 \$07°59.26	Denebola 182°25.30 14°26.12
1 2	204° 53.18 219° 55.64	208°59.02 22.33 223°58.63 21.12	225°39.83 3.61 240°40.46 2.89	159°44.87 13.65 174°46.80 13.81	219°20.85 59.15 234°23.05 59.05	Gienah 175°43.95 -17°40.70
3	234°58.11	238° 58.25 · · 19.91	255°41.08 · · 2.18	174°46.80 13.81 189°48.73 · · 13.96	249°25.25 · · 58.95	Acrux 173°0.21 -63°14.06
4	250°0.57	253°57.87 18.70	270°41.71 1.46	204°50.66 14.12	264°27.45 58.84	Gacrux 171°51.85 -57°15.00
5	265°3.03	268°57.48 17.50	285°42.34 0.74	219°52.59 14.28	279°29.65 58.74	Alioth 166°12.95 55°49.63
6	280°5.50	283°57.10 S03°16.29	300°42.97 \$10°0.03	234°54.52 N16°14.43	294°31.85 S 07°58.63	Spica 158°22.69 -11°17.37 Alkaid 152°52.03 49°11.38
7	295°7.96	298°56.71 15.08	$315^{\circ}43.60 09^{\circ}59.31$	249°56.45 14.59	309°34.05 58.53	Hadar 148°36.39 -60°29.35
8	310° 10.43	313°56.33 13.87	330°44.22 58.59	264°58.37 14.75	324°36.25 58.43	Menkent 147°58.05 -36°29.38
9	325° 12.89	328°55.95 · · 12.66	345°44.85 · · 57.88	280°0.30 · · 14.90	339°38.45 · · 58.32	Arcturus 145°48.20 19°3.20
10	340° 15.35	343°55.56 11.45	0°45.48 57.16	295°2.23 15.06	354°40.65 58.22	Rigil Kent. 139°40.67 -60°56.05
11 12	355° 17.82 10° 20.28	358°55.18 10.25 13°54.80 \$03°9.04	15°46.11 56.44 30°46.74 \$09°55.72	310°4.16 15.22 325°6.09 N16°15.37	9° 42.85 58.12 24° 45.05 \$07° 58.01	Kochab 137°18.72 74°3.11
13	25° 22.75	28°54.42 7.83	45°47.36 55.01	340°8.02 15.53	39°47.25 57.91	Zuben'ubi 136°56.47 -16°8.63
14	40°25.21	43°54.03 6.62	60°47.99 54.29	355°9.95 15.68	54°49.45 57.81	Alphecca 126°4.03 26°37.75
15	55°27.68	58°53.65 · · 5.41	75°48.62 · · 53.57	10°11.88 · · 15.84	69°51.65 · · 57.70	Antares 112°16.45 -26°29.16
16	70°30.14	73°53.27 4.20	90°49.25 52.85	25°13.81 16.00	84°53.85 57.60	Atria 107°11.05 -69°4.04 Sabik 102°3.40 -15°45.36
17	85°32.60	88°52.89 2.99	105°49.88 52.14	40°15.73 16.15	99°56.05 57.50	Shaula 96°11.14 -37°7.22
18	100°35.07	103°52.50 \$03°1.78	120°50.51 S09°51.42	55°17.66 N16°16.31	114°58.25 S 07°57.39	Rasalhague 95°59.06 12°32.30
19	115°37.53	118°52.12 03°0.57	135°51.14 50.70	70°19.59 16.47	130°0.45 57.29	Eltanin 90°42.37 51°28.74
20	130° 40.00	133°51.74 02°59.36	150°51.77 49.98	85°21.52 16.62	145°2.65 57.19	Kaus Aust. 83°33.35 -34°22.34
21 22	145° 42.46 160° 44.93	148°51.36 · · 58.15 163°50.98 56.94	165°52.40 · · 49.26 180°53.03 48.54	100°23.45 · · 16.78 115°25.37 16.94	160°4.85 · · 57.08 175°7.05 56.98	Vega 80°33.65 38°47.99
23	175° 47.39	178° 50.59 55.73	195°53.66 47.82	130°27.30 17.09	190°9.26 56.88	Nunki 75°48.58 -26°16.00
						Altair 62°0.68 8°55.71
Mer. _l	pass. 11:19	ν-0.4' d-1.2' m-3.88	$\nu 0.6' \ d$ -0.7' m1.19	ν1.9' d0.2' m-2.07	$\nu 2.2' \ d$ -0.1' m1.06	Peacock 53°6.97 -56°39.28 Deneb 49°26.48 45°21.65
						Deneb 49°26.48 45°21.65 Enif 33°39.67 9°58.95
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°34.06 -46°50.60
0	190°49.85	193°50.21	210°54.29 \$09°47.10	145°29.23 N16°17.25	205°11.46 S07°56.77	Fomalhaut 15°15.54 -29°29.71
1	205° 52.32	208°49.83 53.30	225°54.92 46.38	160°31.16 17.41	220°13.66 56.67	Scheat 13°46.18 28°12.63
2	220° 54.78 235° 57.25	223°49.45 52.09 238°49.07 • 50.88	240°55.55 45.66 255°56.18 • 44.95	175°33.08 17.56 190°35.01 · · 17.72	235°15.86 56.57 250°18.06 • 56.46	Markab 13°30.85 15°19.94
3 4	250°59.71	253°48.69 49.67	270°56.81 44.23	205°36.94 17.88	265°20.26 56.36	Mar 31 Sun SHA Mer.pass
5	266°2.17	268° 48.31 48.46	285°57.44 43.51	200° 38.87 18.03	280°22.46 56.26	Venus 5°17.10 11:04
6	281°4.64	283°47.93 S02°47.25	300°58.07 S09°42.79	235°40.79 N16°18.19	295°24.66 S07°56.15	Mars 21°32.62 09:58
7	296°7.10	298°47.55 46.03	315°58.70 42.06	250°42.72 18.35	310°26.87 56.05	Jupiter 315°5.00 14:22
8	311°9.57	313°47.17 44.82	330°59.33 41.34	265°44.65 18.50	325°29.07 55.95	Saturn 14°34.30 10:25
9	326° 12.03	328°46.79 · · 43.61	345°59.97 · · 40.62	280°46.57 · · 18.66	340°31.27 · · 55.85	Apr 01 Mon SHA Mer.pass
10	341°14.50	343°46.40 42.40	1°0.60 39.90	295°48.50 18.82	355°33.47 55.74	Venus 4°8.69 11:04
11	356°16.96	358°46.02 41.18	16°1.23 39.18	310°50.43 18.97	10°35.67 55.64	Mars 20°48.49 09:57
12 13	11° 19.42 26° 21.89	13°45.64	31°1.86	325°52.35 N16°19.13 340°54.28 19.29	25°37.87 S 07°55.54 40°40.08 55.43	Jupiter 314°52.22 14:19
14	41°24.35	43°44.89 37.54	61°3.12 37.02	355°56.20 19.44	55°42.28 55.33	Saturn 14°27.94 10:21
15	56°26.82	58°44.51 · · 36.33	76°3.76 · · 36.30	10°58.13 · · 19.60	70°44.48 · · 55.23	Apr 02 Tue SHA Mer.pass
16	71°29.28	73°44.13 35.12	91°4.39 35.58	$26^{\circ}0.06$ 19.75	85°46.68 55.13	Venus 3°0.36 11:05
17	86°31.74	88°43.75 33.90	106°5.02 34.85	41°1.98 19.91	100°48.88 55.02	Mars 20°4.43 09:56
18	101°34.21	103°43.37 S 02°32.69	121°5.65 \$09°34.13	56°3.91 N16°20.07	115°51.09 \$07°54.92	Jupiter 314°39.38 14:16
19	116°36.67	118° 42.99 31.48	136° 6.29 33.41	71°5.83 20.22	130°53.29 54.82	Saturn 14°21.60 10:18
20 21	131°39.14 146°41.60	133°42.61 30.26 148°42.23 •• 29.05	151°6.92 32.69 166°7.55 · · 31.96	86°7.76 20.38 101°9.68 · · 20.54	145°55.49 54.71 160°57.69 • 54.61	Horizontal parallax
21	146 41.60 161°44.07	163°41.85 27.83	181°8.18 31.24	101°9.68 · · 20.54 116°11.61 20.69	175°59.89 54.51	Venus: 0.1
23	176° 46.53	178° 41.47 26.62	196°8.82 30.52	131°13.53 20.85	191°2.10 54.41	Mars: 0.1
		ν-0.4' d-1.2' m-3.88	ν 0.6' d-0.7' m1.19		ν2.2' d-0.1' m1.06	
ivier.	pass. 11:15	ν-υ.4 α-1.2 M-3.δδ	νυ.υ α-υ.ι m1.19	ν1.9' d0.2' m-2.06	ν∠.∠ u-U.1 m1.U0	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.85	$N04^{\circ}15.64$	295°55.04	8.0'	\$27°5.68	5.2'	56.2'
1	193°58.04	16.61	310°22.09	8.0'	27°10.84	5.0'	56.2'
2	208°58.23 223°58.41	17.57 •• 18.54	324°49.05 339°15.93	7.9' 7.8'	27°15.85 27°20.72	4.9' 4.7'	56.3' 56.3'
4	238°58.60	19.51	353°42.72	7.7'	27°25.44	4.6'	56.3
5	253°58.79	20.47	8°9.43	7.6'	$27^{\circ}30.02$	4.4'	56.3'
6	268°58.97	N04°21.44	22°36.06	7.5'	\$27°34.45	4.3'	56.4
7 8	283°59.16 298°59.35	22.41 23.37	37°2.61 51°29.08	7.5' 7.4'	27°38.72 27°42.85	4.1' 4.0'	56.4' 56.4'
9	313°59.53	24.34	65°55.47	7.3'	27°46.83	3.8'	56.5
10	328°59.72	25.30	$80^{\circ}21.79$	7.2'	$27^{\circ}50.65$	3.7'	56.5'
11	343°59.90	26.27	94°48.03	7.2'	27°54.32	3.5'	56.5'
12 13	359°0.09 14°0.28	N04° 27.24 28.20	109°14.19 123°40.29	7.1' 7.0'	\$27°57.83 28°1.19	3.4' 3.2'	56.5' 56.6'
14	29°0.46	29.17	138°6.31	6.9'	28°4.39	3.0'	56.6
15	44°0.65	• • 30.13	152° 32.25	6.9'	28°7.43	2.9'	56.6'
16	59°0.83	31.10	166°58.13	6.8'	28°10.32	2.7'	56.7'
17	74°1.02 89°1.21	32.06 N04° 33.03	181°23.95 195°49.69	6.7' 6.7'	28°13.05 \$28°15.61	2.6' 2.4'	56.7' 56.7'
18 19	89 1.21 104°1 39	33.99	195 49.69 210°15.37	6.6'	28°18.01	2.4 2.2'	56.7'
20	119°1.58	34.96	224° 40.99	6.6'	28°20.26	2.1'	56.8'
21	134°1.76	• • 35.92	239°6.54	6.5'	28°22.33	1.9'	56.8'
22	149°1.95	36.89	253°32.04	6.4'	28°24.25	1.7'	56.8'
23	164°2.13	37.85	267°57.47	6.4'	28°26.00	1.6'	56.9'
	SD = 16.0'	d = 1.0'		SI	D = 15.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°2.32	N04°38.81	282°22.85	6.3'	S28°27.58	1.4'	56.9'
1 2	194°2.50 209°2.69	39.78 40.74	296°48.18 311°13.44	6.3' 6.2'	28°29.00 28°30.25	1.3' 1.1'	56.9' 57.0'
3	209 2.09 224° 2.88	. 41.70	325°38.66	6.2'	28°31.33	0.9'	57.0'
4	239°3.06	42.67	340°3.83	6.1'	28°32.25	0.7'	57.0'
5	254°3.25	43.63	354°28.94	6.1'	28°32.99	0.6'	57.0'
6 7	269°3.43 284°3.62	N04° 44.60 45.56	8°54.02 23°19.04	6.0' 6.0'	\$28°33.57 28°33.97	0.4' 0.2'	57.1' 57.1'
8	299° 3.80	45.50 46.52	37°44.02	5.9'	26°34.21	0.2	57.1'
9	314°3.99	• • 47.48	52°8.96	5.9'	28°34.27	-0.1	57.2'
10	329°4.17	48.45	66° 33.86	5.9'	28°34.16	-0.3'	57.2'
11	344°4.36 359°4.54	49.41	80° 58.72 95° 23.55	5.8'	28°33.88 528°33.42	-0.5'	57.2'
12 13	359°4.54 14°4.73	N04° 50.37 51.33	95°23.55 109°48.34	5.8' 5.8'	28° 32.79	-0.6' -0.8'	57.3' 57.3'
14	29°4.91	52.30	124°13.10	5.7'	28°31.98	-1.0'	57.3'
15	44°5.09	• • 53.26	138° 37.82	5.7'	28°31.01	-1.2'	57.4'
16 17	59°5.28 74°5.46	54.22 55.18	153°2.52 167°27.19	5.7' 5.6'	28°29.85 28°28.52	-1.3' -1.5'	57.4' 57.4'
18	89° 5.65	N04° 56.14	181°51.84	5.6'	528°27.02	-1.7	57.5
19	104°5.83	57.10	196° 16.46	5.6'	28°25.34	-1.9'	57.5'
20	119°6.02	58.06	210°41.07		28°23.48	-2.0'	57.5'
21 22	134°6.20 149°6.39	04° 59.03 04° 59.99	225°5.65 239°30.22	5.6' 5.6'	28°21.44 28°19.23	-2.2' -2.4'	57.6' 57.6'
23	164° 6.57	04 59.99	259°54.77	5.5'	28°16.84	-2.4 -2.6'	57.6'
	SD = 16.0'	d = 1.0'			D = 15.5'		
_							
Tue 0	GHA 179°6.75	Dec N05°1.91	GHA 268° 19.30	u5.5'	Dec 528°14.28	d -2.7'	HP 57.7'
1	194°6.94	2.87	200 19.30 282°43.83	5.5'	28°11.53	-2.1 -2.9'	57.7'
2	209°7.12	3.83	297°8.34	5.5'	28°8.61	-3.1'	57.7'
3	224°7.30	• • 4.79	311° 32.85	5.5'	28° 5.51	-3.3'	57.8'
4 5	239°7.49 254°7.67	5.75 6.71	325°57.35 340°21.85	5.5' 5.5'	28° 2.24 27° 58.78	-3.5' -3.6'	57.8' 57.8'
6	269°7.86	0.71 N05°7.67	340° 21.85 354° 46.34	5.5'	\$27°55.15	-3.8'	57.8
7	284°8.04	8.63	9° 10.84	5.5'	27°51.34	-4.0'	57.9'
8	299°8.22	9.59	23°35.33	5.5'	27°47.35	-4.2'	57.9'
9 10	314°8.41 329°8.59	· · 10.55 11.51	37°59.83 52°24.34	5.5' 5.5'	27°43.19 27°38.85	-4.3' -4.5'	58.0' 58.0'
10 11	329°8.59 344°8.77	11.51 12.46	52°24.34 66°48.85	5.5' 5.5'	27°38.85 27°34.33	-4.5' -4.7'	58.0° 58.0°
12	359°8.96	N05° 13.42	81° 13.37	5.5'	\$27°29.63	-4.9	58.1
13	14°9.14	14.38	95°37.90	5.5'	27°24.75	-5.1'	58.1'
14 15	29°9.32 44°9.51	15.34 •• 16.30	110°2.44 124°27.00	5.6' 5.6'	27°19.70 27°14.47	-5.2' -5.4'	58.1' 58.2'
15 16	59°9.69	17.26	124 27.00 138°51.57	5.6'	27 14.47 27°9.07	-5.4 -5.6'	58.2'
17	74° 9.87	18.21	153° 16.16	5.6'	27° 3.49	-5.8'	58.2'
18	89°10.05	N05° 19.17	167°40.77	5.6'	S26°57.73	-5.9'	58.3'
19 20	104°10.24 119°10.42	20.13 21.09	182°5.40 196°30.05	5.7' 5.7'	26°51.80 26°45.69	-6.1' -6.3'	58.3' 58.3'
20	119°10.42 134°10.60	22.04	210°54.73	5.7' 5.7'	26°45.69 26°39.41	-6.5'	58.4'
22	149°10.78	23.00	225° 19.43	5.7'	26°32.96	-6.6'	58.4
23	164°10.97	23.96	239° 44.15	5.8'	26°26.33	-6.8'	58.4'
	SD = 16.0'	d = 1.0'		SI	O = 15.7'		

	Twi	light			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	01:32	03:38	04:54	19:17	20:33	22:47
N 70°	02:17	03:55	05:01	19:09	20:16	21:57
68°	02:46	04:08	05:07	19:02	20:02	21:26
66°	03:07	04:19	05:13	18:57	19:51	21:04
64°	03:23	04:27	05:17	18:52	19:42	20:47
62°	03:37	04:35	05:21	18:48	19:35	20:33
60°	03:48	04:41	05:24	18:45	19:28	20:22
N 58°	03:57	04:47	05:27	18:42	19:22	20:12
56°	04:05	04:52	05:30	18:39	19:17	20:04
54°	04:12	04:56	05:32	18:37	19:13	19:57
52°	04:18	05:00	05:34	18:35	19:09	19:51
50°	04:24	05:03	05:36	18:33	19:05	19:45
45°	04:35	05:10	05:40	18:28	18:58	19:33
N 40°	04:44	05:16	05:43	18:25	18:52	19:24
35°	04:51	05:21	05:46	18:22	18:47	19:17
30°	04:57	05:25	05:49	18:19	18:43	19:11
20°	05:05	05:31	05:53	18:14	18:37	19:02
N 10°	05:11	05:36	05:57	18:11	18:32	18:56
0°	05:16	05:40	06:00	18:07	18:28	18:52
S 10°	05:18	05:43	06:04	18:04	18:25	18:49
20°	05:20	05:45	06:07	18:00	18:22	18:48
30°	05:19	05:47	06:11	17:56	18:20	18:48
35°	05:18	05:48	06:13	17:54	18:19	18:48
40°	05:17	05:48	06:15	17:51	18:18	18:50
45°	05:15	05:49	06:18	17:49	18:18	18:52
S 50°	05:12	05:49	06:21	17:45	18:17	18:55
52°	05:10	05:49	06:23	17:44	18:17	18:56
54°	05:08	05:49	06:24	17:42	18:17	18:58
56°	05:06	05:49	06:26	17:40	18:17	19:00
58°	05:03	05:49	06:28	17:38	18:17	19:03
S 60°	05:00	05:49	06:30	17:36	18:17	19:06
		Moonris	ie		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
	<u> </u>					

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°						
64°						
62°	03:38			05:08		
60°	02:38	04:05	04:49	06:08	06:40	07:59
N 58°	02:05	03:22	04:12	06:42	07:23	08:36
56°	01:40	02:54	03:46	07:07	07:52	09:02
54°	01:21	02:31	03:25	07:27	08:14	09:22
52°	01:04	02:13	03:08	07:43	08:32	09:40
50°	00:50	01:57	02:53	07:58	08:48	09:54
45°	00:21	01:26	02:23	08:27	09:19	10:24
N 40°	•• ••	01:02	01:59	08:50	09:44	10:47
35°		00:42	01:39	09:09	10:03	11:06
30°		00:25	01:23	09:26	10:21	11:23
20° N 10°	23:56 23:32		00:55 00:30	09:53 10:17	10:49 11:14	11:50 12:14
0°	23:32		00:30	10:17	11:14	12:14
			00.00			
S 10° 20°	22:46 22:22	23:45 23:21		11:02 11:26	12:00 12:24	12:58 13:21
30°	22:22	23:21	23:58	11:20	12:24	13:21
35°	21:34	22:36	23:42	12:10	13:10	14:04
40°	21:17	22:16	23:25	12:10	13:30	14:22
45°	20:54	21:52	23:03	12:53	13:54	14:45
S 50°	20:23	21:22	22:36	13:23	14:24	15:13
52°	20:23	21:06	22:22	13:38	14:40	15:15
54°	19:51	20:49	22:07	13:55	14:58	15:42
56°	19:30	20:27	21:49	14:16	15:19	16:01
58°	19:03	20:00	21:26	14:42	15:46	16:24
S 60°	18:26	19:21	20:57	15:19	16:26	16:53

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	72-52%	
31	04:09	04:00	12:04	04:26	16:54		
01	03:51	03:42	12:04	05:23	17:52		
02	03.33	03.24	12.03	06.22	18.51		

CHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
19 14-98 193* 10 902* 256 2019 20 2019 2	Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
2 2001-14.6							
1. 2017-2016 2317-2018 -2.17.0 pt. 2011-101 -2.07.0 pt. 2011-101 -2.07.	1	$206^{\circ}51.46$	208°40.72 24.19	226°10.08 29.07	161°17.38 21.16	221°6.50 54.20	
2 2010-0.8 2011-0.8 2011-0.8 2011-0.1 2							
1.							
1							
7 927 624 92878 45 1.00 301138 2473 2512893 22.10 3111977 59.59 9 1.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.21 31.00 11.20 31.00 11.21 31.00 11.20 31.00 11.21 31.00 11.20 31.00 31.00 11.20 31.00 31.00 11.20 31.00 11.20 31.00 11.20 31.00 11.20 31.00 11.20 31.00 3							1
8 312"617 331"867 15.08 331"1-62 2.01 300"308 22.20 300"218 5.94 4.7108 300"000 479.08 3271127 320"308 311"1-32 311.32 11.37 31.							
1							
13 327-1438 347-1438 117-364 117-364 2138 3017-3642 2273 360-3238 5.3.18	9		328°37.69 · · 14.47		281°32.78 · · 22.42		1
19 1							I I
15 1 20 30 1 3 30 1 30 30 30 30 30 30 30 30 30 30 30 30 30							I I
14							
15 77" 29.65 59" 59.43 7.17 79" 18.00 1.19.04 11" 41.52 7.23 29.07 71" 73" 37.04 77" 52.05 73" 52.07 73" 53.05 38" 54.08 47.01 10" 50.20 17.49 41" 48.16 23.07 10" 10" 10" 10" 20.00 11" 10" 20.00 11" 10" 20.00 11" 10" 20.00 11" 20" 20" 10" 20"							
18 17 18 18 18 18 18 18							1
18 102 333							
19 11 11 11 11 11 11 11 11 11 11 11 11 1							
Adam	18	102°33.35	103°34.30 S02°3.52	121°20.87 \$09°16.76	56°50.08 N16°23.83		
12-36.26 16-33.35 10-139 15-27.18 1-13.18 16-33.95 24-46 17-27.27 2-15 2-							I I
Politic Poli							1
Mer.pass. 11:11							1
Tru							
Thu GHA GHA ORC GHA DRC GHA GRUIN 2074-04 011*50.00 208*316.5 01*50.2 22*12*2.6 20.08*316.5 05.00 208*316.5 05							
The GHA GIA Cist Cis	Mer.	pass. 11:11	ν-0.4' d-1.2' m-3.88	$\nu 0.6' \ d$ -0.7' m1.19	ν1.9′ d0.2′ m-2.06	ν2.2′ d-0.1′ m1.06	
The GHA							
1 207 208 103 208	Thu	GHA	GHA Dec	GHA Dec		GHA Dec	"
1 207°93.06 229°31.07 55.00 226°25.52 11.68 102°3.54 24.92 221°5.93.8 51.75 222°25.30 229°31.07 53.78 21.75 50 11.05 11.75 6.07 50 11.05 11.75 6.07 50 11.05 11.75 6.07 50 11.05 11.75 6.07 50 11.05 1	0						
3 237°55.53 288°30.91 · · · · · · · · · · · · · · · · · · ·							I I
8 252°57.99							Acrux 173°0.20 -63°14.08
5 268°0.45 268°30.16 50.13 286°27.87 8.77 222°11.23 255.5 282°8.0 51.34 Allolin 1.29°2.02.89°1.24 1 100°2.81							1
Sar292							
8 315°7.63 313°20.64 0.64 3.67 2.91.5 7.32 252°15.07 25.86 312°12.60 51.14							
8 313°7.85 1313°29.04 46.47 331°29.78 6.59 267°16.99 26.02 327°14.81 51.04 Market 147°88.03 36°29.39 328°10.31 328°26.66 4.52 5 346°30.42 *5.86 228°18.91 *2.01.71 328°1.70 1 *59.04 Market 147°88.03 36°29.39 338°19.21 138°15.24 358°27.91 4.28 1 16°31.70 4.41 312°22.75 26.49 12°21.25 50.73 Market 147°88.03 36°29.39 338°19.22 5 50.73 Market 147°88.03 36°29.39 338°19.22 5 50.73 Market 147°88.03 36°29.39 338°19.22 5 50.73 Market 147°88.03 36°29.39 Market 147°89.03 Market 147°88.03 36°29.39 Market 147°89.03 Market 147°89.03 Market 147°88.03 36°29.39 Market 147°89.03 Market 147°99.03 Market 147°99.03 Market 147°99.03 Market 147°99.03 Market 147°99.03 Market 147°							
9 388*10.3 328*28.86	8	313°7.85	313°29.04 46.47	331°29.78 6.59	267°16.99 26.02		
10 343°12.77 343°28.29 44.03 1°31.06 5.13 29°7°20.83 26.39 12°21.75 24 50.38 1.38°1.70 44.03 16°31.70 44.1 312°22.75 26.49 12°21.25 50.73 1.38°1.52 44 50.79 14.28 1 16°31.70 44.1 31°22.75 26.49 12°21.25 50.73 1.38°1.20 47.31.2 12 13°17.70 13°27.56 14 59.31°3.23 50°3.68 32°7°26.57 11°26.64 27°23.63 50°5.03 1.38°1.20 12°37.51 14 43°22.63 43°26.79 39.16 61°33.01 2.22 35°7.28.52 2.60 60 57°28.04 50.43 1.40 11°3.01°2.75 1.50 58°26.64 1 37.94 46°32.07 2.95 3472.65 9 2.60 60 57°28.04 50.43 1.40 11°2.16 2.60 11°3.74 11°3.01°2.02 4 50.33 1.50 1.50 11°3.57 1.50 11°3.5							
13 28°017 28°7216 403 84°3207 295 340°2659 688 22°2467 N16°2664 27°2363 S07°59.63 14 43°2263 43°2679 39.16 61°3361 2.22 55°2852 26.96 57°28.04 50.43 15 88°25.10 58°26.41 37.94 76°3425 2.14.9 12°30.44 2.71.1 72°30.24 5.03.3 16 73°27.56 73°26.04 36.72 91°34.89 0.77 27°32.36 27.72 87°32.45 50.22 17 88°30.22 88°25.66 35.50 106°35.52 0°0.004 42°34.28 2.72.3 87°32.45 50.22 18 103°32.49 103°25.29 501°34.89 12°36.16 508°59.31 57°35.00 N16°27.58 117°36.86 507°50.02 19 118°34.95 118°14.51 118°1.24 118°3.84 151°37.44 57°8.5 87°40.04 27.00 147°41.27 49.82 21 163°32.49 118°32.59 501°34.89 153°4.45 150°34.89 12°36.16 508°59.31 57°35.00 N16°27.58 117°36.86 507°50.02 22 163°42.34 163°23.79 2.940 181°36.72 56.03 117°43.88 2.11°45.88 49.51 Mer.pass. 11:07 \$\nu_0.4' d-1.2' m-3.89 \\ \nu_0.4' d-1.2' m-3.89 \\ \nu_0.4' d-1.2' m-3.89 \\ \nu_0.6' d-0.7' m1.18 \\ \nu_0.6' d-0.7' m1.18 \\ \nu_0.6' d-0.7' m1.18 \\ \nu_0.6' d-0.7' m1.18 \\ \nu_0.6' d-0.8' d-0.2' m-2.06 \\ \nu_0.6' d-0.8' d-0.9' d-0.8' d-0.9' d-0.9							
13 28°20.17 28°27.16 40.38 46°32.97 2.95 342°26.59 26.80 42°25.83 50.53 30.53 14 43°22.26 43 40°32.87 2.95 2.60 45.20 15.80 16.80 15							1
14 43°22.63 43°6.679 30.16 61°33.61 2.22 557°28.652 26.96 57°28.04 50.43 1.56°5.10 58°6.64 3.579 47 676°3.45 5 1.48°9.10 1.2°3.04 4 2711 72°3.04 5.50.13 Artiar 107°10.99 40°4.05 1.66°7.3°27.56 1.08°3.52 0.08°0.04 42°34.28 27.43 10.3°32.45 50.22 1.88°0.02 88°5.66 3.50 106°35.52 0.9°0.04 42°34.28 27.43 10.3°32.49 118°34.95 118°24.91 33.06 136°3.60 89.85 72°38.12 27.74 132°39.06 49.92 118°34.95 118°24.91 33.06 136°36.00 88.55 72°38.12 27.74 132°39.06 49.92 116°37.42 133°34.43 13.84 151°37.44 57.85 87°40.04 27.99 117°43.88 28.21 17°45.68 49.02 136°37.29 23.94 181°38.72 56.39 117°43.88 28.21 17°45.68 49.02 116°3.279 29.04 181°38.72 56.39 117°43.88 28.21 177°45.68 49.02 Ninki 75°48.65 2.26°10.00 133°4.45 11.07 \$							
15							1 '
16 73°27.56 73°26.04 36.77 91°34.89 0.77 27°32.36 27.27 88°32.45 50.22 18 103°32.49 103°25.29 50°34.28 121°36.16 508°9.51 50°6.02 101°36.32.49 103°25.29 50°34.28 121°36.16 508°9.93 15°36.20 N16°27.58 117°36.86 50°50.02 133°37.42 133°24.54 31.84 151°37.44 57.85 87°40.04 27.90 147°41.27 49.82 11 148°39.88 148°42.16 30°6.2 166°36.06 58.58 72°38.12 27.74 19°23.30 69.92 11°40.13°23.30 150°36.80 58.58 72°38.12 27.74 19°23.30 49.92 11°38°38.81 148°41.61 30°6.2 166°38.08 57.12 100°41.96 5.28.05 11°40.48 49.51 11°38°38.81 181°33.42 15°37.44 57.85 88°40.04 27.90 147°41.27 49.82 11°38°42.34 163°23.79 29.40 181°38.72 56.39 117°43.88 28.21 17°45.68 49.62 Nunki 75°48.55 26°16.00 181°38.72 56.39 117°43.88 28.21 17°45.68 49.62 Nunki 75°48.55 26°16.00 181°38.72 56.39 117°43.88 28.21 17°45.68 49.51 Nunki 75°48.55 26°16.00 181°38.72 10°24.19 10°24.99 10°24.78 49.51 Nunki 75°48.55 26°16.00 181°38.72 10°24.99 10°24.79 10°24.99 10°39.50 10°24.99 10°39.50 10°24.99 10°39.50 10°24.99 10°39.50 10°24.99 10°39.50 10°24.99 10°39.50 10°24.99 10°39.50 10°24.99 1							1
18 18 18 18 18 18 18 18	16	$73^{\circ}27.56$	73°26.04 36.72	91°34.89 0.77	27°32.36 27.27	87°32.45 50.22	
18 103°32.49 103°25.29 \$01°34.28 121°36.16 \$08°69.31 57°36.20 NI6°27.58 117°36.86 \$07°50.02 19 118°34.95 118°24.91 33.06 136°36.00 58.58 72°38.12 27.74 132°39.06 49.92 20 133°37.42 133°24.54 31.84 151°37.44 57.85 87°40.04 27.90 147°41.27 49.82 21 148°39.88 148°24.16 3.06.2 166°38.08 5.71.2 102°41.96 2.28.05 162°43.47 4.97.2 22 163°42.34 163°23.79 29.40 181°83.72 56.39 117°43.88 28.21 177°45.68 49.62 23 178°44.81 178°23.42 28.18 196°39.36 55.66 132°45.79 28.37 192°47.88 49.51 Mer.pass. 11:07 ν-0.4′ d-1.2′ m-3.89 ν-0.6′ d-0.7′ m1.18 ν-1.9′ d0.2′ m-2.06 ν-2.2′ d-0.1′ m1.06 Fri GHA GHA CHA CHA CHA CHA CHA CHA CHA CHA CHA C							1
20 133°37.42 133°24.54 31.84 151°37.44 57.85 87°40.04 27.90 147°41.27 49.82 1148°38.81 48°41.6 · · · · · · · · · · · · · · · · · · ·							
148°39.88 148°34.16 · · · · · · · · · · · · · · · · · ·							Eltanin 90°42.34 51°28.74
22 163°42.34 163°23.79 29.40 181°38.72 56.39 117°43.88 28.21 177°45.68 49.62							
Mer.pass 11:07 V-0.4' d-1.2' m-3.89 V-0.6' d-0.7' m1.18 V-1.9' d0.2' m-2.06 V-2.2' d-0.1' m1.06							
Mer.pass. 11:07							
Fri CHA CHA CHA Dec GHA Dec GH	Mor	nass 11:07		ν0.6/ d.0.7/ m1.10	11 0' d0 2' m 2 06		I I
Fri GHA GHA Dec GHA DE	ivier.	pass. 11.07	V-0.4 U-1.2 III-3.89	νο.ο <i>u</i> -ο. <i>τ</i> III1.18	V1.9 UU.2 III-2.00	ν2.2 <i>u</i> -0.1 III1.00	
0 193° 47.27 193° 23.04 S01° 26.06 211° 40.00 S08° 54.93 147° 47.71 N16° 28.52 20° 50.09 S07° 49.41 208° 49.74 208° 22.67 25.74 226° 40.64 54.20 162° 49.63 228° 52.09 49.31 223° 52.20 223° 52.20 223° 52.20 241° 41.28 53.47 177° 51.55 28.84 237° 54.50 49.21 233° 54.66 238° 21.92 · 23.30 256° 41.92 · 52.74 192° 53.47 · 28.99 252° 56.70 · 49.11 253° 57.13 253° 21.55 22.08 271° 42.56 52.01 207° 55.39 29.15 267° 58.91 49.01 266° 59.59 268° 21.17 20.86 286° 43.20 51.28 222° 57.31 29.31 283° 1.12 48.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.91 283° 1.12 49.99 266° 30.07 29.77 328° 7.73 48.60 313° 20.05 17.19 331° 45.12 49.90 266° 30.07 29.77 328° 7.73 48.60 328° 10.68 · 15.97 346° 45.76 · 48.36 283° 4.98 · 29.93 343° 9.94 · 48.50 244° 1.19 133° 1.14 75 1° 46.40 4 76.63 288° 40.90 30.09 358° 12.15 48.40 13° 18.56 501° 12.31 31° 47.68 508° 46.17 328° 10.74 N16° 30.40 28° 16.56 507° 48.20 129° 19.31 28° 18.19 11.09 46° 48.32 454 434° 12.66 30.56 43° 18.76 48.10 44° 21.77 43° 17.81 9.87 61° 48.96 44.70 358° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 14.57 30.71 58° 20.97 48.00 14° 40° 31.63 100° 16.32 501° 49.81 121° 55.53 508° 41.78 10° 40° 40° 40° 40° 40° 40° 40° 40° 40° 4							
1 208°49.74 208°22.67 25.74 226°40.64 54.20 162°49.63 28.68 222°52.29 49.31 223°52.20 223°22.29 24.52 241°41.28 53.47 177°51.55 28.84 237°54.50 49.21 23.30 256°41.92 52.74 192°53.47 28.89 252°56.70 49.11 24.55 268°55.91 255°2.208 271°42.56 52.01 207°55.39 29.15 267°58.91 49.01 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.12 48.91 283°1.13°45.12 49.90 268°3.07 29.75 328°7.73 48.60 313°30.05 17.19 331°45.12 49.90 268°3.07 29.77 328°7.73 48.60 343°1.91 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 385°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.55 48.30 12 14°16.84 13°18.56 501°12.31 31°47.68 508°44.17 328°10.74 N16°30.40 28°16.56 507°48.20 313°45.12 48.91 14.96 48.32 45.44 343°12.66 30.56 43°18.76 48.10 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 5°24.23 58°17.44 *8.64 67°49.60 *43.70 358°14.57 30.71 58°20.97 48.00 15 5°24.23 58°17.44 *8.64 67°49.60 *43.70 358°14.57 30.71 58°20.97 48.00 15 5°24.23 58°17.44 *8.64 67°49.60 *43.93 13.64 91.03 88°25.38 47.80 16°31.63 130°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 14°2.82 10.07 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 14°2.22 10.07 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 14°2.22 10.07 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 14°2.22 10.07 14°2.22 166°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 14°10.11 14°20.14 14°0.05 58.87 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 14.05 1							Al Na'ir 27°34.03 -46°50.58
2 223°52.20 223°22.29 24.52 241°41.28 53.47 177°51.55 28.84 237°54.50 49.21 323°52.50 238°21.92 · 23.30 256°41.92 · 52.74 192°53.47 · 28.99 252°56.70 · 49.11 4 253°57.13 253°21.55 22.08 271°42.56 52.01 207°55.39 29.15 267°58.91 49.01 5 268°59.59 268°21.17 20.86 286°43.20 51.28 222°57.31 29.31 283°1.12 48.91 7 29.06 283°20.80 501°19.64 301°43.84 508°50.55 237°59.23 N16°29.46 298°3.32 507°48.81 Mars 19°20.46 09.55 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 51.28 22°57.73 12.29.19 340°45.50 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 50.00 11 359°14.38 348°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 386°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 11 340°45.81 19.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 11 44°12.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 11 104°31.63 103°16.32 501°4.89 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 131°40.49 111°40.21 110°40.41 1110°40.41							
3 238°54.66 238°21.92 · 23.30 256°41.92 · · 52.74 192°53.47 · · 28.99 252°56.70 · · 49.11 4 253°57.13 253°21.55 22.08 271°42.56 52.01 207°55.39 29.15 267°58.91 49.01 5 268°59.59 268°21.17 20.86 286°43.20 51.28 222°57.31 29.31 283°1.12 48.91 6 284°2.06 283°2.08 501°19.64 301°43.84 508°50.55 237°59.23 N16°29.46 298°3.32 507°48.81 Mars 19°20.46 09:55 7 299°4.52 298°20.43 18.41 316°44.48 49.82 253°1.15 29.62 313°5.53 48.71 299°9.45 228°1.96 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 1344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 501°12.31 31°47.68 508°46.17 328°10.74 N16°30.40 28°16.56 507°48.20 13 29°19.31 28°18.19 11.09 46°48.96 44.70 358°14.57 30.71 58°20.97 48.00 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · · · 8.64 76°49.60 · · · 43.97 13°16.49 · · · 30.87 73°23.18 · · · 47.90 18°9.21.68 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 18 104°31.63 103°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°35.62 47.19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.09 118°15.21 11.31 166°53.46 130°36.22							I I
4 253°57.13 253°21.55 22.08 271°42.56 52.01 207°55.39 29.15 267°58.91 49.01 5 268°59.59 268°21.17 20.86 286°43.20 51.28 222°57.31 29.31 283°1.12 48.91 6 284°2.06 283°20.80 501°19.64 301°43.84 508°50.55 237°59.23 N16°29.46 298°3.32 507°48.81 7 299°4.52 298°20.43 18.41 316°44.48 49.82 253°1.15 29.62 313°55.53 48.71 8 314°6.98 313°20.05 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 9 329°9.45 328°19.68 · 15.97 346°45.76 · 48.36 283°4.98 · 29.93 343°9.94 · 48.50 10 344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 501°12.31 31°47.68 508°46.17 328°10.74 N16°30.40 28°16.56 507°48.20 13 29°19.31 28°17.81 9.87 61°48.96 44.70 3388°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · 8.64 76°49.60 · 43.97 13°16.49 · 30.87 73°23.18 · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.90 507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 118°29.91 31.97 178°38.62 47.19 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 49.01 48.91 49.9							IVIAГКАВ 13°30.84 15°19.94
6 284°2.06 283°20.80 \$01°19.64 301°43.84 \$08°50.55 237°59.23 \$N16°29.46 298°3.32 \$07°48.81 7 299°4.52 298°20.43 18.41 316°44.48 49.82 253°1.15 29.62 313°5.53 48.71 8 314°6.98 313°20.05 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 9 329°9.45 328°19.68 · 15.97 346°45.76 · 48.36 283°4.98 · 29.93 343°9.94 · 48.50 10 344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 501°12.31 31°47.68 508°46.17 328°10.74 \$N16°30.40 28°16.56 \$07°48.20 13 29°19.31 28°18.19 11.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 \$01°4.98 121°51.53 \$08°41.78 58°22.24 \$N16°31.34 118°29.80 \$07°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 103°28.00 · 31.81 163°36.42 · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 319°40.83 47.90 409.55 Jupiter 314°26.46 14:13 311°20.46 14:13 311°20.46 14:13 311°20.48 14:10 310°40.48 14:10 310°40.48 14:10 310°40.48 14:10 310°40.48 14:10 310°40.48 14:10 310°40.48 14:10 310°40.48 14:10 310°40.48 14			253°21.55 22.08				
7 299°4.52 298°20.43 18.41 316°44.48 49.82 253°1.15 29.62 313°5.53 48.71 8 314°6.98 313°20.05 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 9 329°9.45 328°19.68 · 15.97 346°45.76 · 48.36 283°4.98 · 29.93 343°9.94 · 48.50 10 344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.55 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12°919.31 28°18.19 11.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · 8.64 76°49.60 · 43.97 13°16.49 · 30.87 73°23.18 · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 16 104°31.63 103°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 118°15.95 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 119°34.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 180°10.11 19°20.11 10°10.11 10°11 10°10.11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°10.11 10°11 10°10.11 10°10.11 10°11 10°10.11 10°10.11 10°10.11 10°10.11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11 10°10.11 10°11							
8 314°6.98 313°20.05 17.19 331°45.12 49.09 268°3.07 29.77 328°7.73 48.60 9 329°9.45 328°19.68 · 15.97 346°45.76 · 48.36 283°4.98 · 29.93 343°9.94 · 48.50 10 344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 501°12.31 31°47.68 508°46.17 328°10.74 N16°30.40 28°16.56 507°48.20 13 29°19.31 28°18.19 11.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · 8.64 76°49.60 · 43.97 13°16.49 · 30.87 73°23.18 · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 118°29.80 507°47.60 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 103°28.00 · 31.81 163°36.42 · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 26 320°40.50 170 170 170 170 170 170 170 170 170 17							I I
9 329°9.45 328°19.68 · · 15.97 346°45.76 · · · 48.36 283°4.98 · · 29.93 343°9.94 · · · 48.50 10 344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 501°12.31 31°47.68 508°46.17 328°10.74 N16°30.40 28°16.56 507°48.20 13 29°19.31 28°18.19 11.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · · · 8.64 76°49.60 · · · 43.97 13°16.49 · · · 30.87 73°23.18 · · · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · · 1.31 166°53.46 · · 39.58 103°28.00 · · 31.81 163°36.42 · · · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 348°0.99 4.98 121°51.50 136°4.70 4.98 113°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 24 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 25 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 26 164°41.48 163°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09							
10 344°11.91 343°19.31 14.75 1°46.40 47.63 298°6.90 30.09 358°12.15 48.40 11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 S01°12.31 31°47.68 S08°46.17 328°10.74 N16°30.40 28°16.56 S07°48.20 13 29°19.31 28°18.19 11.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · 8.64 76°49.60 · 43.97 13°16.49 · 30.87 73°23.18 · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 103°28.00 · 31.81 163°36.42 · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Apr 04 Thu SHA Mer.pass Value of 48.30 Venus 54.30 value of 48.30 Venus 11:06							Saturn 14 15.51 10.14
11 359°14.38 358°18.93 13.53 16°47.04 46.90 313°8.82 30.24 13°14.35 48.30 12 14°16.84 13°18.56 S01°12.31 31°47.68 S08°46.17 328°10.74 N16°30.40 28°16.56 S07°48.20 13 29°19.31 28°18.19 11.09 46°48.32 45.44 343°12.66 30.56 43°18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · 8.64 76°49.60 · 43.97 13°16.49 · 30.87 73°23.18 · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 103°28.00 · 31.81 163°36.42 · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Venus 0°43.91 11:06 Mars 18°36.55 509:54 Jupiter 314°3.48 14:10 Saturn 14°9.04 10:11 Apr 05 Fri SHA Mer.pass Venus 359°35.77 11:07 Mars 17°52.73 09:53 Jupiter 314°0.44 14:07 Saturn 14°2.82 10:07 Horizontal parallax Venus: 0.1 Mars: 0.1							1 '
12 14 16.84 13 18.56 S0l* 12.31 31 47.68 S08*46.17 328*10.74 N16*30.40 28*16.56 S0l* 48.20 14.10 29*19.31 28*18.19 11.09 46*48.32 45.44 343*12.66 30.56 43*18.76 48.10 14 44*21.77 43*17.81 9.87 61*48.96 44.70 358*14.57 30.71 58*20.97 48.00 15 59*24.23 58*17.44 · · · 8.64 76*49.60 · · · 43.97 13*16.49 · · · 30.87 73*23.18 · · · 47.90 16 74*26.70 73*17.07 7.42 91*50.25 43.24 28*18.41 31.03 88*25.38 47.80 17 89*29.16 88*16.70 6.20 106*50.89 42.51 43*20.33 31.18 103*27.59 47.70 19 119*34.09 118*15.95 3.76 136*52.17 41.05 73*24.16 31.50 133*32.00 47.50 139*34.09 118*15.95 3.76 136*52.17 41.05 73*24.16 31.50 133*32.00 47.50 133*32.00 47.50 134*36.55 133*15.58 2.54 151*52.81 40.31 88*26.08 31.65 148*34.21 47.40 19 19*34.09 148*15.21 · · 1.31 166*53.46 · · · 39.58 103*28.00 · · · 31.81 163*36.42 · · · 47.29 164*41.48 163*14.83 01*0.09 181*54.10 38.85 118*29.91 31.97 178*38.62 47.19 18*34.09 Mars: 0.1 18*35*34.83 12*10.10*10*10*10*10*10*10*10*10*10*10*10*10*1							
13 29 19.31 28 18.19 11.09 46 48.32 49.44 343 12.00 30.50 43 18.76 48.10 14 44°21.77 43°17.81 9.87 61°48.96 44.70 358°14.57 30.71 58°20.97 48.00 15 59°24.23 58°17.44 · · · 8.64 76°49.60 · · · 43.97 13°16.49 · · · 30.87 73°23.18 · · · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · · 1.31 166°53.46 · · · 39.58 103°28.00 · · 31.81 163°36.42 · · · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Saturn 14°9.04 10:11	12		13°18.56 S 01°12.31			28°16.56 S07°48.20	
14 44*21.77 43*17.81 9.87 61*48.96 44.70 358*14.57 30.71 58*20.97 48.00 15 59°24.23 58°17.44 · · · 8.64 76°49.60 · · · 43.97 13°16.49 · · · 30.87 73°23.18 · · · 47.90 16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 \$01°4.98 121°51.53 \$08°41.78 \$58°22.24 \$N16°31.34 \$118°29.80 \$07°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · · 1.31 166°53.46 · · · 39.58 103°28.00 · · 31.81 163°36.42 · · · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Apr 05 Fri SHA Mer.pass Venus 359°35.77 11:07 Mars 17°52.73 09:53 11:07 Saturn 14°2.82 10:07 Horizontal parallax Venus: 0.1 Mars: 0.1							
16 74°26.70 73°17.07 7.42 91°50.25 43.24 28°18.41 31.03 88°25.38 47.80 Venus 359°35.77 11:07 17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 \$501°4.98 121°51.53 \$508°41.78 \$58°22.24 \$N16°31.34 \$118°29.80 \$507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 103°28.00 · 31.81 163°36.42 · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Venus 359°35.77 11:07 Mars 17°52.73 09:53 Jupiter 314°0.44 14:07 Saturn 14°2.82 10:07 Horizontal parallax Venus: 0.1 Mars: 0.1							
17 89°29.16 88°16.70 6.20 106°50.89 42.51 43°20.33 31.18 103°27.59 47.70 18 104°31.63 103°16.32 501°4.98 121°51.53 508°41.78 58°22.24 N16°31.34 118°29.80 507°47.60 19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · 1.31 166°53.46 · 39.58 103°28.00 · 31.81 163°36.42 · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Mars 17°52.73 09:53 Jupiter 314°0.44 14:07 Saturn 14°2.82 10:07 Horizontal parallax Venus: 0.1 Mars 17°52.73 09:53 Venus: 0.1							1 '
18							I I
19 119°34.09 118°15.95 3.76 136°52.17 41.05 73°24.16 31.50 133°32.00 47.50 20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · · 1.31 166°53.46 · · 39.58 103°28.00 · · 31.81 163°36.42 · · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Mars: 0.1							I I
20 134°36.55 133°15.58 2.54 151°52.81 40.31 88°26.08 31.65 148°34.21 47.40 21 149°39.02 148°15.21 · · 1.31 166°53.46 · · 39.58 103°28.00 · · 31.81 163°36.42 · · 47.29 22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Horizontal parallax Venus: 0.1 Mars: 0.1							1 '
22 164°41.48 163°14.83 01°0.09 181°54.10 38.85 118°29.91 31.97 178°38.62 47.19 Venus: 0.1 23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Mars: 0.1							
23 179°43.95 178°14.46 00°58.87 196°54.74 38.12 133°31.83 32.12 193°40.83 47.09 Mars: 0.1					_	_	1
25 115 15.55 116 11.16 05 36.61 156 51.11 36.12 155 51.05 11.15							1
Mer.pass. 11:03 ν -0.4′ d -1.2′ m-3.89 ν 0.6′ d -0.7′ m1.18 ν 1.9′ d 0.2′ m-2.06 ν 2.2′ d -0.1′ m1.06	23	179~43.95	178°14.46 00°58.87		133°31.83 32.12	193~40.83 47.09	IVIAIS: U.1
	Mer.	pass. 11:03	ν -0.4′ d -1.2′ m-3.89	$ u 0.6' \ d 0.7' \ \text{m} 1.18$	$\nu 1.9'~d0.2'~\text{m-}2.06$	$\nu 2.2'~\textit{d}\text{-}0.1'~\text{m}1.06$	

L	Ç.,	_	$\Delta I = II - V$		N /		
h	Su				Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°11.15 194°11.33	N05° 24.92 25.87	254°8.91 268°33.70	5.8' 5.8'	\$26°19.53 26°12.55	-7.0' -7.1'	58.5' 58.5'
2	209°11.51	26.83	282°58.51	5.8'	26°5.41	-7.1 -7.3	58.5'
3	224°11.70	• • 27.79	297°23.36	5.9'	25°58.09	-7.5'	58.6'
4	239°11.88	28.74	311°48.25	5.9'	$25^{\circ}50.60$	-7.7'	58.6'
5	254°12.06	29.70	326°13.17	6.0'	25°42.95	-7.8'	58.6'
6 7	269°12.24 284°12.42	N05° 30.65 31.61	340°38.12 355°3.12	6.0' 6.0'	\$25°35.12 25°27.12	-8.0' -8.2'	58.7' 58.7'
8	299°12.61	32.56	9°28.15	6.1	25 27.12 25°18.96	-0.2 -8.3'	58.7'
9	314°12.79	33.52	23°53.22	6.1'	25°10.63	-8.5	58.8'
10	329°12.97	34.48	38° 18.34	6.2'	$25^{\circ}2.13$	-8.7'	58.8'
11	344°13.15	35.43	52°43.49	6.2'	24°53.47	-8.8'	58.8'
12	359°13.33	N05°36.39	67°8.69	6.2'	\$24°44.64	-9.0'	58.9'
13 14	14°13.51 29°13.69	37.34 38.29	81°33.94 95°59.23	6.3' 6.3'	24°35.65 24°26.49	-9.2' -9.3'	58.9' 58.9'
15	44°13.88	39.25	110°24.57	6.4	24°17.18	-9.5'	59.0'
16	59°14.06	40.20	124°49.96	6.4'	24°7.70	-9.6'	59.0'
17	74°14.24	41.16	139° 15.39	6.5'	23°58.06	-9.8'	59.0'
18	89°14.42	N05°42.11	153°40.88	6.5'	\$23°48.26	-10.0'	59.1'
19 20	104°14.60 119°14.78	43.06 44.02	168°6.41 182°32.00	6.6' 6.6'	23°38.30 23°28.19	-10.1' -10.3'	59.1' 59.1'
21	134°14.76	• • 44.97	196° 57.63	6.7'	23°17.92	-10.5 -10.4'	59.1 59.2'
22	149°15.14	45.92	211°23.32	6.7'	23°7.50	-10.6'	59.2'
23	164°15.32	46.88	225°49.07	6.8'	22°56.92	-10.7'	59.2'
	SD = 16.0'	d = 1.0'		S	D = 15.9'		
					2 10.5		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°15.50 194°15.68	N05° 47.83 48.78	240°14.86 254°40.71	6.9' 6.9'	\$22°46.19 22°35.30	-10.9' -11.0'	59.3' 59.3'
2	209°15.86	48.78 49.74	254 40.71 269°6.62	6.9 7.0'	22°24.27	-11.0 -11.2'	59.3'
3	224°16.04	• • 50.69	283°32.58	7.0'	22°13.08	-11.3'	59.4
4	$239^{\circ}16.22$	51.64	297°58.60	7.1'	$22^{\circ}1.75$	-11.5'	59.4'
5	254°16.40	52.59	312°24.67	7.1'	21°50.27	-11.6'	59.4'
6	269°16.58 284°16.76	N05° 53.54 54.50	326°50.80 341°16.99	7.2' 7.2'	\$21°38.65 21°26.88	-11.8' -11.9'	59.5' 59.5'
7 8	284°16.76 299°16.94	54.50 55.45	341°16.99 355°43.23	7.2	21°26.88 21°14.96	-11.9 -12.1'	59.5'
9	314°17.12	56.40	10°9.53	7.4	21°2.91	-12.2'	59.6'
10	329°17.30	57.35	24°35.89	7.4'	20°50.71	-12.3'	59.6'
11	344°17.48	58.30	39°2.31	7.5'	20°38.37	-12.5'	59.6'
12	359°17.66	N05°59.25	53°28.79	7.5'	\$20°25.90	-12.6'	59.6'
13 14	14°17.84 29°18.02	06°0.20 1.15	67°55.32 82°21.91	7.6' 7.7'	20°13.29 20°0.54	-12.7' -12.9'	59.7' 59.7'
15	44°18.20	2.10	96°48.57	7.7'	19°47.66	-13.0'	59.7'
16	59°18.38	3.05	111°15.28	7.8'	19°34.65	-13.1'	59.8'
17	74°18.56	4.00	125°42.04	7.8'	19°21.51	-13.3'	59.8'
18	89°18.74	N06°4.95	140°8.87	7.9'	\$19°8.23 18°54.83	-13.4'	59.8'
19 20	104°18.92 119°19.10	5.90 6.85	154°35.75 169°2.70	7.9' 8.0'	18°54.83 18°41.30	-13.5' -13.7'	59.9' 59.9'
21	134°19.27	7.80	183°29.70	8.1	18°27.65	-13.8'	59.9'
22	149°19.45	8.75	197°56.76	8.1'	18°13.87	-13.9'	59.9'
23	164°19.63	9.70	212°23.87	8.2'	$17^{\circ}59.97$	-14.0'	60.0'
	SD = 16.0'	d = 1.0'		S	D = 16.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°19.81 194°19.99	N06° 10.65 11.60	226°51.04 241°18.27	8.2' 8.3'	\$17°45.94 17°31.80	-14.1' -14.3'	60.0' 60.0'
2	209°20.17	12.54	255° 45.56	8.3'	17° 17.54	-14.3 -14.4'	60.1
3	224°20.34	• • 13.49	270°12.90	8.4'	$17^{\circ}3.17$	-14.5'	60.1'
4	239°20.52	14.44	284°40.30	8.5'	16°48.68	-14.6'	60.1'
5	254°20.70 269°20.88	15.39	299°7.76	8.5' 8.6'	16°34.08	-14.7'	60.1'
6 7	269°20.88 284°21.06	N06° 16.33 17.28	313°35.27 328°2.83	8.6′ 8.6′	\$16°19.36 16°4.54	-14.8' -14.9'	60.2' 60.2'
8	299°21.23	18.23	342° 30.45	8.7'	15°49.61	-14.9	60.2
9	314°21.41	• • 19.18	356°58.12	8.7'	15°34.57	-15.1	60.2'
10	329°21.59	20.12	11°25.85	8.8'	15°19.43	-15.2'	60.3'
11	344°21.77	21.07	25°53.63	8.8'	15°4.18	-15.3'	60.3'
12 13	359°21.94 14°22.12	N06° 22.02 22.96	40°21.46 54°49.34	8.9' 8.9'	\$14°48.83 14°33.38	-15.4' -15.5'	60.3' 60.3'
13 14	29°22.30	22.96	69° 17.27	9.0'	14° 33.38 14° 17.84	-15.5' -15.6'	60.4
15	44°22.48	24.85	83°45.25	9.0'	14°2.20	-15.7'	60.4
16	59°22.65	25.80	98°13.28	9.1'	13°46.46	-15.8'	60.4'
17	74°22.83	26.74	112°41.36	9.1'	13°30.63	-15.9'	60.4
18 19	89°23.01 104°23.18	N06°27.69 28.64	127°9.49 141°37.66	9.2' 9.2'	\$13°14.71 12°58.70	-16.0' -16.1'	60.5' 60.5'
19 20	104°23.18 119°23.36	28.64	141°37.66 156°5.88	9.2'	12°58.70 12°42.60	-16.1' -16.2'	60.5
21	134°23.54	30.52	170°34.15	9.3'	12°26.42	-16.3'	60.5
22	149°23.71	31.47	185°2.46	9.4'	12°10.15	-16.4	60.5'
23	164°23.89	32.41	199°30.81	9.4'	11°53.80	-16.4'	60.6'
	SD = 16.0'	d = 0.9'		S	D = 16.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	00:37	03:19	04:38	19:31	20:51	////
N 70°	01:51	03:39	04:47	19:21	20:31	22:23
68°	02:26	03:54	04:55	19:13	20:15	21:45
66°	02:51	04:06	05:01	19:07	20:02	21:19
64°	03:09	04:16	05:06	19:01	19:52	20:59
62°	03:24	04:24	05:11	18:56	19:43	20:44
60°	03:37	04:32	05:15	18:52	19:36	20:31
N 58°	03:47	04:38	05:19	18:49	19:29	20:21
56°	03:56	04:43	05:22	18:45	19:24	20:11
54°	04:04	04:48	05:25	18:42	19:19	20:04
52°	04:11	04:53	05:27	18:40	19:14	19:57
50°	04:17	04:56	05:29	18:37	19:10	19:50
45°	04:29	05:05	05:34	18:32	19:02	19:38
N 40°	04:39	05:11	05:39	18:28	18:55	19:28
35°	04:47	05:17	05:42	18:24	18:50	19:20
30°	04:53	05:21	05:45	18:21	18:45	19:13
20°	05:03	05:29	05:51	18:15	18:37	19:03
N 10°	05:10	05:34	05:55	18:10	18:32	18:56
0°	05:15	05:39	06:00	18:06	18:27	18:51
S 10°	05:18	05:43	06:04	18:02	18:23	18:47
20°	05:20	05:46	06:08	17:57	18:19	18:45
30°	05:21	05:49	06:13	17:53	18:16	18:44
35°	05:21	05:50	06:15	17:50	18:15	18:44
40°	05:20	05:51	06:18	17:47	18:14	18:45
45°	05:19	05:52	06:22	17:43	18:12	18:46
S 50°	05:16	05:54	06:26	17:39	18:11	18:48
52°	05:15	05:54	06:28	17:37	18:11	18:50
54°	05:14	05:54	06:30	17:35	18:10	18:51
56°	05:12	05:55	06:32	17:32	18:10	18:53
58°	05:10	05:55	06:35	17:30	18:09	18:54
S 60°	05:07	05:56	06:37	17:27	18:09	18:57

N 72°	Lat.		Moonris	е		Moonset	;
N 70° ■ 06:41 ■ 12:10 68° ■ 07:25 06:14 ■ 09:29 12:36 66° ■ 06:27 05:52 ■ 10:26 12:56 64° 06:38 05:53 05:35 08:14 10:59 13:11 62° 05:38 05:28 05:21 09:14 11:23 13:24 60° 05:04 05:08 05:09 09:48 11:42 13:35 N 58° 04:38 04:51 04:59 10:12 11:58 13:44 56° 04:18 04:37 04:49 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01	Lut.	Wed	Thu	Fri	Wed	Thu	Fri
68°	N 72°	_		07:21			11:33
66° d4° 06:38 05:53 05:35 08:14 10:59 13:11 62° 05:38 05:28 05:21 09:14 11:23 13:24 60° 05:04 05:08 05:09 09:48 11:42 13:35 N 58° 04:38 04:51 04:59 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:17 11:4 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47 02:47 13:54 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:40 01:47 02:47 13:54 14:46 15:36 20° 00:24 01:28 02:33 14:14 15:02 15:44 15:25 S 10° 00:40 01:47 02:47 13:54 14:46 15:36 20° 00:24 01:28 02:33 14:14 15:02 15:46 30° ⋯ 01:07 02:04 03:00 13:34 14:31 15:25 S 50° ⋯ 00:54 02:08 14:51 15:31 16:06 40° ⋯ 00:39 01:57 15:07 15:43 16:14 45° 15:0° 00:00 01:27 02:22 15:59 16:22 16:40 54° 23:38 ⋯ 01:14 16:12 16:31 16:55 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56°	N 70°			06:41			12:10
64° 06:38 05:53 05:35 08:14 10:59 13:11 62° 05:38 05:28 05:21 09:14 11:23 13:24 60° 05:04 05:08 05:09 09:48 11:42 13:35 N 58° 04:38 04:51 04:59 10:12 11:58 13:44 56° 04:18 04:37 04:49 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47 02:47 13:54 14:46 15:36 30° ⋯ 01:07 02:04 03:00 13:34 14:41 15:02 15:46 30° ⋯ 01:07 02:17 14:37 15:21 15:59 35° ⋯ 00:39 01:57 15:07 15:43 16:14 45° ⋯ 00:22 01:45 15:25 15:57 16:23 \$50° ⋯ 00:00 01:29 15:48 16:14 16:34 55° 23:38 ⋯ 01:14 16:12 16:31 16:45 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 56° 23:24 ⋯ 01:05 16:26 16:41 16:51 58° 23:08 ⋯ 00:54 16:42 16:52 16:58	68°		07:25	06:14		09:29	12:36
62° 05:38 05:28 05:21 09:14 11:23 13:24 60° 05:04 05:08 05:09 09:48 11:42 13:35 N 58° 04:38 04:51 04:59 10:12 11:58 13:44 56° 04:18 04:37 04:49 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47 02:47 13:54 14:46 15:36 20° 00:24 01:28 02:33 14:14 15:02 15:46 30° 01:07 02:07 14:57 15:21 15:59 35° 00:22 01:45 15:25 15:57 16:23 S 50° 00:00 01:29 15:48 16:14 16:34 52° 23:38 01:05 15:45 16:26 16:41 16:51 56° 23:24 01:05 16:26 16:41 16:51 58° 23:08 00:54 16:42 16:52 16:58				05:52		10:26	12:56
60° 05:04 05:08 05:09 09:48 11:42 13:35 N 58° 04:38 04:51 04:59 10:12 11:58 13:44 56° 04:18 04:37 04:49 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22		06:38	05:53	05:35	08:14	10:59	13:11
N 58° 04:38 04:51 04:59 10:12 11:58 13:44 56° 04:18 04:37 04:49 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04							
56° 04:18 04:37 04:49 10:32 12:11 13:52 54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47		05:04	05:08	05:09	09:48	11:42	13:35
54° 04:01 04:25 04:41 10:48 12:23 13:59 52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47 02:47 13:54 14:46 15:36 20° 00:24 01:28		04:38	04:51	04:59	10:12	11:58	13:44
52° 03:47 04:14 04:34 11:02 12:33 14:06 50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47 02:47 13:54 14:46 15:36 20° 00:24 01:28 02:33 14:14 15:02 15:49 30° 01:07		04:18	04:37	04:49	10:32	12:11	13:52
50° 03:34 04:05 04:27 11:14 12:42 14:12 45° 03:08 03:44 04:13 11:40 13:01 14:24 N 40° 02:47 03:28 04:01 11:59 13:16 14:34 35° 02:30 03:14 03:51 12:16 13:29 14:43 30° 02:15 03:01 03:42 12:30 13:40 14:51 20° 01:49 02:40 03:26 12:54 13:59 15:04 N 10° 01:27 02:22 03:13 13:15 14:16 15:15 0° 01:07 02:04 03:00 13:34 14:31 15:25 S 10° 00:46 01:47 02:47 13:54 14:46 15:36 20° 00:24 01:28 02:33 14:14 15:02 15:46 30° ··· 01:07 02:17 14:37 15:21 15:59 35° ··· 00:54 <		04:01			10:48	12:23	13:59
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					l		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	45°	03:08	03:44	04:13	11:40	13:01	14:24
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		02:47	03:28	04:01	11:59	13:16	14:34
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		02:30	03:14	03:51	12:16	13:29	14:43
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		02:15	03:01		12:30	13:40	14:51
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		-					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1	01:07	02:04	03:00	13:34	14:31	15:25
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		00:46		02:47	13:54	14:46	15:36
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		00:24			l		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	40°	••••					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	45°		00:22	01:45	15:25	15:57	16:23
54° 23:38 ··· 01:14 16:12 16:31 16:45 56° 23:24 ··· 01:05 16:26 16:41 16:51 58° 23:08 ··· 00:54 16:42 16:52 16:58			00:00			16:14	16:34
56° 23:24 ··· 01:05 16:26 16:41 16:51 58° 23:08 ··· 00:54 16:42 16:52 16:58					ı		
58° 23:08 ··· 00:54 16:42 16:52 16:58							
S 60° 22:49 ··· 00:42 17:02 17:05 17:06							
	S 60°	22:49	•• ••	00:42	17:02	17:05	17:06

		Sun		Moon	on		
Day	Eqn.o	Eqn.of Time		Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	41-20%	
03	03:15	03:07	12:03	07:21	19:49		
04	02:58	02:49	12:03	08:18	20:45		
05	02:41	02:32	12:03	09:13	21:39		

h	Aries	Ve	nus	, M:	ars	Jur	oiter	Sat	urn		Stars
Sat 0	GHA 194° 46.41	GHA 193°14.09	Dec \$00°57.65	GHA 211°55.38	Dec \$08°37.38	GHA 148°33.75	Dec N16° 32.28	GHA 208°43.04	Dec S 07°46.99		SHA
1	209° 48.87	208° 13.72	56.42	226° 56.03	36.65	163°35.66	32.44	200 45.04 223°45.24	46.89		357°35.81
2	224°51.34	223°13.34	55.20	241°56.67	35.92	178°37.58	32.59	238°47.45	46.79	Ankaa	353°8.17
3	239°53.80	$238^{\circ}12.97$	• • 53.98	$256^{\circ}57.31$	• • 35.18	193°39.50	• • 32.75	253°49.66	• • 46.69	Schedar Diphda	349°32.39 348°48.26
4	254° 56.27	253°12.60	52.76	271°57.95	34.45	208°41.41	32.90	268°51.87	46.59	Achernar	335°21.20
5	269°58.73	268° 12.23	51.53	286° 58.60	33.72	223°43.33	33.06	283°54.07	46.49	Hamal	327°52.27
6 7	285°1.19 300°3.66	283°11.86 298°11.48	\$00°50.31 49.09	301°59.24 316°59.88	\$08°32.98 32.25	238°45.25 253°47.16	N16° 33.22 33.37	298°56.28 313°58.49	\$07°46.39 46.29	Polaris	$314^{\circ}47.53$
8	315°6.12	313°11.11	49.09 47.87	332° 0.53	31.52	268°49.08	33.53	329°0.70	46.29	Acamar	315°12.62
9	330°8.59	328° 10.74	• • 46.64	347°1.17	30.78	283°50.99	• • 33.69	344°2.90	• • 46.09	Menkar	314°7.11
10	$345^{\circ}11.05$	343°10.37	45.42	2°1.81	30.05	298°52.91	33.84	359°5.11	45.99	Mirfak Aldebaran	308°29.61 290°40.57
11	0°13.51	358° 10.00	44.20	17°2.46	29.31	313°54.82	34.00	14°7.32	45.89	Rigel	281°4.65
12	15° 15.98	13°9.63 28°9.25	S00°42.97	32°3.10	S08°28.58	328°56.74	N16°34.16	29°9.53 44°11.73	S07°45.79	Capella	280°23.07
13 14	30° 18.44 45° 20.91	28 9.25 43°8.88	41.75 40.53	47°3.75 62°4.39	27.85 27.11	343°58.66 359°0.57	34.31 34.47	59°13.94	45.69 45.59	Bellatrix	278°23.72
15	60°23.37	58°8.51	39.30	77°5.03	26.38	14°2.49	• • 34.63	74°16.15	• • 45.49	Elnath	278°2.85
16	75°25.83	73°8.14	38.08	92°5.68	25.64	29°4.40	34.78	89°18.36	45.39	Alnilam	275°38.51 270°52.89
17	90°28.30	88°7.77	36.86	107°6.32	24.91	44° 6.32	34.94	104°20.57	45.29	Betelgeuse Canopus	270 52.89 263°52.80
18	105°30.76	103°7.40	S00°35.63	122°6.97	S08°24.17	59°8.23	N16° 35.09	119°22.77	S07°45.19	Sirius	258°26.86
19	120°33.23 135°35.69	118°7.03	34.41	137°7.61	23.44	74°10.15	35.25	134°24.98 149°27.19	45.09	Adhara	255°6.40
20 21	150°38.15	133°6.65 148°6.28	33.19 •• 31.96	152°8.26 167°8.90	22.70 •• 21.97	89°12.06 104°13.97	35.41 •• 35.56	149 27.19 164°29.40	44.99 •• 44.89	Procyon	244°51.48
22	165°40.62	163°5.91	30.74	182°9.55	21.23	119°15.89	35.72	179°31.61	44.79	Pollux	243°18.05
23	180°43.08	178°5.54	29.52	197° 10.19	20.50	134°17.80	35.88	194°33.82	44.69	Avior	234°14.85
Morr	pass. 10:59	11 0 A' d 1	2′ m-3.89	υ0.6′ d.0	.7' m1.18	11 0' d0	.2′ m-2.05	,,2 2' d C	0.1' m1.06	Suhail Miaplacidus	222°46.60 221°38.03
- IVICI.	Dass. 10.39	ν-0.4 u-1	1.2 111-3.09	νο.σ <i>u</i> -σ	.7 1111.10	ν1.9 αυ.	.2 111-2.03	ν2.2 u -0	7.1 1111.00	Alphard	217°48.22
•	6114	6114	_	6114	-	CILA		6114	_	Regulus	
Sun 0	GHA 195° 45.55	GHA 193°5.17	Dec \$00°28.29	GHA 212° 10.84	Dec \$08°19.76	GHA 149°19.72	Dec N16° 36.03	GHA 209°36.02	Dec S 07°44.59	Dubhe	193°41.18
1	210° 48.01	208° 4.80	27.07	212 10.84 227°11.49	19.02	164°21.63	36.19	209 30.02 224°38.23	44.49	Denebola	182°25.30
2	225° 50.47	223°4.43	25.84	242°12.13	18.29	179°23.55	36.35	239°40.44	44.39	Gienah	175°43.94 173°0.21
3	$240^{\circ}52.94$	238°4.06	• • 24.62	257° 12.78	• • 17.55	194°25.46	• • 36.50	254°42.65	• • 44.29		173 0.21 171°51.85
4	255°55.40	253°3.69	23.40	272°13.42	16.82	209°27.37	36.66	269°44.86	44.19		166°12.93
5	270°57.87	268°3.32	22.17	287°14.07	16.08	224°29.29	36.81	284°47.07 299°49.28	44.09	Spica	158°22.67
6 7	286°0.33 301°2.79	283°2.95 298°2.57	\$00°20.95 19.72	302°14.72 317°15.36	\$08°15.34 14.61	239°31.20 254°33.11	N16° 36.97 37.13	299 49.28 314°51.49	\$07°43.99 43.89		152°52.01
8	316°5.26	313°2.20	18.50	332° 16.01	13.87	269°35.03	37.28	329°53.69	43.79	Hadar	148°36.35
9	331°7.72	328°1.83	• • 17.28	347° 16.65	• • 13.13	284°36.94	• • 37.44	344°55.90	• • 43.69		147°58.02 145°48.17
10	346° 10.19	343°1.46	16.05	2°17.30	12.40	299°38.85	37.60	359°58.11	43.59	Rigil Kent.	139°40.62
11	1°12.65	358°1.09	14.83	17° 17.95	11.66	314°40.77	37.75	15°0.32	43.49	Kochab	137°18.65
12 13	16° 15.12 31° 17.58	13°0.72 28°0.35	\$00°13.60 12.38	32°18.60 47°19.24	\$08°10.92 10.18	329°42.68 344°44.59	N16° 37.91 38.07	30°2.53 45°4.74	\$07°43.39 43.29	Zuben'ubi	136°56.44
14	46°20.04	42°59.98	11.15	62°19.89	9.45	359°46.51	38.22	60°6.95	43.19	Alphecca	126°3.99
15	61°22.51	57°59.61	• • 9.93	77° 20.54	• • 8.71	14°48.42	• • 38.38	75°9.16	• • 43.09	Antares Atria	112°16.40 107°10.94
16	$76^{\circ}24.97$	72°59.24	8.70	$92^{\circ}21.18$	7.97	29°50.33	38.53	90°11.37	43.00	Sabik	107 10.94 102°3.36
17	91°27.44	87°58.87	7.48	107°21.83	7.23	44°52.24	38.69	105°13.58	42.90	Shaula	96°11.08
18 19	106° 29.90 121° 32.36	102°58.50 117°58.13	\$00°6.26	122°22.48	\$08°6.50	59°54.16 74°56.07	N16° 38.85	120°15.79 135°18.00	\$07°42.80	Rasalhague	$95^{\circ}59.01$
20	136°34.83	132° 57.76	5.03 3.81	137°23.13 152°23.78	5.76 5.02	89°57.98	39.00 39.16	150°20.21	42.70 42.60	Eltanin	90°42.31
21	151° 37.29	147°57.39	2.58	167°24.42	• • 4.28	104°59.89	39.32	165°22.42	• • 42.50	Kaus Aust.	83°33.29
22	166°39.76	162°57.02	1.36	182°25.07	3.54	120° 1.80	39.47	180°24.63	42.40	Vega Nunki	80°33.59 75°48.53
23	181°42.22	177°56.65	0.13	197° 25.72	2.80	135° 3.72	39.63	195°26.84	42.30	Altair	62°0.64
Mer.p	pass. 10:55	ν -0.4' d-1	2′ m-3.89	$\nu 0.6' \ d-0$	0.7′ m1.18	$\nu 1.9' d0$.2′ m-2.05	$\nu 2.2' \ d-0$	0.1' m1.06	Peacock	53°6.89
				-						Deneb	49°26.43
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.63
0	196° 44.68	192°56.28	N00°1.09	212°26.37	S08°2.07	150° 5.63		210°29.05	S07°42.20	Al Na'ir Fomalhaut	27°34.01 15°15.51
1	$211^{\circ}47.15$	$207^{\circ}55.91$	2.32	227°27.02	1.33	$165^{\circ}7.54$	39.94	225°31.26	42.10	Scheat	13°46.15
2	226°49.61	222°55.54	3.54	242°27.67	08°0.59	180° 9.45	40.10	240°33.47	42.00	Markab	13°30.83
3	241°52.08 256°54.54	237°55.17 252°54.80	· · 4.77	257°28.31 272°28.96	07°59.85	195°11.36 210°13.27	· · 40.25	255°35.68 270°37.89	· · 41.90	Apr 06 Sat	SHA
4 5	256°54.54 271°57.00	252°54.80 267°54.43	5.99 7.22	272°28.96 287°29.61	59.11 58.37	210°13.27 225°15.18	40.41 40.57	270°37.89 285°40.10	41.81 41.71		358°27.68
6	286° 59.47	282° 54.06	N00°8.44		50.57 S07°57.63	240°17.10			\$07°41.61	Mars	17°8.97
7	302°1.93	297°53.69	9.67	317°30.91	56.89	255°19.01	40.88	315°44.52	41.51	Jupiter	313°47.34
8	317°4.40	312°53.32	10.89	332°31.56	56.15	270°20.92	41.03	330°46.73	41.41	Saturn	13°56.63
9	332°6.86	327°52.95	• • 12.12	347°32.21	• • 55.41	285°22.83	• • 41.19	345°48.95	• • 41.31	Apr 07 Sun	SHA
10 11	347°9.32 2°11.79	342°52.58 357°52.21	13.34 14.57	2°32.86 17°33.51	54.67 53.93	300°24.74 315°26.65	41.35 41.50	0°51.16 15°53.37	41.21 41.11		$357^{\circ}19.62$
12	17° 14.25		N00°15.79	32°34.16	53.93 S07°53.19	330°28.56	N16°41.66	30°55.58		Mars	16°25.29
13	32° 16.72	27°51.47	17.02	47°34.81	52.45	345°30.47	41.82	45°57.79	40.92		313°34.17
14	47° 19.18	42°51.10	18.25	62°35.46	51.71	0°32.38	41.97	61°0.00	40.82	Saturn	13°50.48
15	62°21.64	57°50.73	• • 19.47	77°36.11	• • 50.97	15°34.29	• • 42.13	76°2.21	• • 40.72	Apr 08 Mon	SHA
16 17	77°24.11 92°26.57	72°50.36 87°49.99	20.70 21.92	92°36.76 107°37.41	50.23 49.49	30°36.20 45°38.11	42.28 42.44	91°4.42 106°6.63	40.62 40.52		356°11.60
18	92 20.57 107°29.04		N00°23.15	107 37.41 122°38.06	49.49 \$07°48.75	45 38.11 60°40.02	N16° 42.60		40.52 \$07°40.42	Mars Juniter	15°41.68 313°20.94
19	122°31.50	117°49.25	24.37	137°38.71	48.01	75°41.93	42.75	136°11.06	40.32	Saturn	13°44.37
20	137°33.96	132°48.88	25.60	152°39.36	47.27	90°43.84	42.91	151°13.27	40.23		
21	152°36.43	147°48.51	• • 26.82	167°40.01	· · 46.53	105°45.75	· · 43.06	166°15.48	• • 40.13	Horizor	ntal parallax Venus:
22 23	167° 38.89 182° 41.36	162°48.14 177°47.77	28.05 29.27	182° 40.67 197° 41.32	45.79 45.05	120°47.66 135°49.57	43.22 43.38	181°17.69 196°19.90	40.03 39.93		Mars:
ivier.p	pass. 10:51	ν -0.4' d1	.2′ m-3.89	νυ.σ΄ α -0	0.7′ m1.17	ν1.9' α 0.	.2′ m-2.05	ν2.2' α -0	0.1′ m1.06		

Dec

29°13.28

-42°10.52 56°40.09

-17°51.34

 $-57^{\circ}6.92$

 $23^{\circ}34.53$

89°22.12

-40°12.61

4°10.98

49°56.88 16°33.44

-8°10.54

 $46^{\circ}1.45$

 $6^{\circ}22.23$

28°37.71

 $-1^{\circ}11.28$

7°24.64

-52°42.75 -16°45.12

-29°0.50

-59°35.47

-43°32.04

-69°49.21

-8°45.94

11°50.88

61°37.33

 $14^{\circ}26.12$

-17°40.72

-63°14.10

-57°15.03

55°49.65

-11°17.38

49°11.41 -60°29.38

-36°29.40

 $19^{\circ}3.21$

74°3.13

-16°8.64

26°37.75

-26°29.17

-69°4.06

-15°45.37

 $-37^{\circ}7.23$

 $12^{\circ}32.31$

51°28.74

-34°22.34

38°48.00

-26°16.00

8°55.71

-56°39.27

45°21.64

-46°50.57

-29°29.69 28°12.63

15°19.94

Mer.pass

11:07

09:52

14:04

10:04

11:08

09:51

14:01

10:00

11:09

09:50

13:58

09:57

0.1

0.1

Mer.pass

Mer.pass

9°58.95

-60°56.09

5°9.71 27°58.12

	011010	-0.0142 360		011 —		500	
h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.07	N06° 33.36	213°59.21	9.4'	S11°37.37	-16.5'	60.6'
1	194°24.24 209°24.42	34.30	228°27.64 242°56.12	9.5'	11°20.86 11°4.27	-16.6' -16.7'	60.6'
2	209°24.42 224°24.59	35.25 · · 36.19	242°56.12 257°24.64	9.5' 9.6'	11°4.27 10°47.61	-16.7' -16.7'	60.6' 60.6'
4	239°24.77	37.13	271°53.20	9.6'	10° 47.01	-16.8'	60.7
5	254°24.95	38.08	286°21.80	9.6'	10° 14.07	-16.9'	60.7
6	269°25.12	N06° 39.02	300°50.43	9.7'	S09°57.20	-16.9'	60.7'
7	284°25.30	39.96	$315^{\circ}19.10$	9.7'	09°40.25	-17.0'	60.7'
8	299°25.47	40.90	$329^{\circ}47.81$	9.7'	09°23.24	-17.1'	60.7'
9	314°25.65	• • 41.85	344° 16.55	9.8'	09°6.17	-17.1'	60.8'
10	329°25.82	42.79	358° 45.32 13° 14.13	9.8'	08°49.04 08°31.84	-17.2'	60.8'
11 12	344°26.00 359°26.17	43.73 N06° 44.67	13° 14.13 27° 42.97	9.8' 9.9'	08° 31.84 \$08° 14.59	-17.3' -17.3'	60.8' 60.8'
13	14°26.35	45.61	42°11.83	9.9 9.9'	07°57.28	-17.3 -17.4'	60.8
14	29°26.52	46.55	56° 40.73	9.9'	07°39.92	-17.4	60.8'
15	44°26.70	• • 47.50	71°9.65	10.0'	07°22.50	-17.5'	60.8'
16	59°26.87	48.44	85°38.60	10.0'	07°5.03	-17.5'	60.9'
17	74°27.05	49.38	100°7.58	10.0'	06°47.52	-17.6'	60.9'
18	89°27.22	N06° 50.32	114°36.58	10.0'	S06°29.95	-17.6'	60.9'
19	104°27.40	51.26	129°5.60 143°34.65	10.0' 10.1'	06°12.35	-17.6'	60.9'
20 21	119°27.57 134°27.74	52.20 •• 53.14	143°34.65 158°3.72	10.1'	05°54.70 05°37.01	-17.7' -17.7'	60.9' 60.9'
22	149°27.92	54.08	172° 32.81	10.1	05° 19.28	-17.7 -17.8'	60.9
23	164°28.09	55.02	187°1.91	10.1	05°1.51	-17.8	60.9'
	SD = 16.0'	d = 0.9'		ÇI	D = 16.5'		
	<u> </u>	<u>u — 0.9</u>		اد			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°28.27	N06°55.96	201°31.04	10.1'	\$04°43.71	-17.8'	60.9'
1 2	194°28.44 209°28.61	56.90 57.84	216°0.18 230°29.33	10.2' 10.2'	04°25.88 04°8.01	-17.9' -17.9'	61.0' 61.0'
3	209 28.01 224°28.79	58.77	230 29.33 244°58.50	10.2'	04 8.01 03°50.12	-17.9' -17.9'	61.0'
4	239°28.96	06°59.71	259° 27.69	10.2'	03°32.19	-17.9'	61.0'
5	254°29.13	07°0.65	273°56.88	10.2'	03° 14.25	-18.0'	61.0'
6	269°29.31	N07°1.59	288°26.09	10.2'	S02°56.28	-18.0'	61.0'
7	284°29.48	2.53	$302^{\circ}55.30$	10.2'	02°38.29	-18.0'	61.0'
8	299°29.65	3.46	317°24.53	10.2'	02°20.28	-18.0'	61.0'
9	314°29.83	• • 4.40	331°53.76	10.2'	02°2.25	-18.0'	61.0'
10 11	329°30.00 344°30.17	5.34 6.28	346°22.99 0°52.24	10.2' 10.2'	01°44.21 01°26.16	-18.1' -18.1'	61.0' 61.0'
12	359°30.35	N07°7.21	15°21.48	10.2	S01°8.09	-18.1	61.0
13	14°30.52	8.15	29°50.73	10.2	00° 50.02	-18.1	61.0'
14	29°30.69	9.09	44° 19.97	10.2'	00°31.94	-18.1'	61.0'
15	44°30.86	• • 10.02	58°49.22	10.2'	S00°13.85	-18.1'	61.0'
16	59°31.04	10.96	73° 18.46	10.2'	N00°4.24	18.1'	61.0'
17	74°31.21	11.90 N07° 12.83	87° 47.71 102° 16.95	10.2'	00°22.33	18.1'	61.0'
18 19	89°31.38 104°31.55	NU7 12.83 13.77	102°16.95 116°46.18	10.2' 10.2'	N00° 40.42 00° 58.50	18.1' 18.1'	61.0' 61.0'
20	119°31.72	14.70	131° 15.41	10.2	00° 36.50	18.1	61.0'
21	134°31.89	. 15.64	145°44.62	10.2'	01°34.66	18.1	61.0'
22	149°32.07	16.57	160° 13.84	10.2'	$01^{\circ}52.72$	18.1'	61.0'
23	164°32.24	17.51	174°43.04	10.2'	$02^{\circ}10.77$	18.0'	61.0'
	SD = 16.0'	d = 0.9'		SI	D = 16.6'		
Mon	GHA	Dec	GHA	ν	Dec	d 10.0'	HP
0 1	179°32.41 194°32.58	N07° 18.44 19.37	189° 12.23 203° 41.40	10.2' 10.2'	N02°28.81 02°46.83	18.0' 18.0'	61.0' 61.0'
2	209°32.75	20.31	218° 10.57	10.2	02 40.83 03°4.84	18.0'	61.0'
3	224°32.92	• • 21.24	232°39.72	10.1'	03°22.83	18.0'	61.0'
4	239°33.09	22.18	247°8.85	10.1'	03°40.79	17.9'	61.0'
5	254°33.26	23.11	261°37.96	10.1'	03°58.73	17.9'	61.0'
6	269°33.44	N07°24.04	276°7.06	10.1'	N04°16.65	17.9'	61.0'
7 8	284°33.61 299°33.78	24.97 25.91	290°36.14 305°5.20	10.1' 10.0'	04°34.54 04°52.39	17.9' 17.8'	61.0' 61.0'
9	299°33.78 314°33.95	25.91	305°5.20 319°34.24	10.0'	04°52.39 05°10.22	17.8'	61.0'
10	329°34.12	27.77	334°3.25	10.0'	05°28.01	17.8	61.0'
11	344°34.29	28.70	348° 32.24	10.0'	05°45.77	17.7'	60.9'
12	359°34.46	N07°29.64	3°1.20	9.9'	N06°3.49	17.7'	60.9'
13	14°34.63	30.57	17°30.14	9.9'	06°21.17	17.6	60.9'
14	29°34.80	31.50	31°59.05	9.9'	06°38.80	17.6'	60.9'
15 16	44°34.97 59°35.14	· · 32.43 33.36	46°27.93 60°56.79	9.9' 9.8'	06°56.40 07°13.94	17.5' 17.5'	60.9' 60.9'
17	74°35.31	33.30 34.29	75°25.61	9.8 9.8'	07 13.94 07°31.44	17.5 17.4'	60.9
18	89°35.48	N07°35.22	89°54.40	9.8'	N07°48.89	17.4	60.9'
19	104°35.65	36.15	104° 23.16	9.7'	08°6.29	17.3'	60.9'
20	119°35.81	37.08	$118^{\circ}51.89$	9.7'	$08^{\circ}23.63$	17.3'	60.8'
21	134°35.98	• • 38.01	133°20.58	9.7'	08°40.92	17.2'	60.8'
22	149°36.15	38.94	147°49.23	9.6'	08°58.15 09°15.32	17.2'	60.8'
23	164°36.32	39.87	162°17.85	9.6'		17.1'	60.8'
	SD = 16.0'	d = 0.9'		SI	D = 16.6'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Julilise	Juliset	Civil	Naut.
N 72°	////	02:59	04:21	19:46	21:10	////
N 70°	01:17	03:22	04:33	19:34	20:46	23:00
68°	02:04	03:39	04:42	19:25	20:28	22:06
66°	02:34	03:53	04:49	19:17	20:14	21:35
64°	02:55	04:04	04:56	19:10	20:02	21:13
62°	03:12	04:14	05:01	19:04	19:52	20:55
60°	03:26	04:22	05:06	19:00	19:44	20:41
N 58°	03:37	04:29	05:10	18:55	19:37	20:29
56°	03:47	04:35	05:14	18:51	19:30	20:19
54°	03:55	04:41	05:17	18:48	19:25	20:10
52°	04:03	04:45	05:20	18:45	19:20	20:03
50°	04:09	04:50	05:23	18:42	19:15	19:56
45°	04:23	04:59	05:29	18:36	19:06	19:42
N 40°	04:34	05:06	05:34	18:31	18:58	19:31
35°	04:42	05:12	05:38	18:26	18:52	19:23
30°	04:49	05:18	05:42	18:23	18:47	19:15
20°	05:00	05:26	05:48	18:16	18:38	19:04
N 10°	05:08	05:32	05:54	18:10	18:32	18:56
0°	05:14	05:38	05:59	18:05	18:26	18:50
S 10°	05:18	05:43	06:04	18:00	18:21	18:46
20°	05:21	05:47	06:09	17:55	18:17	18:43
30°	05:23	05:50	06:15	17:49	18:13	18:41
35°	05:23	05:52	06:18	17:46	18:11	18:40
40°	05:23	05:54	06:21	17:42	18:09	18:40
45°	05:22	05:56	06:26	17:38	18:07	18:41
S 50°	05:21	05:58	06:31	17:33	18:05	18:42
52°	05:20	05:59	06:33	17:30	18:04	18:43
54°	05:19	06:00	06:35	17:28	18:03	18:44
56°	05:18	06:01	06:38	17:25	18:02	18:45
58°	05:16	06:02	06:41	17:22	18:01	18:46
S 60°	05:15	06:03	06:45	17:18	18:00	18:48

Lat.		Moonris	e	Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°	06:10	05:26	04:47	14:37	17:12	19:49	
N 70°	05:54	05:22	04:52	14:49	17:12	19:36	
68°	05:42	05:18	04:56	14:59	17:12	19:25	
66°	05:32	05:15	04:59	15:07	17:11	19:17	
64°	05:23	05:12	05:02	15:13	17:11	19:09	
62°	05:15	05:10	05:05	15:19	17:11	19:03	
60°	05:09	05:08	05:07	15:24	17:11	18:58	
N 58°	05:03	05:06	05:09	15:28	17:11	18:53	
56°	04:58	05:05	05:11	15:32	17:10	18:49	
54°	04:53	05:03	05:13	15:35	17:10	18:46	
52°	04:49	05:02	05:14	15:38	17:10	18:42	
50°	04:45	05:01	05:16	15:41	17:10	18:39	
45°	04:37	04:58	05:19	15:47	17:10	18:33	
N 40°	04:30	04:56	05:21	15:52	17:10	18:27	
35°	04:24	04:54	05:24	15:56	17:09	18:23	
30°	04:18	04:52	05:26	16:00	17:09	18:19	
20°	04:09	04:49	05:29	16:07	17:09	18:12	
N 10°	04:01	04:47	05:32	16:12	17:09	18:05	
0°	03:53	04:44	05:35	16:17	17:08	18:00	
S 10°	03:45	04:42	05:38	16:22	17:08	17:54	
20°	03:37	04:39	05:42	16:28	17:08	17:48	
30°	03:27	04:36	05:46	16:34	17:07	17:41	
35°	03:22	04:35	05:48	16:37	17:07	17:37	
40°	03:15	04:33	05:50	16:41	17:07	17:33	
45°	03:08	04:31	05:53	16:46	17:06	17:27	
S 50°	02:59	04:28	05:57	16:51	17:06	17:21	
52°	02:55	04:27	05:59	16:53	17:06	17:18	
54°	02:50	04:25	06:00	16:56	17:06	17:15	
56°	02:45	04:24	06:02	16:59	17:05	17:12	
58°	02:39	04:22	06:05	17:02	17:05	17:08	
S 60°	02:33	04:20	06:07	17:06	17:05	17:04	

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper Lower		27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-1%	
06	02:24	02:15	12:02	10:05	22:31		
07	02:07	01:59	12:02	10:56	23:22		
08	01:50	01:42	12:02	11:47	-:-		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	197° 43.82	192°47.40	N00°30.50	212°41.97	S07°44.30	150°51.48	N16°43.53	211°22.12	S07°39.83			
1	212°46.28	207°47.03	31.72	227° 42.62	43.56	165°53.39	43.69	226°24.33	39.73	Alpheratz	357°35.80	29° 13.27
2	227°48.75	222°46.66	32.95	242°43.27	42.82	180°55.30	43.84	241°26.54	39.64	Ankaa Schedar	353°8.17 349°32.38	-42°10.51 56°40.08
3	242°51.21	237°46.30	• • 34.18	257° 43.92	• • 42.08	195°57.20	• • 44.00	256°28.75	• • 39.54	Diphda	348°48.26	-17°51.34
4	257°53.68	252°45.93	35.40	272°44.57	41.34	210°59.11	44.16	271°30.96	39.44	Achernar	335°21.21	-57°6.90
5	272°56.14	267° 45.56	36.63	287° 45.23	40.60	226°1.02	44.31 N16° 44.47	286°33.18	39.34	Hamal	327°52.27	23°34.52
6 7	287°58.60 303°1.07	282°45.19 297°44.82	N00°37.85 39.08	302°45.88 317°46.53	\$07°39.85 39.11	241°2.93 256°4.84	44.47 44.63	301°35.39 316°37.60	\$07°39.24 39.14	Polaris	$314^{\circ}48.11$	89°22.10
8	318°3.53	312° 44.45	40.30	332°47.18	38.37	271° 6.75	44.78	331°39.81	39.14	Acamar	315°12.63	-40°12.60
9	333°6.00	327°44.08	• • 41.53	347° 47.84	37.63	286° 8.66	• • 44.94	346°42.03	• • 38.95	Menkar	314°7.11	4°10.98
10	348°8.46	342°43.71	42.75	2°48.49	36.88	301°10.56	45.09	1°44.24	38.85	Mirfak Aldebaran	308°29.62 290°40.59	49°56.87 16°33.44
11	3° 10.93	357° 43.34	43.98	17°49.14	36.14	316°12.47	45.25	16°46.45	38.75	Rigel	290 40.59 281°4.66	-8° 10.54
12	18° 13.39	12°42.97	N00°45.21	32°49.79	S07°35.40	331°14.38	N16°45.41	31°48.66	S07°38.65	Capella	280°23.09	46°1.45
13	33° 15.85	27° 42.60	46.43	47° 50.45	34.66	346°16.29	45.56	46°50.88	38.56	Bellatrix	278°23.73	6°22.23
14 15	48° 18.32 63° 20.78	42°42.23 57°41.86	47.66 •• 48.88	62°51.10 77°51.75	33.91 •• 33.17	1°18.20 16°20.10	45.72 •• 45.87	61°53.09 76°55.30	38.46 •• 38.36	Elnath	278°2.87	28° 37.71
16	78° 23.25	72°41.49	50.11	92°52.41	32.43	31°22.01	46.03	91°57.52	38.26	Alnilam	275°38.53	-1°11.28
17	93°25.71	87°41.12	51.33	107°53.06	31.68	46°23.92	46.19	106°59.73	38.16	Betelgeuse	270°52.91	7°24.64
18	108°28.17	102°40.75	N00°52.56	122°53.71	S07°30.94	61°25.83	N16°46.34	122°1.94	S07°38.07	Canopus	263°52.83 258°26.88	-52° 42.75 -16° 45.12
19	123°30.64	$117^{\circ}40.38$	53.78	137°54.37	30.20	76°27.73	46.50	137°4.16	37.97	Sirius Adhara	255°6.42	-10 45.12 -29°0.50
20	138°33.10	132°40.01	55.01	152°55.02	29.45	91°29.64	46.65	152°6.37	37.87	Procyon	244°51.50	5°9.71
21	153°35.57	147°39.65	• • 56.24	167°55.67	• • 28.71	106°31.55	• • 46.81	167°8.58	• • 37.77	Pollux	243°18.06	27°58.12
22 23	168° 38.03 183° 40.49	162°39.28 177°38.91	57.46 58.69	182°56.33 197°56.98	27.97	121°33.46 136°35.36	46.97 47.12	182°10.80 197°13.01	37.67	Avior	$234^{\circ}14.88$	-59°35.47
23	103 40.49				27.22				37.58	Suhail	222°46.62	-43°32.05
_Mer.p	pass. 10:47	ν -0.4' d1	.2′ m-3.89	ν 0.7′ d-0	.7′ m1.17	$\nu^{1.9'} d0$.2′ m-2.05	ν 2.2′ d-0	.1′ m1.07	Miaplacidus	221°38.07	-69°49.22
										Alphard	217°48.23	-8°45.94
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°34.92 193°41.21	11°50.89 61°37.35
0	$198^{\circ}42.96$	192°38.54	$N00^{\circ}59.91$	212°57.64	S07°26.48	151°37.27	N16°47.28	212°15.22	S07°37.48	Dublie	193 41.21 182°25.31	14° 26.13
1	213° 45.42	207°38.17	01°1.14	227°58.29	25.73	166°39.18	47.43	227°17.44	37.38	Gienah	175°43.95	-17°40.72
2	228° 47.89	222°37.80	2.36	242°58.95	24.99	181°41.08	47.59	242°19.65	37.28	Acrux	173°0.21	-63°14.11
3	243°50.35	237°37.43	3.59	257°59.60	• • 24.25	196°42.99	• • 47.75	257°21.86	• • 37.19	Gacrux	$171^{\circ}51.85$	-57°15.04
4 5	258° 52.81 273° 55.28	252°37.06 267°36.69	4.81 6.04	273°0.26 288°0.91	23.50 22.76	211°44.90 226°46.80	47.90 48.06	272°24.08 287°26.29	37.09 36.99	Alioth	166°12.94	55° 49.67
6	288° 57.74	282° 36.32	N01°7.26	303°1.56	S07°22.01	241°48.71	N16°48.21	302°28.51	507°36.89	Spica	158°22.67	-11°17.39
7	304°0.21	297°35.95	8.49	318°2.22	21.27	256°50.62	48.37	317°30.72	36.80	Alkaid	152°52.00	49°11.42
8	319°2.67	312°35.58	9.72	333°2.88	20.52	271°52.52	48.52	332°32.93	36.70	Hadar Menkent	148°36.34 147°58.01	-60°29.39 -36°29.41
9	$334^{\circ}5.13$	$327^{\circ}35.21$	• • 10.94	348°3.53	• • 19.78	286°54.43	• • 48.68	347°35.15	• • 36.60	Arcturus	147 30.01 145°48.17	19°3.22
10	349°7.60	342°34.84	12.17	3°4.19	19.03	301°56.33	48.84	2°37.36	36.50	Rigil Kent.	139°40.61	-60°56.10
11	4° 10.06	357°34.47	13.39	18°4.84	18.29	316°58.24	48.99	17°39.58	36.41	Kochab	$137^{\circ}18.63$	74°3.15
12	19° 12.53 34° 14.99	12°34.10	N01°14.62	33°5.50	\$07°17.54	332°0.14	N16° 49.15	32°41.79	S07°36.31	Zuben'ubi	$136^{\circ}56.43$	-16°8.64
13 14	34 14.99 49°17.46	27°33.73 42°33.36	15.84 17.07	48°6.15 63°6.81	16.80 16.05	347°2.05 2°3.96	49.30 49.46	47°44.01 62°46.22	36.21 36.12	Alphecca	126°3.98	26°37.76
15	64° 19.92	57°33.00	. 18.29	78°7.47	• 15.31	17° 5.86	• • 49.62	77°48.44	• • 36.02	Antares	112°16.39	-26°29.17
16	79°22.38	72°32.63	19.52	93°8.12	14.56	32°7.77	49.77	92°50.65	35.92	Atria	107°10.90 102°3.34	-69°4.07 -15°45.37
17	94°24.85	87°32.26	20.74	108°8.78	13.82	47° 9.67	49.93	107°52.87	35.82	Sabik Shaula	96°11.06	-15 45.57 -37°7.23
18	109°27.31	102°31.89	N01°21.97	123°9.43	S07°13.07	62°11.58	N16°50.08	122°55.08	S07°35.73	Rasalhague	95°58.99	12°32.31
19	124°29.78	117°31.52	23.19	138° 10.09	12.32	77°13.48	50.24	137°57.30	35.63	Eltanin	90°42.28	51°28.75
20	139°32.24	132°31.15	24.42	153° 10.75	11.58	92°15.39	50.39	152°59.51	35.53	Kaus Aust.		-34°22.34
21 22	154°34.70 169°37.17	147°30.78 162°30.41	· · 25.64 26.87	168° 11.40 183° 12.06	· · 10.83 10.09	107°17.29 122°19.20	· · 50.55 50.71	168°1.73 183°3.94	· · 35.44 35.34	Vega	80°33.57	38°48.00
23	184° 39.63	102 30.41 177°30.04	28.09	198° 12.72	9.34	137°21.10	50.71	198° 6.16	35.24	Nunki		-26°16.00
										Altair	62°0.62	8°55.71
Mer.p	pass. 10:43	ν -0.4′ $d1$.2′ m-3.89	ν 0. $l' d$ -0	.7′ m1.17	ν 1.9′ d0.	.2′ m-2.04	$\nu^{2.2'} d-0$.1′ m1.07	Peacock Deneb	53°6.86 49°26.40	-56°39.26 45°21.64
										Enif	33°39.61	9° 58.95
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.99	-46°50.56
0	199° 42.10		N01°29.32	213°13.37	S07°8.59	152°23.01		213°8.37	S07°35.15	Fomalhaut	$15^{\circ}15.50$	-29°29.68
1	214° 44.56	207°29.30	30.54	228°14.03	7.85	167°24.91	51.17	228°10.59	35.05	Scheat	13°46.14	28°12.62
2	229° 47.03 244° 49.49	222°28.93 237°28.56	31.77 · · 33.00	243°14.69 258°15.35	7.10 · · 6.35	182°26.81 197°28.72	51.33 •• 51.49	243°12.80 258°15.02	34.95 •• 34.85	Markab	13°30.82	15° 19.93
4	259° 51.95	252° 28.19	34.22	273° 16.00	5.61	212°30.62	51.64	273°17.23	34.76	Apr 09 Tue	SHA	Mer.pass
5	274° 54.42	267° 27.82	35.44	288° 16.66	4.86	227°32.53	51.80	288°19.45	34.66	Venus	355°3.58	11:09
6	289°56.88		N01°36.67	303°17.32	S07°4.11	242°34.43	N16°51.95	303°21.67		Mars	14°58.15	09:49
7	304°59.35	297°27.08	37.89	$318^{\circ}17.98$	3.37	257°36.34	52.11	318°23.88	34.47	Jupiter	313°7.66	13:55
8	320°1.81	312°26.71	39.12	333°18.64	2.62	272°38.24	52.26	333°26.10	34.37	Saturn	13°38.30	09:53
9	335°4.27	327°26.34	. 40.34	348° 19.29	• • 1.87	287°40.14	• • 52.42	348°28.31	• • 34.27	Apr 10 Wed	SHA	Mer.pass
10 11	350°6.74 5°9.20	342°25.97 357°25.60	41.57 42.79	3° 19.95 18° 20.61	1.12 07°0.38	302°42.05 317°43.95	52.58 52.73	3°30.53 18°32.75	34.18 34.08		353°55.58	11:10
12	20° 11.67	12° 25.23	N01°44.02	33°21.27	506°59.63	332°45.85	N16°52.89	33°34.96	507°33.99	Mars	14°14.68	09:48
13	35°14.13	27° 24.86	45.24	48°21.93	58.88	347°47.76	53.04	48°37.18	33.89	Jupiter		13:52
14	$50^{\circ}16.59$	42°24.49	46.47	63°22.59	58.13	2°49.66	53.20	63°39.40	33.79	Saturn	13°32.27	09:50
15	65° 19.06	57°24.12	• • 47.69	78°23.24	•• 57.39	17°51.56	• • 53.35	78°41.61	• • 33.70	Apr 11 Thu	SHA	Mer.pass
16	80°21.52	72°23.75	48.92	93°23.90	56.64	32°53.47	53.51	93°43.83	33.60		352°47.57	11:10
17	95°23.99	87°23.38	50.14	108°24.56	55.89	47°55.37	53.66	108°46.05	33.50	Mars	13°31.28	09:47
18 19	110°26.45 125°28.92	102°23.01 117°22.64	N01°51.37 52.59	123°25.22 138°25.88	\$06°55.14 54.39	62°57.27 77°59.18	N16°53.82 53.98	123°48.26 138°50.48	\$07°33.41 33.31		312°40.91	13:49
20	125 26.92 140°31.38	117 22.04 132° 22.27	52.59	150 25.00 153° 26.54	53.64	93°1.08	53.96 54.13	150 50.46 153°52.70	33.31	Saturn	13°26.28	09:46
21	155° 33.84	147°21.90	• • 55.04	168° 27.20	• • 52.90	108° 2.98	• • 54.29	168°54.91	• • 33.12	Horizor	ntal parallax	
22	170°36.31	162°21.53	56.26	183°27.86	52.15	123° 4.88	54.44	183°57.13	33.02		Venus:	0.1
23	185°38.77	$177^{\circ}21.16$	57.49	198°28.52	51.40	138° 6.79	54.60	198°59.35	32.93		Mars:	0.1
Mer	pass. 10:39	ν -0.4' d1	.2′ m-3.89	ν0.7′ d-0	.7′ m1.17	$\nu 1.9' d0$.2′ m-2.04	$\nu 2.2' \ d-0$.1′ m1.07			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.49	N07°40.80	176°46.43	9.5'	N09°32.43	17.0'	60.8'
1	194°36.66	41.73	191°14.98	9.5'	09°49.47	17.0'	60.8'
2	209°36.83 224°37.00	42.66 •• 43.58	205°43.48 220°11.94	9.5' 9.4'	10°6.45 10°23.36	16.9' 16.8'	60.7' 60.7'
4	239° 37.16	44.51	234°40.37	9.4'	10°40.20	16.8	60.7'
5	254°37.33	45.44	249°8.75	9.3'	$10^{\circ}56.97$	16.7'	60.7'
6	269° 37.50	N07°46.37	263°37.09	9.3'	N11°13.67	16.6'	60.7'
7 8	284° 37.67 299° 37.84	47.30 48.22	278°5.38 292°33.63	9.2' 9.2'	11°30.29 11°46.83	16.5' 16.5'	60.7' 60.6'
9	314° 38.00	• • 49.15	307°1.83	9.2'	12°3.29	16.4	60.6
10	329°38.17	50.08	321°29.99	9.1'	$12^{\circ}19.67$	16.3'	60.6'
11	344°38.34	51.00	335°58.10	9.1'	12°35.97	16.2'	60.6'
12 13	359°38.51 14°38.67	N07°51.93 52.86	350°26.17 4°54.18	9.0' 9.0'	N12°52.18 13°8.31	16.1' 16.0'	60.6' 60.5'
14	29° 38.84	53.78	19°22.15	9.0 8.9'	13°24.35	15.9'	60.5
15	44°39.01	• • 54.71	33°50.07	8.9'	13°40.29	15.9'	60.5
16	59°39.17	55.63	48°17.93	8.8'	13°56.15	15.8'	60.5'
17	74°39.34 89°39.51	56.56 N07°57.48	62°45.75 77°13.51	8.8'	14°11.91 N14°27.57	15.7'	60.4
18 19	89°39.51 104°39.68	58.41	91°41 23	8.7' 8.7'	14° 43.14	15.6' 15.5'	60.4' 60.4'
20	119° 39.84	07°59.33	106°8.89	8.6'	14°58.60	15.4	60.4
21	134°40.01	08°0.26	120°36.49	8.6'	15°13.97	15.3'	60.3'
22	149°40.17	1.18	135° 4.05	8.5'	15°29.23	15.2'	60.3'
23	164°40.34	2.10	149°31.55	8.4'	15°44.38	15.0'	60.3'
	SD = 16.0'	d = 0.9'		S	D = 16.6'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.51	N08° 3.03	163°58.99	8.4'	N15°59.43	14.9'	60.3'
1	194°40.67	3.95	178°26.38	8.3'	16°14.37	14.8'	60.2'
2	209°40.84 224°41.00	4.87	192°53.72 207°21.00	8.3' 8.2'	16°29.20 16°43.91	14.7' 14.6'	60.2'
3 4	239° 41.17	· · 5.80 6.72	207 21.00 221°48.22	8.2'	16 43.91 16°58.52	14.5	60.2' 60.1'
5	254° 41.33	7.64	236°15.39	8.1'	17°13.00	14.4	60.1
6	269°41.50	N08°8.56	250°42.50	8.1'	N17°27.37	14.3'	60.1'
7	284°41.67	9.49	265° 9.56	8.0'	17°41.63	14.1'	60.1'
8 9	299° 41.83 314° 42.00	10.41 •• 11.33	279°36.56 294°3.50	7.9' 7.9'	17°55.76 18°9.77	14.0' 13.9'	60.0' 60.0'
10	329° 42.16	12.25	308°30.39	7.8'	18°23.65	13.8'	60.0
11	344° 42.32	13.17	322°57.22	7.8'	18°37.41	13.6'	59.9'
12	359°42.49	N08°14.09	337°23.99	7.7'	N18°51.04	13.5'	59.9'
13 14	14° 42.65 29° 42.82	15.01 15.93	351°50.70 6°17.36	7.7' 7.6'	19°4.55 19°17.92	13.4' 13.2'	59.9' 59.8'
15	44° 42.98	. 16.85	20°43.96	7.5'	19 17.92 19°31.16	13.1	59.8'
16	59° 43.15	17.77	35°10.51	7.5'	19°44.27	13.0'	59.8'
17	74°43.31	18.69	49°37.00	7.4'	19°57.25	12.8'	59.7'
18 19	89° 43.47 104° 43.64	N08°19.61 20.53	64°3.43 78°29.81	7.4' 7.3'	N20°10.09 20°22.79	12.7' 12.6'	59.7' 59.7'
20	119° 43.80	20.55	92°56.13	7.3'	20°22.79		59.7 59.6'
21	134° 43.96	22.37	107°22.39	7.2'	20°47.77	12.3'	59.6'
22	149°44.13	23.29	121°48.60	7.2'	$21^{\circ}0.05$	12.1'	59.6'
23	164°44.29	24.20	136°14.75	7.1'	21°12.19	12.0'	59.5'
	SD = 16.0'	d = 0.9'		S	D = 16.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.45 194°44.62	N08°25.12	150°40.85	7.0'	N21°24.18	11.8'	59.5'
1 2	194°44.62 209°44.78	26.04 26.96	165°6.90 179°32.89	7.0' 6.9'	21°36.03 21°47.73	11.7' 11.6'	59.5' 59.4'
3	209 44.76 224°44.94	27.87	179 52.89 193°58.83	6.9	21°59.28	11.4	59.4'
4	239°45.11	28.79	208°24.72	6.8'	22°10.69	11.3'	59.4'
5	254° 45.27	29.71	222°50.56	6.8'	22°21.94	11.1'	59.3'
6 7	269° 45.43 284° 45.59	N08°30.62 31.54	237°16.34 251°42.08	6.7' 6.7'	N22°33.04 22°43.99	10.9' 10.8'	59.3' 59.3'
8	299° 45.76	32.46	266° 7.76	6.6'	22°54.78	10.6'	59.3'
9	314°45.92	• • 33.37	280°33.40	6.6'	23°5.42	10.5'	59.2'
10	329°46.08	34.29	294°58.98	6.5'	23°15.90	10.3'	59.1'
11 12	344° 46.24 359° 46.40	35.20 N08°36.12	309°24.52 323°50.02	6.5' 6.4'	23°26.22 N23°36.39	10.2' 10.0'	59.1' 59.1'
13	14° 46.56	37.03	338°15.47	6.4	23°46.39	9.8'	59.1 59.0'
14	29°46.73	37.94	352°40.87	6.4'	23°56.24	9.7'	59.0'
15	44°46.89	• • 38.86	7°6.23	6.3'	24°5.92	9.5'	59.0'
16	59° 47.05 74° 47.21	39.77 40.69	21°31.55 35°56.83	6.3' 6.2'	24°15.44 24°24.80	9.4' 9.2'	58.9'
17 18	74°47.21 89°47.37	40.69 N08°41.60	35°56.83 50°22.06	6.2'	N24°24.80	9.2'	58.9' 58.8'
19	104° 47.53	42.51	64°47.26	6.2'	24°43.02	8.9'	58.8'
20	119°47.69	43.42	79°12.42	6.1'	24°51.88	8.7'	58.8'
21	134° 47.85	• • 44.34	93°37.55	6.1'	25°0.58	8.5'	58.7'
22 23	149°48.01 164°48.17	45.25 46.16	108°2.63 122°27.69	6.1' 6.0'	25°9.11 25°17.47	8.4' 8.2'	58.7' 58.7'
23	SD = 16.0'	d = 0.9'	122 21.09		D = 16.2'	0.2	30.1
	<u> </u>	u — 0.9		اد			

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	02:37	04:05	20:01	21:32	////
N 70°	////	03:04	04:18	19:47	21:03	////
68°	01:38	03:24	04:29	19:36	20:42	22:32
66°	02:15	03:40	04:38	19:27	20:26	21:53
64°	02:40	03:52	04:45	19:19	20:12	21:27
62°	02:59	04:03	04:51	19:13	20:01	21:07
60°	03:14	04:12	04:57	19:07	19:52	20:51
N 58°	03:27	04:20	05:02	19:02	19:44	20:38
56°	03:38	04:27	05:06	18:57	19:37	20:27
54°	03:47	04:33	05:10	18:54	19:31	20:17
52°	03:55	04:38	05:14	18:50	19:25	20:09
50°	04:02	04:43	05:17	18:47	19:20	20:02
45°	04:17	04:53	05:24	18:40	19:10	19:47
N 40°	04:28	05:02	05:29	18:34	19:02	19:35
35°	04:38	05:08	05:34	18:29	18:55	19:25
30°	04:45	05:14	05:38	18:24	18:49	19:18
20°	04:57	05:23	05:46	18:17	18:39	19:05
N 10°	05:06	05:31	05:52	18:10	18:32	18:56
0°	05:13	05:37	05:58	18:04	18:25	18:50
S 10°	05:18	05:42	06:04	17:59	18:20	18:44
20°	05:22	05:47	06:10	17:52	18:15	18:40
30°	05:24	05:52	06:16	17:46	18:10	18:37
35°	05:25	05:55	06:20	17:42	18:07	18:37
40°	05:26	05:57	06:24	17:37	18:05	18:36
45°	05:26	06:00	06:29	17:32	18:02	18:36
S 50°	05:25	06:03	06:35	17:26	17:59	18:36
52°	05:25	06:04	06:38	17:24	17:57	18:36
54°	05:24	06:05	06:41	17:20	17:56	18:37
56°	05:24	06:07	06:44	17:17	17:55	18:38
58°	05:23	06:08	06:48	17:14	17:53	18:38
S 60°	05:22	06:10	06:52	17:09	17:51	18:39

Lat.		Moonris	e		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	04:02	02:47		22:58		
N 70°	04:18	03:30		22:17		
68°	04:32	03:59	02:38	21:49		01:07
66°	04:42	04:22	03:46	21:29		00:01
64°	04:52	04:39	04:22	21:12	23:26	
62°	05:00	04:54	04:48	20:59	23:00	
60°	05:07	05:07	05:09	20:48	22:41	
N 58°	05:13	05:18	05:26	20:38	22:25	
56°	05:18	05:27	05:40	20:29	22:11	23:50
54°	05:23	05:36	05:53	20:22	21:59	23:33
52°	05:27	05:43	06:04	20:15	21:49	23:19
50°	05:32	05:50	06:14	20:09	21:39	23:06
45°	05:40	06:05	06:35	19:56	21:20	22:41
N 40°	05:48	06:17	06:52	19:46	21:04	22:21
35°	05:54	06:28	07:06	19:37	20:51	22:04
30°	06:00	06:37	07:19	19:29	20:39	21:50
20°	06:10	06:53	07:40	19:15	20:20	21:25
N 10°	06:19	07:07	07:59	19:03	20:03	21:04
0°	06:27	07:21	08:17	18:52	19:47	20:44
S 10°	06:36	07:34	08:35	18:41	19:31	20:25
20°	06:45	07:49	08:54	18:30	19:15	20:04
30°	06:55	08:06	09:16	18:16	18:56	19:40
35°	07:01	08:16	09:30	18:09	18:44	19:26
40°	07:08	08:27	09:45	18:00	18:32	19:09
45°	07:17	08:40	10:03	17:50	18:17	18:50
S 50°	07:26	08:57	10:26	17:38	17:59	18:26
52°	07:31	09:05	10:37	17:33	17:50	18:14
54°	07:36	09:13	10:50	17:26	17:41	18:01
56°	07:42	09:23	11:04	17:20	17:30	17:46
58°	07:48	09:34	11:21	17:12	17:18	17:28
S 60°	07:56	09:47	11:42	17:03	17:04	17:07

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-7%	
09	01:34	01:26	12:01	12:40	00:13		
10	01:18	01:10	12:01	13:34	01:06		
11	01:02	00:54	12:01	14:30	02:02		

April 12, 13, 14 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	200°41.24	192°20.79 N01°58.71	213°29.18 \$06°50.65	153°8.69 N16°54.75	214°1.56 \$07°32.83	
1	215°43.70	207°20.42 01°59.94	228°29.84 49.90	168°10.59 54.91	229°3.78 32.73	Alpheratz 357°35.78 29°13.27
2	230°46.16	222°20.05 02°1.16	243°30.50 49.15	183°12.49 55.07	244°6.00 32.64	Ankaa 353°8.15 -42°10.49
3	245°48.63	237°19.68 · · 2.38	258°31.16 · · 48.40	198°14.39 · · 55.22	259°8.22 · · 32.54	Schedar 349°32.36 56°40.07 Diphda 348°48.25 -17°51.33
4	260°51.09	252°19.31 3.61	273°31.82 47.65	213°16.30 55.38	274°10.43 32.45	Achernar 335°21.21 -57°6.88
5	275°53.56	267°18.94 4.83 282°18.57 N02°6.06	288°32.48 46.91	228°18.20 55.53	289°12.65 32.35	Hamal 327°52.27 23°34.52
6 7	290° 56.02 305° 58.49	282°18.57 N02°6.06 297°18.20 7.28	303°33.14	243°20.10 N16°55.69 258°22.00 55.84	304°14.87 S07°32.25 319°17.09 32.16	Polaris 314°48.32 89°22.09
8	321°0.95	312°17.82 8.50	333°34.46 44.66	273°23.90 56.00	334°19.31 32.06	Acamar 315°12.63 -40°12.59
9	336°3.41	327°17.45 · · 9.73	348°35.12 · · 43.91	288°25.80 · · 56.15	349°21.52 · · 31.97	Menkar 314°7.11 4°10.98
10	351°5.88	342°17.08 10.95	3°35.78 43.16	303°27.71 56.31	4°23.74 31.87	Mirfak 308°29.62 49°56.86 Aldebaran 290°40.59 16°33.44
11	6°8.34	357°16.71 12.17	18° 36.45 42.41	318°29.61 56.46	19°25.96 31.77	Rigel 281°4.67 -8°10.54
12	21° 10.81	12°16.34 N02°13.40	33°37.11 \$06°41.66	333°31.51 N16°56.62	34°28.18 S 07°31.68	Capella 280°23.10 46°1.44
13 14	36° 13.27 51° 15.74	27°15.97 14.62 42°15.60 15.84	48°37.77 40.91 63°38.43 40.16	348°33.41 56.78 3°35.31 56.93	49°30.40 31.58 64°32.61 31.49	Bellatrix 278°23.74 6°22.23
15	66° 18.20	57°15.23 · · 17.07	78°39.09 · · 39.41	18°37.21 · · 57.09	79°34.83 · · 31.39	Elnath 278°2.87 28°37.70
16	81°20.66	72°14.86 18.29	93°39.75 38.66	33°39.11 57.24	94°37.05 31.30	Alnilam 275°38.54 -1°11.28
17	96°23.13	87°14.49 19.51	108°40.41 37.91	48°41.01 57.40	109°39.27 31.20	Betelgeuse 270°52.91 7°24.64 Canopus 263°52.85 -52°42.75
18	111°25.59	102°14.12 N02°20.74	123°41.08 \$06°37.16	63°42.91 N16°57.55	124°41.49 S 07°31.11	Sirius 258°26.89 -16°45.12
19	126°28.06	117°13.74 21.96	138° 41.74 36.41	78°44.81 57.71	139°43.71 31.01	Adhara 255°6.43 -29°0.50
20 21	141°30.52 156°32.98	132°13.37 23.18 147°13.00 · · 24.41	153°42.40 35.66 168°43.06 · · 34.91	93°46.72 57.86 108°48.62 •• 58.02	154°45.93 30.91 169°48.14 · · · 30.82	Procyon 244°51.51 5°9.71
21	150 32.98 171°35.45	147°13.00 · · 24.41 162°12.63 25.63	168°43.06 · · 34.91 183°43.72 34.16	108 48.62 · · 58.02 123°50.52 58.17	169°48.14 · · · 30.82 184°50.36	Pollux 243°18.07 27°58.12
23	186° 37.91	177°12.26 26.85	198°44.39 33.40	138°52.42 58.33	199°52.58 30.63	Avior 234°14.91 -59°35.48
_					-	Suhail 222°46.64 -43°32.06
Wer	pass. 10:36	ν-0.4' d1.2' m-3.89	$\nu 0.7' \ d$ -0.7' m1.16	ν1.9' d0.2' m-2.04	ν2.2' d-0.1' m1.07	Miaplacidus 221°38.11 -69°49.24 Alphard 217°48.24 -8°45.94
						Regulus 207°34.92 11°50.89
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.22 61°37.36
0	201°40.38	192°11.89 N02°28.08	213° 45.05	153°54.32 N16°58.48	214°54.80 S07°30.53	Denebola 182°25.30 14°26.13
1 2	216° 42.84 231° 45.31	207°11.52 29.30 222°11.14 30.52	228°45.71 31.90 243°46.38 31.15	168°56.22 58.64 183°58.12 58.80	229°57.02 30.44 244°59.24 30.34	Gienah 175°43.94 -17°40.72
3	246° 47.77	237°10.77 · · 31.74	258° 47.04 · · 30.40	199° 0.02 · · 58.95	260°1.46 · · · 30.25	Acrux 173°0.20 -63°14.13
4	261°50.23	252°10.40 32.97	273°47.70 29.65	214° 1.92 59.11	275°3.68 30.15	Gacrux 171°51.84 -57°15.06
5	276° 52.70	267°10.03 34.19	288°48.36 28.90	229°3.82 59.26	290°5.90 30.06	Alioth 166°12.94 55°49.68 Spica 158°22.66 -11°17.39
6	291°55.16	282°9.66 N02°35.41	303°49.03 S 06°28.15	244°5.72 N16°59.42	305°8.12 S 07°29.96	Alkaid 152°52.00 49°11.43
7	306° 57.63	297°9.29 36.63	318°49.69 27.40	259°7.61 59.57	320°10.34 29.87	Hadar 148°36.31 -60°29.41
8 9	322°0.09 337°2.55	312°8.91 37.85	333°50.35 26.64	274°9.51 59.73	335°12.56 29.77	Menkent 147°58.00 -36°29.42
10	352°5.02	327°8.54 · · 39.08 342°8.17 40.30	348°51.02 · · 25.89 3°51.68 25.14	289°11.41 16°59.88 304°13.31 17°0.04	350°14.78 · · 29.68 5°17.00 29.58	Arcturus 145°48.16 19°3.23
11	7°7.48	357°7.80 41.52	18° 52.35 24.39	319°15.21 0.19	20°19.22 29.49	Rigil Kent. 139°40.58 -60°56.11
12	22°9.95	12°7.43 N02°42.74	33°53.01 S06°23.64	334°17.11 N17°0.35	35°21.44 S07°29.39	Kochab 137°18.62 74°3.17
13	$37^{\circ}12.41$	27°7.05 43.96	48°53.67 22.89	349°19.01 0.50	50°23.66 29.30	Zuben'ubi 136°56.41 -16°8.65 Alphecca 126°3.96 26°37.77
14	52° 14.88	42°6.68 45.19	63°54.34 22.13	4°20.91 0.66	65°25.88 29.20	Antares 112° 16.36 -26° 29.17
15	67° 17.34	57°6.31 · · 46.41	78°55.00 · · 21.38	19°22.81 · · 0.81	80°28.10 · · 29.11	Atria 107°10.84 -69°4.07
16 17	82° 19.80 97° 22.27	72°5.94 47.63 87°5.56 48.85	93°55.67 20.63 108°56.33 19.88	34°24.71 0.97 49°26.61 1.12	95°30.32 29.01 110°32.54 28.92	Sabik 102°3.31 -15°45.36
18	112° 24.73	87°5.56 48.85 102°5.19 N02°50.07	123° 56.99 S06° 19.12	64°28.50 N17°1.28	110 32.54 20.92 125°34.76 \$07°28.82	Shaula 96°11.03 -37°7.23
19	127° 27.20	117°4.82 51.29	138°57.66 18.37	79°30.40 1.43	140°36.98 28.73	Rasalhague 95°58.97 12°32.32
20	142° 29.66	132°4.45 52.51	153° 58.32 17.62	94°32.30 1.59	155°39.20 28.63	Eltanin 90°42.25 51°28.76 Kaus Aust. 83°33.23 -34°22.33
21	157°32.12	147°4.07 · · 53.74	168°58.99 · · 16.87	109°34.20 · · 1.74	170°41.42 · · 28.54	Vega 80°33.54 38°48.01
22	172°34.59	162°3.70 54.96	183°59.65 16.11	124°36.10 1.90	185°43.64 28.45	Nunki 75°48.48 -26°15.99
23	187°37.05	177°3.33 56.18	199°0.32 15.36	139°38.00 2.05	200°45.86 28.35	Altair 62°0.59 8°55.72
Mer.	pass. 10:32	ν -0.4 $'$ $d1.2'$ m-3.89	$ u 0.7' \ d 0.8' \ \text{m} 1.16$	$\nu 1.9' \ d0.2' \ \text{m-}2.04$	$ u 2.2' \ d \text{-} 0.1' \ \text{m} 1.07$	Peacock 53°6.82 -56°39.25
						Deneb 49°26.37 45°21.64
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.59 9°58.96 Al Na'ir 27°33.97 -46°50.55
0	202°39.52	192°2.96 N02°57.40	214°0.98	154°39.89 N17°2.21	215°48.08 \$07°28.26	Al Na'ir 27°33.97 -46°50.55 Fomalhaut 15°15.48 -29°29.66
1	217°41.98	207°2.58 58.62	229°1.65 13.85	169°41.79 2.36	230°50.30 28.16	Scheat 13°46.11 28°12.62
2	232° 44.45	222°2.21 02°59.84	244°2.31 13.10	184°43.69 2.52	245°52.52 28.07	Markab 13°30.80 15°19.94
3 4	247° 46.91 262° 49.37	237°1.84 03°1.06 252°1.46 2.28	259°2.98 ·· 12.35 274°3.65	199°45.59 · · 2.67 214°47.48 2.83	260°54.75 · · 27.97 275°56.97 27.88	Apr 12 Fri SHA Mer.pass
5	202 49.37 277°51.84	267°1.09 3.50	289°4.31 10.84	214 47.46 2.83 229°49.38 2.99	290°59.19 27.78	Venus 351°39.55 11:11
6	292°54.30	282°0.72 N03°4.72	304°4.98 S06°10.09	244°51.28 N17°3.14	306°1.41 S07°27.69	Mars 12°47.94 09:46
7	307°56.77	297°0.34 5.94	319°5.64 9.34	259°53.18 3.30	321°3.63 27.60	Jupiter 312°27.45 13:46
8	322°59.23	311°59.97 7.16	334°6.31 8.58	274°55.07 3.45	336°5.85 27.50	Saturn 13°20.33 09:42
9	338°1.70	326°59.60 · · 8.38	349°6.98 · · 7.83	289°56.97 · · 3.61	351°8.07 · · 27.41	Apr 13 Sat SHA Mer.pass
10 11	353°4.16 8°6.62	341°59.22 9.60 356°58.85 10.82	4°7.64 7.07 19°8.31 6.32	304°58.87 3.76 320°0.77 3.91	6°10.30 27.31	Venus 350°31.51 11:11
12	23°9.09	11°58.47 N03°12.04	19°8.31 6.32 34°8.97 \$06°5.57	320° 0.77 3.91 335° 2.66 N17° 4.07	21°12.52 27.22 36°14.74 \$07°27.13	Mars 12°4.67 09:45
13	38° 11.55	26°58.10 13.26	49°9.64 4.81	350°4.56 4.22	51°16.96 27.03	Jupiter 312°13.94 13:43
14	53° 14.02	41°57.73 14.48	64° 10.31 4.06	5°6.46 4.38	66°19.18 26.94	Saturn 13°14.42 09:39
15	68° 16.48	56°57.35 · · 15.70	79° 10.97 · · · 3.31	20°8.35 · · 4.53	81°21.41 · · 26.84	Apr 14 Sun SHA Mer.pass
16	83° 18.94	71°56.98 16.92	94° 11.64 2.55	35°10.25 4.69	96°23.63 26.75	Venus 349°23.44 11:12
17	98°21.41	86°56.60 18.14	109° 12.31 1.80	50°12.15 4.84	111°25.85 26.66	Mars 11°21.47 09:44
18 19	113°23.87 128°26.34	101°56.23 N03°19.36 116°55.86 20.58	124°12.98	65°14.04 N17°5.00 80°15.94 5.15	126°28.07 \$07°26.56 141°30.30 26.47	Jupiter 312°0.38 13:40
20	143° 28.80	131°55.48 21.79	159 15.04 00 0.29 154°14.31 05°59.53	95°17.84 5.31	156°32.52 26.37	Saturn 13°8.56 09:35
21	158° 31.27	146°55.11 · · 23.01	169°14.98 · · 58.78	110°19.73 · · 5.46	171°34.74 · · 26.28	Horizontal parallax
22	173°33.73	161°54.73 24.23	184° 15.65 58.02	125°21.63 5.62	186°36.96 26.19	Venus: 0.1
23	188°36.19	176°54.36 25.45	199° 16.31 57.27	140°23.52 5.77	201°39.19 26.09	Mars: 0.1
Mer	pass. 10:28	ν-0.4' d1.2' m-3.89	ν0.7' d-0.8' m1.16	ν1.9' d0.2' m-2.04	ν2.2' d-0.1' m1.07	

h	Su	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.33	N08°47.07	136°52.71	6.0'	$N25^{\circ}25.66$	8.0'	58.6'
1	194° 48.49	47.98	151°17.70	6.0'	25°33.68	7.9'	58.6'
2	209° 48.65 224° 48.81	48.90 •• 49.81	165°42.66 180°7.59	5.9' 5.9'	25°41.53 25°49.21	7.7' 7.5'	58.5' 58.5'
4	239° 48.97	50.72	194°32.49	5.9'	25°56.72	7.3	58.5'
5	254°49.13	51.63	208°57.37	5.9'	$26^{\circ}4.05$	7.2'	58.4'
6	269° 49.29	N08°52.54	223°22.22	5.8'	N26°11.22	7.0'	58.4'
7 8	284°49.45 299°49.61	53.45 54.36	237°47.05 252°11.86	5.8' 5.8'	26°18.21 26°25.02	6.8' 6.6'	58.3' 58.3'
9	314°49.77	• • 55.27	266°36.65	5.8'	26°31.66	6.5	58.3'
10	329°49.93	56.18	281°1.42	5.8'	26°38.13	6.3'	58.2'
11	344°50.08	57.09	295°26.18	5.7'	26°44.43	6.1'	58.2'
12 13	359°50.24 14°50.40	N08°57.99 58.90	309°50.92 324°15.65	5.7' 5.7'	N26°50.54 26°56.49	5.9' 5.8'	58.1' 58.1'
14	29° 50.56	08°59.81	338°40.37	5.7'	20° 30.49	5.6'	58.1
15	44°50.72	09° 0.72	353° 5.08	5.7'	27°7.84	5.4'	58.0'
16	59° 50.88	1.63	7°29.78	5.7'	27°13.26	5.2'	58.0'
17 18	74°51.03 89°51.19	2.53 N09°3.44	21°54.47 36°19.16	5.7' 5.7'	27°18.49 N27°23.56	5.1' 4.9'	57.9' 57.9'
19	104°51.35	4.35	50°43.85	5.7'	27°28.44	4.9 4.7'	57.9'
20	119°51.51	5.25	65°8.54	5.7'	27°33.15	4.5'	57.8'
21	134°51.66	• • 6.16	79°33.23	5.7'	$27^{\circ}37.68$	4.4'	57.8'
22	149°51.82	7.07	93°57.92	5.7'	27°42.03	4.2'	57.7'
23	164°51.98	7.97	108°22.62	5.7'	27°46.21	4.0'	57.7'
	SD = 15.9'	d = 0.9'		SI	D = 16.0'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°52.14 194°52.29	N09°8.88 9.78	122°47.32 137°12.04	5.7' 5.7'	N27°50.21 27°54.03	3.8' 3.6'	57.7' 57.6'
2	209° 52.45	10.69	151°36.76	5.7'	27°57.68	3.5'	57.6'
3	224° 52.61	• • 11.59	166° 1.50	5.8'	28°1.15	3.3'	57.5'
4	239° 52.76	12.50	180°26.25 194°51.02	5.8'	28°4.44 28°7.56	3.1'	57.5'
5 6	254°52.92 269°53.07	13.40 N09°14.30	209°15.80	5.8' 5.8'	28° 7.56 N28° 10.50	2.9' 2.8'	57.5' 57.4'
7	284°53.23	15.21	223°40.61	5.8'	28°13.26	2.6'	57.4'
8	299° 53.39	16.11	238° 5.44	5.9'	28°15.85	2.4'	57.4'
9	314°53.54 329°53.70	· · 17.01 17.92	252°30.29 266°55.17	5.9' 5.9'	28°18.26 28°20.50	2.2' 2.1'	57.3' 57.3'
10 11	329 53.70 344°53.85	17.92	200 55.17 281°20.07	5.9'	28° 22.57	2.1 1.9'	57.3 57.2'
12	359° 54.01	N09°19.72	295°45.01	6.0'	N28°24.46	1.7'	57.2'
13	14°54.16	20.62	310° 9.97	6.0'	28°26.17	1.5'	57.2'
14 15	29°54.32 44°54.47	21.53	324°34.97 339°0.01	6.0' 6.1'	28°27.72 28°29.08	1.4' 1.2'	57.1' 57.1'
16	59°54.63	23.33	353°25.08	6.1	28°30.28	1.0'	57.1°
17	74°54.78	24.23	$7^{\circ}50.19$	6.2'	$28^{\circ}31.31$	0.9'	57.0'
18 19	89°54.94 104°55.09	N09°25.13 26.03	22°15.34 36°40.53	6.2' 6.2'	N28°32.16 28°32.84	0.7' 0.5'	57.0' 56.9'
20	119° 55.25	26.93	51° 5.77	6.3	28°33.36	0.3	56.9
21	134°55.40	• • 27.83	65°31.05	6.3'	28°33.70	0.2'	56.9'
22	149° 55.55	28.73	79°56.38	6.4'	28°33.87	0.0'	56.8'
23	164°55.71	29.63	94°21.77	6.4'	28°33.88	-0.2'	56.8'
	SD = 15.9'	d = 0.9'		SI	D = 15.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.86 194°56.01	N09°30.53	108°47.20	6.5'	N28°33.72 28°33.39	-0.3'	56.7'
1 2	194°56.01 209°56.17	31.43 32.32	123°12.68 137°38.22	6.5' 6.6'	28°33.39 28°32.89	-0.5' -0.7'	56.7' 56.7'
3	224° 56.32	• • 33.22	152°3.82	6.7'	28°32.23	-0.8	56.6'
4	239° 56.47	34.12	166°29.47	6.7'	28°31.40	-1.0'	56.6'
5	254° 56.63 269° 56.78	35.02 N09°35.91	180°55.18 195°20.95	6.8' 6.8'	28°30.41 N28°29.26	-1.2' -1.3'	56.6' 56.5'
6 7	284° 56.78	36.81	195°20.95 209°46.79	6.9	28° 27.95	-1.5'	56.5'
8	299°57.08	37.71	224°12.69	7.0'	28°26.47	-1.6'	56.5'
9	314°57.24	• • 38.60	238°38.65	7.0'	28°24.83	-1.8'	56.4
10 11	329°57.39 344°57.54	39.50 40.40	253°4.68 267°30.78	7.1' 7.2'	28°23.04 28°21.08	-2.0' -2.1'	56.4' 56.4'
12	344 57.54 359°57.69	40.40 N09°41.29	281°56.95	7.2'	N28°18.97	-2.1 -2.3'	56.3
13	14°57.84	42.19	296°23.19	7.3'	$28^{\circ}16.70$	-2.4'	56.3'
14	29°58.00	43.08	310°49.50	7.4'	28°14.27	-2.6'	56.3'
15 16	44°58.15 59°58.30	· · 43.98 44.87	325°15.89 339°42.35	7.5' 7.5'	28°11.69 28°8.95	-2.7' -2.9'	56.2' 56.2'
17	74°58.45	45.77	354°8.89	7.6'	28°6.07	-3.0'	56.1
18	89°58.60	N09°46.66	8°35.50	7.7'	N28°3.02	-3.2'	56.1'
19	104°58.75	47.55	23°2.19	7.8'	27°59.83 27°56.49	-3.3'	56.1'
20 21	119°58.90 134°59.05	48.45 •• 49.34	37°28.97 51°55.82	7.9' 7.9'	27°56.49 27°53.00	-3.5' -3.6'	56.1' 56.0'
22	149°59.20	50.23	66°22.75	8.0'	27°49.36	-3.8'	56.0'
23	164°59.35	51.12	80°49.77	8.1'	27°45.58	-3.9'	56.0'
	SD = 15.9'	d = 0.9'	SD = 15.5′				

Lat.	Twilight		Sunrise	Sunset	Twilight	
Lat.	Naut.	Civil	Juliuse	Junset	Civil	Naut.
N 72°	////	02:12	03:48	20:17	21:56	////
N 70°	////	02:45	04:04	20:00	21:21	////
68°	01:04	03:08	04:16	19:48	20:57	23:11
66°	01:54	03:26	04:26	19:37	20:38	22:13
64°	02:23	03:40	04:35	19:28	20:23	21:42
62°	02:45	03:52	04:42	19:21	20:11	21:19
60°	03:02	04:02	04:48	19:14	20:00	21:01
N 58°	03:16	04:11	04:54	19:09	19:51	20:47
56°	03:28	04:19	04:59	19:04	19:44	20:35
54°	03:38	04:25	05:03	18:59	19:37	20:24
52°	03:47	04:31	05:07	18:55	19:31	20:15
50°	03:55	04:37	05:10	18:51	19:25	20:07
45°	04:11	04:48	05:18	18:43	19:14	19:51
N 40°	04:23	04:57	05:25	18:37	19:05	19:38
35°	04:33	05:04	05:30	18:31	18:57	19:28
30°	04:42	05:11	05:35	18:26	18:51	19:20
20°	04:55	05:21	05:43	18:18	18:40	19:06
N 10°	05:04	05:29	05:50	18:10	18:32	18:57
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:57	18:18	18:43
20°	05:22	05:48	06:10	17:50	18:12	18:38
30°	05:26	05:54	06:18	17:42	18:06	18:34
35°	05:28	05:57	06:22	17:38	18:03	18:33
40°	05:29	06:00	06:27	17:33	18:00	18:32
45°	05:29	06:03	06:33	17:27	17:57	18:31
S 50°	05:30	06:07	06:40	17:20	17:53	18:30
52°	05:30	06:09	06:43	17:17	17:51	18:30
54°	05:30	06:11	06:46	17:13	17:49	18:30
56°	05:29	06:12	06:50	17:10	17:47	18:30
58°	05:29	06:14	06:54	17:05	17:45	18:31
S 60°	05:28	06:17	06:59	17:01	17:43	18:31

Lat.	Moonrise			Moonset		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°						
66°						
64°	03:35			02:13		
62°	04:40	04:13		01:09	03:39	
60°	05:15	05:33	06:23	00:34	02:19	03:31
N 58°	05:41	06:09	07:02	00:09	01:43	02:51
56°	06:01	06:35	07:30		01:17	02:24
54°	06:18	06:56	07:51		00:57	02:02
52°	06:33	07:13	08:09		00:40	01:44
50°	06:45	07:28	08:24		00:25	01:29
45°	07:12	07:58	08:55	23:55		00:58
N 40°	07:33	08:22	09:19	23:32	•• ••	00:34
35°	07:50	08:41	09:39	23:13		00:14
30°	08:05	08:58	09:55	22:56	23:57	
20°	08:31	09:26	10:24	22:29	23:29	
N 10°	08:54	09:51	10:48	22:05	23:04	
0°	09:15	10:13	11:11	21:43	22:41	23:38
S 10°	09:36	10:36	11:34	21:21	22:18	23:15
20°	09:59	11:01	11:58	20:57	21:54	22:52
30°	10:25	11:29	12:26	20:30	21:25	22:24
35°	10:41	11:46	12:43	20:13	21:08	22:07
40°	10:59	12:06	13:03	19:55	20:48	21:48
45°	11:21	12:30	13:26	19:32	20:24	21:25
S 50°	11:50	13:01	13:57	19:03	19:52	20:55
52°	12:04	13:17	14:12	18:49	19:37	20:40
54°	12:20	13:35	14:30	18:32	19:19	20:22
56°	12:39	13:57	14:51	18:13	18:56	20:01
58°	13:03	14:26	15:18	17:48	18:28	19:35
S 60°	13:35	15:08	15:56	17:16	17:46	18:57

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-32%	
12	00:47	00:39	12:01	15:29	02:59		
13	00:31	00:24	12:00	16:27	03:58		
14	00:17	00:09	12:00	17:24	04:56		

April 15, 16, 17 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	203°38.66	191°53.98 N03°26.67	214°16.98 \$05°56.52	155°25.42 N17°5.93	216°41.41 \$07°26.00	Alpheratz 357°35.76 29°13.27
1	218°41.12	206°53.61 27.89	229° 17.65 55.76	$170^{\circ}27.32$ 6.08	231°43.63 25.91	Ankaa 353°8.14 -42°10.47
2	233° 43.59	221°53.23 29.11	244°18.32 55.01	185°29.21 6.24	246°45.85 25.81	Schedar 349°32.34 56°40.06
3	248° 46.05	236°52.86 · · 30.32	259°18.98 · · 54.25	200°31.11 · · 6.39	261°48.08 · · 25.72	Diphda 348°48.24 -17°51.31
4 5	263° 48.51 278° 50.98	251°52.48 31.54 266°52.11 32.76	274°19.65 53.50 289°20.32 52.74	215°33.00 6.55 230°34.90 6.70	276°50.30 25.63 291°52.52 25.53	Achernar 335°21.20 -57°6.86
6	278 50.98 293°53.44	266°52.11 32.76 281°51.73 N03°33.98	289°20.32 52.74 304°20.99 \$05°51.98	230°34.90 6.70 245°36.79 N17°6.86	291°52.52 25.53 306°54.75 \$07°25.44	Hamal 327°52.26 23°34.52
7	308°55.91	296°51.36 35.19	319°21.66 51.23	260°38.69 7.01	321°56.97 25.35	Polaris 314°48.61 89°22.07
8	323°58.37	311°50.98 36.41	334°22.33 50.47	275°40.59 7.17	336°59.19 25.25	Acamar 315°12.63 -40°12.57
9	339°0.84	326°50.61 · · 37.63	349°22.99 · · 49.72	290°42.48 · · 7.32	352°1.42 · · 25.16	Menkar 314°7.11 4°10.99 Mirfak 308°29.62 49°56.85
10	354°3.30	341°50.23 38.85	4°23.66 48.96	305°44.38 7.48	7°3.64 25.07	Aldebaran 290°40.59 16°33.44
11	9°5.76	356°49.85 40.06	19°24.33 48.21	320°46.27 7.63	22°5.87 24.97	Rigel 281°4.67 -8°10.53
12	24°8.23	11°49.48 N03°41.28 26°49.10 42.50	34°25.00 \$05°47.45 49°25.67 46.70	335°48.17 N17°7.78 350°50.06 7.94	37°8.09 \$07°24.88 52°10.31 24.79	Capella 280°23.11 46°1.44
13 14	39° 10.69 54° 13.16	26°49.10 42.50 41°48.73 43.71	49°25.67 46.70 64°26.34 45.94	350°50.06 7.94 5°51.96 8.09	52°10.31 24.79 67°12.54 24.69	Bellatrix 278°23.74 6°22.24
15	69° 15.62	56°48.35 · · 44.93	79°27.01 · · 45.18	20°53.85 · · 8.25	82°14.76 · · 24.60	Elnath 278°2.88 28°37.70
16	84° 18.08	71°47.97 46.15	94°27.68 44.43	35°55.75 8.40	97°16.99 24.51	Alnilam 275°38.54 -1°11.28 Betelgeuse 270°52.92 7°24.64
17	99° 20.55	86°47.60 47.36	109°28.35 43.67	50°57.64 8.56	112°19.21 24.41	Betelgeuse 270°52.92 7°24.64 Canopus 263°52.87 -52°42.74
18	114°23.01	101°47.22 N03°48.58	124°29.02 S05°42.92	65°59.53 N17°8.71	127°21.43	Sirius 258°26.89 -16°45.12
19	129°25.48	116°46.84 49.80	139°29.69 42.16	81°1.43 8.87	142°23.66 24.23	Adhara 255° 6.45 -29° 0.50
20 21	144°27.94 159°30.40	131°46.47 51.01 146°46.09 · · 52.23	154°30.36 41.40 169°31.03 •• 40.65	96°3.32 9.02 111°5.22 •• 9.18	157°25.88 24.14 172°28.11 •• 24.04	Procyon 244°51.51 5°9.71
22	174° 32.87	161°45.71 53.44	184°31.70 39.89	111 5.22 9.16 126°7.11 9.33	187°30.33 23.95	Pollux 243°18.08 27°58.12
23	189°35.33	176° 45.34 54.66	199°32.37 39.14	141°9.01 9.48	202°32.56 23.86	Avior 234°14.94 -59°35.48
		$\frac{1.0^{\circ} \cdot 0.00^{\circ}}{\nu - 0.4' \ d1.2' \ m-3.90}$	$\frac{199 \text{ Gz.e.}}{\nu 0.7' \text{ d-}0.8' \text{ m1.16}}$	$\frac{11.9' \text{ d}0.2' \text{ m-2.03}}{\nu 1.9' \text{ d}0.2' \text{ m-2.03}}$	$\frac{102.02' \text{ d-}0.1' \text{ m1.07}}{\nu 2.2' \text{ d-}0.1' \text{ m1.07}}$	Suhail 222°46.65 -43°32.06
ivier.	pass. 10:24	ν-υ.4 α1.2 m-3.90	νυ.ι α-υ.δ m1.10	ν1.9 αυ.2 m-2.03	ν2.2 α-U.1 m1.U/	Miaplacidus 221°38.15 -69°49.24 Alphard 217°48.25 -8°45.95
	_					Regulus 207°34.92 11°50.89
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.23 61°37.37
0 1	204° 37.80 219° 40.26	191°44.96 N03°55.88 206°44.58 57.09	214°33.04 S 05°38.38 229°33.71 37.62	156°10.90 N17°9.64 171°12.79 9.79	217°34.78	Denebola 182°25.30 14°26.13
2	219 40.26 234° 42.73	206° 44.58 57.09 221° 44.20 58.31	229°33.71 37.62 244°34.38 36.87	171°12.79 9.79 186°14.69 9.95	247°39.23 23.58	Gienah 175°43.94 -17°40.73
3	249° 45.19	236°43.83 03°59.52	259° 35.05 · · 36.11	201°16.58 · · 10.10	262°41.46 · · 23.49	Acrux 173°0.20 -63°14.15
4	264° 47.65	251°43.45 04°0.74	274°35.72 35.35	216°18.47 10.26	277°43.68 23.39	Gacrux 171°51.84 -57°15.08
5	279°50.12	266°43.07 1.95	289°36.39 34.60	231°20.37 10.41	292°45.91 23.30	Alioth 166°12.93 55°49.69 Spica 158°22.65 -11°17.39
6	294° 52.58	281°42.69 N04°3.17	304°37.06 S 05°33.84	246°22.26 N17°10.57	307°48.13 S 07°23.21	Alkaid 152°51.99 49°11.44
7	309°55.05	296°42.32 4.38	319° 37.73 33.08	261°24.16 10.72	322°50.36 23.12	Hadar 148°36.29 -60°29.43
8	324°57.51	311°41.94 5.59 326°41.56 • 6.81	334°38.40 32.32	276°26.05 10.87	337°52.58 23.02	Menkent 147°57.98 -36°29.43
9 10	339°59.97 355°2.44	326°41.56 · · 6.81 341°41.18 8.02	349°39.07 · · 31.57 4°39.74	291°27.94 · · 11.03 306°29.84	352°54.81 · · 22.93 7°57.04 22.84	Arcturus 145°48.15 19°3.23
11	10°4.90	356°40.80 9.24	19°40.42 30.05	321°31.73 11.34	22°59.26 22.75	Rigil Kent. 139°40.56 -60°56.13
12	25°7.37	11°40.42 N04°10.45	34°41.09 \$05°29.30	336°33.62 N17°11.49	38°1.49 S07°22.66	Kochab 137°18.60 74°3.18 Zuben'ubi 136°56.40 -16°8.65
13	40°9.83	26°40.05 11.67	49°41.76 28.54	351°35.51 11.65	53°3.71 22.56	Zuben'ubi 136°56.40 -16°8.65 Alphecca 126°3.94 26°37.78
14	55° 12.30	41°39.67 12.88	64°42.43 27.78	6°37.41 11.80	68°5.94 22.47	Antares 112°16.34 -26°29.17
15	70° 14.76	56°39.29 · · 14.09	79°43.10 · · 27.02	21°39.30 · · 11.95	83°8.17 · · 22.38	Atria 107°10.78 -69°4.08
16	85° 17.22	71°38.91 15.31	94°43.77 26.27	36°41.19 12.11 51°43.09 12.26	98°10.39 22.29 113°12.62 22.19	Sabik 102°3.29 -15°45.37
17 18	100° 19.69 115° 22.15	86°38.53 16.52 101°38.15 N04°17.73	109°44.45 25.51 124°45.12 \$05°24.75	51°43.09 12.26 66°44.98 N17°12.42	113°12.62 22.19 128°14.84 \$07°22.10	Shaula 96°10.99 -37°7.23
19	130°24.62	116°37.77 18.94	139° 45.79 23.99	81°46.87 12.57	143°17.07 22.01	Rasalhague 95°58.95 12°32.32
20	145°27.08	131°37.39 20.16	154°46.46 23.23	96°48.76 12.73	158°19.30 21.92	Eltanin 90°42.22 51°28.77 Kaus Aust. 83°33.20 -34°22.33
21	$160^{\circ}29.54$	146°37.01 · · 21.37	169°47.13 · · 22.48	111°50.65 · · 12.88	173°21.52 · · 21.83	Kaus Aust. 83°33.20 -34°22.33 Vega 80°33.52 38°48.02
22	175°32.01	161°36.63 22.58	184° 47.81 21.72	126°52.55 13.03	188°23.75 21.73	Nunki 75°48.45 -26°15.99
23	190°34.47	176°36.25 23.79	199°48.48 20.96	141°54.44 13.19	203°25.98 21.64	Altair 62°0.56 8°55.73
Mer.	pass. 10:20	ν-0.4' d1.2' m-3.90	ν0.7' d-0.8' m1.15	$\nu 1.9' \ d0.2' \ \text{m-}2.03$	$\nu 2.2' \ d\text{-}0.1' \ \text{m}1.07$	Peacock 53°6.77 -56°39.24
						Deneb 49°26.34 45°21.64
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.57 9°58.96
0	205°36.94	191°35.87 N04°25.01	214°49.15 S05°20.20	156°56.33 N17°13.34	218°28.20 S07°21.55	Al Na'ir 27°33.93 -46°50.53 Fomalhaut 15°15.46 -29°29.65
1	220°39.40	206°35.49 26.22	229°49.82 19.44	171°58.22 13.50	233°30.43 21.46	Scheat 13°46.09 28°12.62
2	235° 41.86	221°35.11 27.43	244°50.50 18.69	187° 0.12 13.65	248°32.66 21.37	Markab 13°30.77 15°19.94
3	250° 44.33	236°34.73 · · 28.64	259°51.17 · · 17.93	202°2.01 · · 13.80	263°34.88 · · 21.28	
4	265°46.79	251°34.35 29.85	274°51.84 17.17 289°52.52 16.41	217° 3.90 13.96	278°37.11 21.18	Apr 15 Mon SHA Mer.pass Venus 348°15.33 11:13
5 6	280° 49.26 295° 51.72	266°33.97 31.06 281°33.59 N04°32.28	289°52.52 16.41 304°53.19 \$05°15.65	232°5.79 14.11 247°7.68 N17°14.27	293°39.34 21.09 308°41.57 \$07°21.00	Mars 10°38.32 09:42
7	310°54.19	296°33.21 33.49	319°53.86 14.89	262°9.57 14.42	323°43.79 20.91	Jupiter 311°46.76 13:37
8	325° 56.65	311°32.83 34.70	334°54.54 14.13	277°11.46 14.57	338°46.02 20.82	Saturn 13°2.75 09:32
9	$340^{\circ}59.11$	326°32.45 · · 35.91	349°55.21 · · 13.38	292°13.36 · · 14.73	353°48.25 · · 20.73	Apr 16 Tue SHA Mer.pass
10	356°1.58	341°32.07 37.12	4°55.88 12.62	307°15.25 14.88	8°50.48 20.63	Venus 347°7.16 11:13
11	11°4.04	356°31.69 38.33	19°56.56 11.86	322°17.14 15.04	23°52.70 20.54	Mars 9°55.24 09:41
12 13	26°6.51 41°8.97	11°31.31 N04°39.54 26°30.92 40.75	34°57.23 S 05°11.10 49°57.90 10.34	337°19.03 N17°15.19 352°20.92 15.34	38°54.93	Jupiter 311°33.10 13:34
14	56°11.43	41°30.54 41.96	64°58.58 9.58	7°22.81 15.50	68°59.39 20.27	Saturn 12°56.99 09:28
15	71° 13.90	56°30.16 · · 43.17	79°59.25 · · 8.82	22°24.70 · · 15.65	84°1.62 · · 20.18	Apr 17 Wed SHA Mer.pass
16	$86^{\circ}16.36$	71°29.78 44.38	94°59.93 8.06	37°26.59 15.81	99°3.84 20.09	Venus 345°58.94 11:14
17	101°18.83	86°29.40 45.59	110°0.60 7.30	52°28.48 15.96	114°6.07 20.00	Mars 9°12.22 09:40
18	116°21.29	101°29.01 N04°46.80	125°1.28	67°30.37 N17°16.11	129°8.30 S07°19.90	Jupiter 311°19.39 13:31
19	131°23.75 146°26.22	116°28.63 48.01 131°28.25 49.22	140°1.95 5.79 155°2.62 5.03	82°32.27 16.27 97°34.16 16.42	144°10.53 19.81	Saturn 12°51.27 09:25
20 21	146° 26.22 161° 28.68	131°28.25 49.22 146°27.87 • 50.42	155°2.62 5.03 170°3.30 · · 4.27	97°34.16 16.42 112°36.05 •• 16.58	159°12.76 19.72 174°14.99 •• 19.63	Horizontal parallax
22	176° 31.15	161°27.48 51.63	185°3.97 3.51	127°37.94 16.73	189°17.22 19.54	Venus: 0.1
23	191°33.61	176°27.10 52.84	200°4.65 2.75	142°39.83 16.88	204°19.44 19.45	Mars: 0.1
Mer	pass. 10:16	ν-0.4' d1.2' m-3.90	ν0.7' d-0.8' m1.15	ν1.9' d0.2' m-2.03	ν2.2' d-0.1' m1.07	
		- J GILL III J.JU				

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.50	N09°52.02	95° 16.87	8.2'	N27°41.65	-4.1'	55.9'
1	194°59.65	52.91	109°44.06	8.3'	27°37.57	-4.2'	55.9'
2	209°59.80	53.80	124°11.33	8.4'	27°33.35	-4.4'	55.9'
3	224°59.95	• • 54.69	$138^{\circ}38.68$	8.4'	27°28.99	-4.5'	55.8'
4	240°0.10	55.58	153°6.13	8.5'	27°24.49	-4.6'	55.8'
5	255°0.25	56.47	167°33.66	8.6'	27° 19.84	-4.8'	55.8'
6	270°0.40	N09°57.36	182°1.28	8.7'	N27°15.06	-4.9'	55.7'
7	285°0.55	58.25	196°28.99	8.8'	27° 10.14	-5.1'	55.7'
8	300°0.70	09°59.14	210°56.79	8.9'	27°5.08	-5.2'	55.7'
9	315°0.85	10°0.03	225°24.68	9.0'	26°59.89	-5.3'	55.6'
10	330°1.00	0.92	239°52.66 254°20.74	9.1'	26°54.56 26°49.10	-5.5'	55.6'
11	345°1.15 0°1.29	1.81 N10°2.70	254 20.74 268°48.91	9.2' 9.3'	26 49.10 N26°43.51	-5.6'	55.6'
12 13	15°1.44	3.59	283° 17.17	9.3 9.4'	26° 37.79	-5.7' -5.9'	55.6' 55.5'
14	30°1.59	4.48	297°45.52	9.4	26°31.93	-6.0'	55.5'
15	45°1.74	5.36	312° 13.97	9.5'	26° 25.95	-6.1	55.5'
16	60°1.89	6.25	326°42.51	9.6'	26° 19.84	-6.2	55.4'
17	75°2.03	7.14	341°11.15	9.7'	26° 13.60	-6.4'	55.4'
18	90°2.18	N10°8.03	355°39.88	9.8'	N26°7.24	-6.5'	55.4'
19	105°2.33	8.91	10°8.70	9.9'	$26^{\circ}0.75$	-6.6'	55.4'
20	120°2.48	9.80	24°37.63	10.0'	$25^{\circ}54.14$	-6.7'	55.3'
21	135°2.62	• • 10.68	39°6.65	10.1'	$25^{\circ}47.41$	-6.9'	55.3'
22	150°2.77	11.57	53° 35.76	10.2'	25° 40.56	-7.0'	55.3'
23	165°2.92	12.46	68°4.97	10.3'	25° 33.59	-7.1'	55.2'
	SD = 15.9'	d = 0.9'		SI	D = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°3.06 195°3.21	N10° 13.34	82°34.28 97°3.68	10.4'	N25°26.50	-7.2'	55.2' 55.2'
1	195°3.21 210°3.36	14.23 15.11	97°3.68 111°33.18	10.5' 10.6'	25° 19.30 25° 11.98	-7.3' -7.4'	55.2' 55.2'
2	210°3.36 225°3.50	15.11 •• 15.99	111°33.18 126°2.78	10.6′ 10.7′	25°11.98 25°4.54	-7.4′ -7.5′	55.2' 55.1'
3 4	225° 3.50 240° 3.65	16.88	126° 2.78 140° 32.47	10.7	25°4.54 24°56.99	-7.5' -7.7'	55.1'
5	255°3.79	17.76	155°2.26	10.0	24° 49.33	-7.7 -7.8'	55.1'
6	270°3.94	N10° 18.64	169° 32.15	11.0'	N24°41.55	-7.9'	55.1'
7	285°4.09	19.53	184°2.13	11.1'	24°33.67	-8.0'	55.0'
8	300°4.23	20.41	198°32.21	11.2'	24°25.68	-8.1'	55.0'
9	315°4.38	21.29	213°2.38	11.3'	24° 17.58	-8.2	55.0'
10	330°4.52	22.18	227°32.66	11.4'	24°9.37	-8.3'	55.0'
11	345°4.67	23.06	242°3.02	11.5'	24°1.06	-8.4'	55.0'
12	0°4.81	N10°23.94	256° 33.49	11.6'	N23°52.65	-8.5'	54.9'
13	15°4.95	24.82	271°4.04	11.7'	23°44.13	-8.6'	54.9'
14	30°5.10	25.70	285° 34.70	11.7'	23°35.50	-8.7'	54.9'
15	45°5.24	• • 26.58	300°5.44	11.8'	23°26.78	-8.8'	54.9'
16	60°5.39	27.46	314°36.29	11.9'	23° 17.96	-8.9'	54.8'
17 18	75°5.53 90°5.67	28.34 N10° 29.22	329°7.22 343°38.25	12.0' 12.1'	23°9.04 N23°0.02	-9.0' -9.1'	54.8' 54.8'
19	105°5.82	30.10	358° 9.38	12.1	22°50.91	-9.1 -9.2'	54.8'
20	120°5.96	30.10	12° 40.60	12.3'	22°41.70	-9.2 -9.3'	54.8'
21	135°6.11	• • 31.86	27° 11.90	12.4	22° 32.40	-9.4'	54.7'
22	150°6.25	32.74	41°43.31	12.5'	22°23.00	-9. 5 '	54.7'
23	165°6.39	33.62	56° 14.80	12.6'	22°13.51	-9.6'	54.7'
	SD = 15.9'	d = 0.9'			D = 15.1'		
		<u> </u>					
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°6.53	N10°34.49	70°46.38	12.7'	N22°3.93	-9.7'	54.7'
1	195°6.68	35.37	85° 18.06	12.8'	21°54.26	-9.8'	54.7'
2	210°6.82	36.25	99°49.82	12.9'	21°44.50	-9.8'	54.6'
3	225°6.96 240°7.10	•• 37.12	114°21.68 128°53.62	12.9'	21°34.66 21°24.73	-9.9'	54.6'
4 5	240° 7.10 255° 7.25	38.00 38.88	128° 53.62 143° 25.65	13.0' 13.1'	21°24.73 21°14.71	-10.0' -10.1'	54.6' 54.6'
6	255° 7.25 270° 7.39	38.88 N10°39.75	143° 25.65 157° 57.77	13.1	N21°4.60	-10.1	54.6'
7	270 7.39 285°7.53	40.63	157 57.77 172°29.98	13.2	20°54.42	-10.2 -10.3'	54.5'
8	300°7.67	41.50	187°2.27	13.4'	20° 44.15	-10.3	54.5
9	315°7.81	42.38	201°34.65	13.5'	20°33.80	-10.4	54.5'
10	330°7.95	43.25	216°7.11	13.5'	20°23.37	-10.5'	54.5'
11	345°8.09	44.13	230°39.66	13.6'	20°12.86	-10.6'	54.5'
12	0°8.23	N10°45.00	245° 12.30	13.7'	N20°2.27	-10.7'	54.5'
13	15°8.38	45.88	259° 45.01	13.8'	19°51.61	-10.7'	54.4'
14	30°8.52	46.75	274° 17.81	13.9'	19°40.86	-10.8'	54.4'
15	45°8.66	• • 47.62	288° 50.69	14.0'	19°30.05	-10.9'	54.4'
16	60°8.80	48.50	303°23.65	14.0'	19° 19.16	-11.0'	54.4'
17	75°8.94	49.37	317°56.69	14.1'	19°8.19	-11.0'	54.4'
18	90°9.08	N10°50.24	332°29.81	14.2'	N18° 57.15 18° 46.04	-11.1'	54.4'
19 20	105°9.22 120°9.36	51.11 51.99	347°3.01 1°36.28	14.3' 14.4'	18° 46.04 18° 34.86	-11.2' -11.2'	54.4' 54.3'
20	120° 9.36 135° 9.49	51.99 •• 52.86	1° 36.28 16° 9.63	14.4' 14.4'	18° 34.86 18° 23.61	-11.2 -11.3'	54.3'
22	150°9.63	53.73	30° 43.06	14.4	18° 12.30	-11.3 -11.4'	54.3'
23	165° 9.77	54.60	45° 16.57	14.6'	18°0.91	-11.5'	54.3'
-	SD = 15.9'	d = 0.9'			D = 14.9'		-
	JD — 13.9	u — 0.9		اد	J — 14.9		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	01:43	03:31	20:33	22:26	////
N 70°	////	02:24	03:49	20:14	21:41	////
68°	////	02:52	04:03	19:59	21:12	////
66°	01:29	03:12	04:14	19:47	20:51	22:39
64°	02:06	03:28	04:24	19:37	20:34	21:59
62°	02:31	03:42	04:32	19:29	20:20	21:32
60°	02:50	03:53	04:39	19:22	20:09	21:12
N 58°	03:06	04:02	04:45	19:15	19:59	20:56
56°	03:19	04:10	04:51	19:10	19:50	20:43
54°	03:30	04:18	04:56	19:05	19:43	20:32
52°	03:39	04:24	05:00	19:00	19:36	20:22
50°	03:48	04:30	05:04	18:56	19:31	20:13
45°	04:05	04:42	05:13	18:47	19:18	19:56
N 40°	04:18	04:52	05:20	18:40	19:08	19:42
35°	04:29	05:00	05:26	18:34	19:00	19:31
30°	04:38	05:07	05:32	18:28	18:53	19:22
20°	04:52	05:18	05:41	18:19	18:41	19:08
N 10°	05:03	05:28	05:49	18:11	18:32	18:57
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:18	05:42	06:04	17:56	18:17	18:42
20°	05:23	05:49	06:11	17:48	18:10	18:36
30°	05:28	05:56	06:20	17:39	18:03	18:31
35°	05:30	05:59	06:25	17:34	18:00	18:29
40°	05:31	06:03	06:30	17:28	17:56	18:27
45°	05:33	06:07	06:37	17:22	17:52	18:26
S 50°	05:34	06:12	06:45	17:14	17:47	18:24
52°	05:34	06:14	06:48	17:11	17:45	18:24
54°	05:35	06:16	06:52	17:07	17:43	18:24
56°	05:35	06:18	06:56	17:02	17:40	18:23
58°	05:35	06:21	07:01	16:57	17:38	18:23
S 60°	05:35	06:23	07:06	16:52	17:35	18:23
	ı			1		

Lat.		Moonris	e		Moonset	;
Ldl.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°			09:04			06:14
66°			09:50			05:27
64°		08:15	10:20		05:22	04:56
62°	06:58	08:57	10:42	04:51	04:40	04:33
60°	07:48	09:25	11:00	04:01	04:11	04:14
N 58°	08:19	09:47	11:15	03:30	03:49	03:59
56°	08:43	10:04	11:27	03:06	03:31	03:46
54°	09:01	10:19	11:38	02:47	03:15	03:34
52°	09:17	10:32	11:48	02:31	03:02	03:24
50°	09:31	10:43	11:57	02:17	02:50	03:15
45°	09:59	11:07	12:15	01:48	02:26	02:55
N 40°	10:21	11:26	12:30	01:25	02:06	02:39
35°	10:39	11:41	12:42	01:07	01:50	02:26
30°	10:55	11:55	12:53	00:50	01:36	02:14
20°	11:22	12:18	13:12	00:23	01:11	01:53
N 10°	11:44	12:38	13:28	00:00	00:50	01:36
0°	12:05	12:56	13:43		00:30	01:19
S 10°	12:27	13:14	13:58		00:10	01:02
20°	12:49	13:34	14:14	23:49		00:44
30°	13:15	13:57	14:32	23:24		00:23
35°	13:31	14:10	14:42	23:09		00:11
40°	13:48	14:25	14:54	22:52	23:57	
45°	14:10	14:43	15:08	22:31	23:40	
S 50°	14:37	15:05	15:25	22:05	23:19	
52°	14:50	15:16	15:33	21:52	23:09	
54°	15:05	15:27	15:42	21:38	22:57	
56°	15:23	15:41	15:52	21:20	22:44	
58°	15:44	15:57	16:04	21:00	22:29	23:56
S 60°	16:11	16:16	16:17	20:33	22:11	23:43

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	42-62%	
15	00:02	00:05	12:00	18:18	05:52		
16	00:12	00:19	12:00	19:08	06:43		
17	00:26	00:33	11:59	19:53	07:31		

h	Aries	Venus	s	Ma	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	206° 36.07		04°54.05	215°5.32	S05°1.99	157°41.72	N17° 17.04	219°21.67	S07°19.36			
1	221°38.54	206°26.33	55.26	230°6.00	1.23	172°43.61	17.19	234°23.90	19.27	Alpheratz	357°35.75	29°13.26
2	236° 41.00	221°25.95	56.47	245°6.67	05°0.47	187°45.50	17.34	249°26.13	19.18	Ankaa	353°8.12	-42°10.46
3	251° 43.47		• 57.67	260°7.35	04°59.71	202°47.39	• • 17.50	264°28.36	• • 19.09	Schedar	349°32.33	56°40.05
4	266° 45.93		04°58.88	275°8.02	58.95	217°49.28	17.65	279°30.59	18.99	Diphda	348°48.23	-17°51.30
5	281°48.40	266°24.80	05°0.09	290°8.70	58.19	232°51.17	17.81	294°32.82	18.90	Achernar	335°21.19	-57° 6.84
6	296° 50.86		05°1.30	305°9.38	504°57.43	247°53.06	N17° 17.96	309°35.05	S07°18.81	Hamal	327°52.26	23°34.52
7	311°53.32	296°24.03	2.50	320° 10.05	56.67	262°54.95	18.11	324°37.28	18.72	Polaris	314°49.06	89°22.06
8	326°55.79	311°23.65	3.71	335°10.73	55.91	277°56.84	18.27	339°39.51	18.63	Acamar	315°12.63	-40°12.56
9	341°58.25	326°23.26	• • 4.92	350°11.40	• • 55.15	292°58.72	• 18.42	354°41.74	• • 18.54	Menkar	314°7.11	4°10.99
10	357°0.72	341°22.88	6.12	5°12.08	54.39	308° 0.61	18.57	9°43.97	18.45	Mirfak	308°29.63	49°56.84
11	12°3.18	356°22.49	7.33	$20^{\circ}12.75$	53.63	323°2.50	18.73	24°46.20	18.36	Aldebaran	290°40.60	16°33.44
12	27°5.64	11°22.11	√05°8.54	35° 13.43	S04°52.87	338°4.39	N17° 18.88	39°48.43	S07°18.27	Rigel	281°4.68	-8°10.53
13	42°8.11	26°21.73	9.74	50°14.11	52.11	353°6.28	19.03	54°50.66	18.18	Capella	280°23.12	46°1.43
14	$57^{\circ}10.57$	41°21.34	10.95	65°14.78	51.35	8°8.17	19.19	69°52.89	18.09	Bellatrix	278°23.75	6°22.24 28°37.70
15	$72^{\circ}13.04$	56°20.95 ·	• 12.15	80° 15.46	• • 50.59	23°10.06	• • 19.34	84°55.12	• • 18.00	Elnath Alnilam	278°2.89 275°38.55	-1°11.27
16	$87^{\circ}15.50$	71°20.57	13.36	95°16.13	49.83	$38^{\circ}11.95$	19.49	99°57.35	17.91	1	270°52.93	7°24.65
17	$102^{\circ}17.96$	86°20.18	14.56	$110^{\circ}16.81$	49.07	53°13.84	19.65	114°59.58	17.82	Betelgeuse Canopus	263°52.90	-52°42.73
18	$117^{\circ}20.43$	101°19.80 NO	05°15.77	125° 17.49	S04°48.30	68°15.73	$N17^{\circ}19.80$	$130^{\circ}1.81$	S 07°17.73	Sirius	258°26.91	-32 42.73 -16°45.11
19	$132^{\circ}22.89$	$116^{\circ}19.41$	16.97	140° 18.16	47.54	83°17.62	19.95	145°4.04	17.64	Adhara	255°6.46	-29°0.49
20	$147^{\circ}25.36$	131°19.03	18.18	155° 18.84	46.78	98°19.50	20.11	160°6.27	17.55	Procyon	244°51.53	5°9.72
21	$162^{\circ}27.82$		• 19.38	170° 19.52	• • 46.02	113°21.39	• • 20.26	175°8.50	• • 17.46	Pollux	244 51.55 243°18.09	27°58.13
22	177°30.28	161°18.25	20.59	185°20.20	45.26	128°23.28	20.41	190°10.73	17.37	Avior	234° 14.97	-59°35.48
23	$192^{\circ}32.75$	176° 17.87	21.79	200° 20.87	44.50	143°25.17	20.57	$205^{\circ}12.96$	17.28	Suhail	222°46.67	-43°32.06
Mor	pass. 10:12	ν-0.4' d1.2'	m 3 00	ν 0.7′ d-0	9' m1 15	11 0' d0	.2′ m-2.03	1/2 2 ¹ d 0	.1′ m1.07	Miaplacidus	221°38.20	-69°49.25
IVICI.	pass. 10.12	ν-0.4 μ1.2	111-3.90	νο.τ u-υ	.0 1111.15	ν1.9 do.	.2 111-2.03	ν2.2 u -0	.1 1111.07	Alphard	217°48.26	-8°45.94
										Regulus	207°34.93	11°50.89
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.25	61°37.38
0	$207^{\circ}35.21$		05°22.99	215°21.55	S04°43.74	158°27.06	N17°20.72	220°15.19	507°17.19	Denebola	182°25.31	14°26.14
1	222° 37.68	206° 17.09	24.20	230° 22.23	42.98	173°28.95	20.87	235°17.42	17.10	Gienah	175°43.94	-17°40.74
2	$237^{\circ}40.14$	221°16.71	25.40	245°22.90	42.22	188°30.83	21.03	250°19.65	17.01	Acrux	173°0.21	-63°14.16
3	252° 42.60		• 26.60	260°23.58	• • 41.46	203°32.72	• • 21.18	265°21.89	• • 16.92	Gacrux	171°51.84	-57°15.09
4	267° 45.07	251°15.93	27.81	275°24.26	40.70	218°34.61	21.33	280°24.12	16.83	Alioth	166°12.93	55°49.71
5	282°47.53	266° 15.55	29.01	290°24.94	39.93	233°36.50	21.49	295°26.35	16.74	Spica	158°22.64	-11°17.40
6	297°50.00		05°30.21	305°25.61	S04°39.17	248°38.39	N17°21.64	310°28.58	S07°16.65	Alkaid	152°51.98	49°11.46
7	$312^{\circ}52.46$	296°14.77	31.42	320° 26.29	38.41	263°40.27	21.79	$325^{\circ}30.81$	16.56	Hadar	148°36.29	-60°29.44
8	327°54.93	311°14.38	32.62	335°26.97	37.65	278°42.16	21.95	340°33.04	16.47	Menkent	147°57.98	-36°29.44
9	342°57.39		• 33.82	350°27.65	• • 36.89	293°44.05	•• 22.10	355°35.27	• • 16.38	Arcturus	145°48.14	19° 3.24
10	357° 59.85	341°13.61	35.02	5°28.33	36.13	308°45.94	22.25	10°37.51	16.29	Rigil Kent.	139°40.55	-60°56.14
11	13°2.32	356° 13.22	36.22	20°29.00	35.37	323°47.82	22.41	25°39.74	16.20	Kochab	137°18.57	74°3.19
12	28°4.78		05°37.43	35° 29.68	S04°34.60	338°49.71	N17°22.56	40°41.97	S07°16.11	Zuben'ubi	136°56.39	-16°8.66
13	43°7.25	26° 12.44	38.63	50° 30.36	33.84	353°51.60	22.71	55°44.20	16.02	Alphecca	126°3.93	26°37.79
14	58°9.71	41°12.05	39.83	65°31.04	33.08	8°53.49	22.87	70°46.43	15.93	Antares	112°16.32	-26°29.18
15	73° 12.17		• 41.03	80°31.72	• • 32.32	23°55.37	• • 23.02	85°48.67	• • 15.84	Atria	107°10.73	-69°4.10
16	88° 14.64	71°11.27	42.23	95°32.40	31.56	38°57.26	23.17	100°50.90	15.75	Sabik	102°3.27	-15°45.37
17	103° 17.10	86°10.88	43.43	110°33.07	30.79	53°59.15	23.33	115°53.13	15.66	Shaula	96°10.97	-37°7.23
18	118° 19.57		05°44.63	125°33.75	504°30.03	69°1.04	N17°23.48	130°55.36	S07°15.57	Rasalhague	95°58.93	12°32.33
19	133°22.03	116°10.10	45.83	140°34.43	29.27	84°2.92	23.63	145°57.60	15.49	Eltanin	90°42.20	51°28.78
20	148° 24.49	131°9.71	47.03	155°35.11	28.51	99°4.81	23.78	160°59.83	15.40	Kaus Aust.	83°33.17	-34°22.33
21	163°26.96		• 48.23	170°35.79	• • 27.75	114°6.70	• • 23.94	176°2.06	• 15.31	Vega	80°33.49	38°48.02
22	178° 29.42	161°8.93	49.43	185°36.47	26.98	129°8.58	24.09	191°4.30	15.22	Nunki	75°48.42	-26°15.99
23	193°31.89	176°8.54	50.63	200°37.15	26.22	144°10.47	24.24	206°6.53	15.13	Altair	62°0.54	8°55.73
Mer.	pass. 10:08	ν -0.4' $d1.2'$	m-3.90	ν 0.7′ d-0	.8′ m1.15	$\nu 1.9' \ d0.$.2′ m-2.03	$\nu 2.2' \ d-0$.1′ m1.07	Peacock	53°6.73	-56°39.24
	<u>. </u>									Deneb	49°26.32	45°21.64
_			_		_		_		_	Enif	33°39.55	9°58.96
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.91	-46°50.52
0	208°34.35 223°36.81	191°8.15 NO 206°7.76	53.03	215°37.83 230°38.51	24.70	159°12.36 174°14.24	N17°24.40 24.55	221°8.76	\$07°15.04 14.95	Fomalhaut	15°15.44	-29°29.64
1 2	238° 39.28	206 7.76 221°7.37	54.23	230 38.51 245°39.19	23.94	174 14.24 189°16.13	24.55 24.70	236°10.99 251°13.23	14.95 14.86	Scheat	13°46.08	28°12.62
3	250 59.26 253°41.74		• 55.42	245 39.19 260° 39.87	23.17	204° 18.01	. 24.70	266°15.46		Markab	13°30.76	15°19.94
4	268° 44.21	250 0.96 C	56.62	200 39.67 275° 40.55	22.41	219° 19.90	25.01	281°17.69	· · 14.77 14.68	Apr 18 Thu	SHA	Mer.pass
5	283° 46.67	266°6.20	57.82	290°41.23	21.65	219 19.90 234°21.79	25.16	296°19.93	14.59	Venus	344°50.64	11:15
6	298° 49.13		05°59.02		S04°20.89	249°23.67	N17°25.31	311°22.16	S07°14.51	Mars	8°29.25	09:39
7	313°51.60	296°5.41	06° 0.22	320° 42.58	20.12	264° 25.56	25.47	326°24.39	14.42	Jupiter	311°5.64	13:28
8	328° 54.06	311°5.02	1.41	335°43.26	19.36	279°27.45	25.62	341°26.63	14.33	Saturn	12°45.60	09:21
9	343° 56.53		2.61	350°43.94	•• 18.60	294°29.33	25.77	356°28.86	• • 14.24			
10	358° 58.99	341°4.24	3.81	5° 44.62	17.83	309°31.22	25.93	11°31.10	14.15	Apr 19 Fri	SHA	Mer.pass
11	14°1.45	356°3.84	5.00	20°45.31	17.07	324°33.10	26.08	26°33.33	14.06	Venus	343°42.27	11:15
12	29°3.92		106° 6.20	35°45.99	S04°16.31	339°34.99	N17°26.23	41°35.56	S07°13.97	Mars	7°46.34	09:38
13	44°6.38	26°3.06	7.40	50°46.67	15.55	354°36.87	26.38	56°37.80	13.89	Jupiter	310°51.85	13:25
14	59°8.85	41°2.66	8.59	65° 47.35	14.78	9°38.76	26.54	71°40.03	13.80	Saturn	12°39.98	09:18
15	74° 11.31		• • 9.79	80°48.03	• • 14.02	24°40.65	26.69	86°42.27	· · 13.71	Apr 20 Sat	SHA	Mer.pass
16	89° 13.77	71°1.88	10.98	95°48.71	13.26	39°42.53	26.84	101°44.50	13.62	Venus	342°33.80	11:16
17	104° 16.24	86°1.48	12.18	110°49.39	12.49	54°44.42	26.99	116°46.74	13.53	Mars	7°3.48	09:37
18	119° 18.70		06°13.37		S04°11.73	69°46.30	N17°27.15	131°48.97	S07°13.44	Jupiter	310°38.01	13:21
19	134° 21.17	116°0.70	14.57	140°50.75	10.97	84°48.19	27.30	146°51.21	13.35	Saturn	12°34.41	09:14
20	149°23.63	131°0.30	15.76	155°51.43	10.21	99°50.07	27.45	161°53.44	13.27			-3.21
21	164°26.09		• 16.96	$170^{\circ}52.11$	• • 9.44	114°51.96	• • 27.60	176°55.68	• • 13.18	Horizor	ıtal parallax	
22	179°28.56	160°59.51	18.15	185°52.79	8.68	129°53.84	27.76	191°57.91	13.09		Venus:	0.1
23	194°31.02	175°59.12	19.35	200°53.47	7.92	144°55.73	27.91	207°0.15	13.00		Mars:	0.1
Mar	pass. 10:04	ν-0.4' d1.2'	m-3 00	ν0.7′ d-0	8/ m1 1/	1/1 O/ dO	.2′ m-2.02	1/2 2/ 4 0	.1′ m1.07			
ivier.	pass. 10.04	ν-0.4 U1.2	111-3.90	νυ.ι u-0	.0 1111.14	ν1.9 UU.	.2 111-2.02	ν Δ.Δ U-U	1111.01			

h	Su	n	Moon					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°9.91	$N10^{\circ}55.47$	59°50.14	14.7'	N17°49.46	-11.5'	54.3'	
1 2	195°10.05 210°10.19	56.34 57.21	74°23.80 88°57.52	14.7' 14.8'	17°37.94 17°26.35	-11.6' -11.6'	54.3' 54.3'	
3	210 10.19 225°10.33	58.08	103°31.32	14.6 14.9'	17 20.35 17°14.71	-11.0 -11.7'	54.3'	
4	240°10.47	58.95	118°5.18	14.9'	17°3.00	-11.8'	54.2'	
5	255°10.60	10°59.82	132°39.12	15.0'	16°51.22	-11.8'	54.2'	
6	270°10.74 285°10.88	N11°0.68 1.55	147°13.13 161°47.20	15.1' 15.1'	N16°39.39 16°27.49	-11.9' -12.0'	54.2' 54.2'	
7 8	300°11.02	2.42	161 47.20 176°21.34	15.1 15.2'	16° 27.49	-12.0'	54.2'	
9	315°11.15	3.29	190°55.55	15.3'	16°3.52	-12.1'	54.2'	
10	330°11.29	4.16	205°29.82	15.3'	15°51.45	-12.1'	54.2'	
11 12	345°11.43 0°11.56	5.02 N11°5.89	220°4.16 234°38.56	15.4' 15.5'	15°39.32 N15°27.14	-12.2' -12.2'	54.2' 54.2'	
13	15°11.70	6.76	234 38.50 249°13.03	15.5'	15°14.90	-12.2 -12.3'	54.2'	
14	30°11.84	7.62	263°47.55	15.6'	15°2.61	-12.3'	54.1'	
15	45°11.97	• • 8.49	278°22.14	15.6'	14°50.26	-12.4'	54.1'	
16 17	60°12.11 75°12.25	9.35 10.22	292°56.79 307°31.49	15.7' 15.8'	14°37.86 14°25.40	-12.5' -12.5'	54.1' 54.1'	
18	90°12.38	N11°11.08	322°6.25	15.8'	N14° 12.90	-12.5 -12.6'	54.1	
19	105°12.52	11.95	336°41.07	15.9'	14°0.34	-12.6'	54.1'	
20	120°12.65	12.81	351° 15.95	15.9'	13°47.74	-12.7'	54.1'	
21	135°12.79	• • 13.67	5°50.88	16.0'	13°35.09 13°22.39	-12.7'	54.1'	
22 23	150°12.92 165°13.06	14.54 15.40	20°25.86 35°0.90	16.0' 16.1'	13° 22.39 13° 9.64	-12.7' -12.8'	54.1' 54.1'	
	SD = 15.00	d = 0.9'			D = 14.8'		JI	
	JU = 15.9′	$a = 0.9^{\circ}$		51	∪ = 14.8′			
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°13.19	N11° 16.26	49°35.99	16.1'	N12°56.85	-12.8'	54.1'	
1 2	195°13.33 210°13.46	17.13 17.99	64°11.13 78°46.32	16.2' 16.2'	12°44.01 12°31.12	-12.9' -12.9'	54.1' 54.1'	
3	210 13.40 225°13.60	17.99	93°21.56	16.3	12° 18.19	-12.9 -13.0'	54.1 54.0'	
4	240°13.73	19.71	107° 56.85	16.3'	12°5.22	-13.0'	54.0'	
5	255°13.86	20.57	122°32.18	16.4'	11°52.21	-13.1'	54.0'	
6 7	270°14.00 285°14.13	N11°21.43 22.29	137°7.56 151°42.99	16.4' 16.5'	N11°39.15 11°26.06	-13.1' -13.1'	54.0' 54.0'	
8	300°14.26	22.29	166° 18.46	16.5	11°12.00	-13.1 -13.2'	54.0'	
9	315°14.40	• • 24.01	180°53.97	16.6'	10°59.74	-13.2'	54.0'	
10	330°14.53	24.87	195°29.52	16.6'	10°46.53	-13.3'	54.0'	
11 12	345°14.66 0°14.80	25.73 N11°26.59	210°5.11 224°40.75	16.6' 16.7'	10°33.28 N10°19.99	-13.3' -13.3'	54.0' 54.0'	
12	15°14.80	27.45	224°40.75 239°16.42	16.7	10° 6.66	-13.3' -13.4'	54.0'	
14	30°15.06	28.31	253°52.13	16.7	09°53.30	-13.4	54.0'	
15	45°15.19	• • 29.16	268° 27.88	16.8'	09°39.90	-13.4'	54.0'	
16	60°15.33 75°15.46	30.02	283°3.66 297°39.48	16.8'	09°26.47 09°13.01	-13.5'	54.0'	
17 18	75 15.46 90°15.59	30.88 N11°31.74	297 39.48 312°15.33	16.9' 16.9'	N08°59.51	-13.5' -13.5'	54.0' 54.0'	
19	105°15.72	32.59	326°51.21	16.9'	08° 45.98	-13.6'	54.0'	
20	120°15.85	33.45	341°27.13		08°32.42		54.0'	
21	135°15.98 150°16.11	· · 34.30 35.16	356°3.07	17.0'	08° 18.83 08° 5.21	-13.6' -13.6'	54.0'	
22 23	165°16.11	35.16 36.01	10°39.05 25°15.05	17.0' 17.0'	08°5.21 07°51.56	-13.6 -13.7'	54.0' 54.0'	
20	SD = 15.9'	d = 0.9'			D = 14.7'	10.1	31.0	
	$\frac{3D = 15.9}{}$	a = 0.9		- 31	D = 14.7			
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°16.37	N11°36.87	39°51.08	17.1'	N07°37.88	-13.7'	54.0'	
1 2	195°16.50 210°16.63	37.72 38.58	54°27.14 69°3.22	17.1' 17.1'	07°24.18 07°10.45	-13.7' -13.8'	54.0' 54.0'	
3	210 16.63 225°16.76	38.58	83°39.33	17.1'	07 10.45 06°56.69	-13.8'	54.0'	
4	240°16.89	40.28	98° 15.46	17.2'	$06^{\circ}42.91$	-13.8'	54.0'	
5	255°17.02	41.14	112°51.61	17.2	06°29.10	-13.8'	54.0'	
6 7	270°17.15 285°17.28	N11°41.99 42.84	127°27.78 142°3.97	17.2' 17.2'	N06°15.26 06°1.41	-13.9' -13.9'	54.0' 54.0'	
8	300°17.41	42.64	142 3.97 156° 40.18	17.2'	05°47.53	-13.9'	54.0'	
9	315°17.54	• • 44.55	$171^{\circ}16.41$	17.2'	$05^{\circ}33.63$	-13.9'	54.0'	
10	330°17.67	45.40	185°52.66	17.3	05°19.71	-13.9'	54.0'	
11	345°17.80 0°17.93	46.25 N11°47.10	200°28.92 215°5.20	17.3' 17.3'	05°5.77 N04°51.81	-14.0' -14.0'	54.0' 54.0'	
12 13	15°18.05	47.10 47.95	215 5.20 229°41.49	17.3	04°37.82	-14.0' -14.0'	54.0'	
14	30°18.18	48.80	244°17.80	17.3'	04°23.83	-14.0'	54.0'	
15	45°18.31	• • 49.65	258° 54.11	17.3'	04°9.81	-14.0'	54.0'	
16 17	60°18.44 75°18.56	50.50 51.35	273°30.44 288°6.77	17.3' 17.3'	03°55.78 03°41.73	-14.0' -14.1'	54.0' 54.0'	
18	75°18.56 90°18.69	51.35 N11°52.20	302°43.12	17.4	N03°27.66	-14.1'	54.0'	
19	105°18.82	53.05	317° 19.47	17.4	03°13.58	-14.1'	54.0'	
20	120°18.95	53.89	331°55.83	17.4	02°59.49	-14.1'	54.0'	
21 22	135°19.07 150°19.20	• • 54.74 55.59	346°32.19 1°8.56	17.4' 17.4'	02°45.38 02°31.26	-14.1' -14.1'	54.0' 54.0'	
23	150° 19.20 165° 19.33	55.59 56.44	15° 44.93	17.4° 17.4°	02° 31.26 02° 17.13	-14.1' -14.1'	54.0'	
-	SD = 15.9'	d = 0.9'			D = 14.7'			
		<u>u — 0.9</u>		اد	_ 17.1			

	Twi	light		_	Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	01:05	03:13	20:50	23:10	////
N 70°	////	02:02	03:34	20:28	22:03	////
68°	////	02:34	03:50	20:11	21:28	////
66°	00:56	02:58	04:03	19:58	21:04	23:17
64°	01:46	03:16	04:13	19:47	20:45	22:18
62°	02:16	03:31	04:23	19:37	20:30	21:46
60°	02:38	03:43	04:31	19:29	20:17	21:24
N 58°	02:55	03:53	04:37	19:22	20:07	21:06
56°	03:09	04:02	04:44	19:16	19:57	20:51
54°	03:21	04:10	04:49	19:10	19:49	20:39
52°	03:31	04:17	04:54	19:05	19:42	20:28
50°	03:41	04:24	04:58	19:01	19:36	20:19
45°	03:59	04:37	05:08	18:51	19:22	20:00
N 40°	04:13	04:47	05:16	18:43	19:11	19:46
35°	04:25	04:56	05:23	18:36	19:02	19:34
30°	04:35	05:04	05:29	18:30	18:55	19:24
20°	04:50	05:16	05:39	18:20	18:42	19:09
N 10°	05:01	05:26	05:48	18:11	18:32	18:57
0°	05:10	05:35	05:56	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:54	18:16	18:40
20°	05:24	05:50	06:12	17:46	18:08	18:34
30°	05:29	05:57	06:22	17:36	18:00	18:28
35°	05:32	06:01	06:27	17:30	17:56	18:26
40°	05:34	06:06	06:33	17:24	17:52	18:23
45°	05:36	06:11	06:41	17:17	17:47	18:21
S 50°	05:38	06:16	06:49	17:08	17:41	18:19
52°	05:39	06:18	06:53	17:04	17:39	18:18
54°	05:40	06:21	06:57	17:00	17:36	18:17
56°	05:40	06:24	07:02	16:55	17:33	18:17
58°	05:41	06:27	07:07	16:50	17:30	18:16
S 60°	05:42	06:30	07:13	16:44	17:27	18:15

Lat.		Moonris	e		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	10:19	12:50	14:53	06:34	05:29	04:50
N 70°	11:00	13:07	14:59	05:51	05:09	04:41
68°	11:28	13:21	15:04	05:22	04:54	04:33
66°	11:48	13:31	15:08	05:00	04:42	04:27
64°	12:05	13:40	15:12	04:42	04:31	04:22
62°	12:18	13:48	15:14	04:27	04:22	04:17
60°	12:30	13:55	15:17	04:15	04:15	04:13
N 58°	12:39	14:00	15:19	04:04	04:08	04:10
56°	12:48	14:06	15:21	03:55	04:02	04:07
54°	12:55	14:10	15:23	03:47	03:56	04:04
52°	13:02	14:14	15:25	03:39	03:51	04:01
50°	13:08	14:18	15:26	03:32	03:47	03:59
45°	13:21	14:26	15:29	03:18	03:37	03:53
N 40°	13:32	14:33	15:32	03:06	03:29	03:49
35°	13:41	14:38	15:34	02:56	03:22	03:45
30°	13:49	14:43	15:36	02:46	03:15	03:42
20°	14:03	14:52	15:40	02:31	03:04	03:36
N 10°	14:15	15:00	15:43	02:17	02:55	03:31
0°	14:26	15:07	15:46	02:04	02:46	03:26
S 10°	14:37	15:14	15:49	01:51	02:37	03:21
20°	14:49	15:21	15:52	01:37	02:27	03:15
30°	15:02	15:30	15:55	01:20	02:16	03:09
35°	15:10	15:35	15:57	01:11	02:09	03:06
40°	15:19	15:40	16:00	01:00	02:02	03:02
45°	15:29	15:46	16:02	00:47	01:53	02:57
S 50°	15:41	15:54	16:05	00:31	01:42	02:51
52°	15:47	15:57	16:07	00:24	01:37	02:48
54°	15:53	16:01	16:08	00:16	01:32	02:45
56°	16:00	16:06	16:10	00:06	01:26	02:42
58°	16:08	16:10	16:12		01:19	02:39
S 60°	16:17	16:15	16:14		01:11	02:35

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	209°33.49	190°58.72 N06°20.54	215°54.16 \$04°7.15	159°57.61 N17°28.06	222°2.38 S 07°12.91	
1	224° 35.95	205°58.33 21.73	230°54.84 6.39	174°59.50 28.21	237°4.62 12.83	Alpheratz 357°35.74 29°13.26
2	239°38.41	220°57.93 22.93	245°55.52 5.62	190°1.38 28.37	252°6.85 12.74	Ankaa 353°8.11 -42°10.45 Schedar 349°32.32 56°40.04
3	254° 40.88	235°57.54 · · 24.12	260°56.20 · · 4.86	205° 3.27 · · 28.52	267°9.09 · · 12.65	Diphda 348°48.22 -17°51.29
4	269° 43.34	250°57.14 25.31	275°56.88 4.10	220° 5.15 28.67	282°11.32 12.56	Achernar 335°21.19 -57°6.83
5 6	284° 45.81	265° 56.74 26.50	290°57.56 3.33	235°7.03 28.82	297°13.56 12.47 312°15.79 \$07°12.39	Hamal 327°52.26 23°34.52
7	299° 48.27 314° 50.74	280°56.35 N06°27.70 295°55.95 28.89	305°58.25	250°8.92 N17°28.98 265°10.80 29.13	312°15.79 S07°12.39 327°18.03 12.30	Polaris 314°49.46 89°22.04
8	329°53.20	310°55.56 30.08	335°59.61 1.04	280°12.69 29.28	342°20.27 12.21	Acamar 315°12.64 -40°12.54
9	344° 55.66	325°55.16 · · 31.27	351°0.29 04°0.28	295°14.57 · · 29.43	357°22.50 · · 12.12	Menkar 314°7.11 4°10.99
10	359°58.13	340°54.76 32.46	6°0.97 03°59.52	310°16.46 29.59	12°24.74 12.03	Mirfak 308°29.64 49°56.83 Aldebaran 290°40.61 16°33.44
11	15°0.59	355°54.36 33.66	21°1.66 58.75	325°18.34 29.74	27°26.97 11.95	Rigel 281°4.69 -8°10.52
12	30°3.06	10°53.97 N06°34.85	36°2.34 \$03°57.99	340°20.22 N17°29.89	42°29.21 S07°11.86	Capella 280°23.14 46°1.43
13 14	45°5.52 60°7.98	25°53.57 36.04 40°53.17 37.23	51°3.02 57.22 66°3.70 56.46	355°22.11 30.04 10°23.99 30.19	57°31.45 11.77 72°33.68 11.68	Bellatrix 278°23.76 6°22.24
15	75° 10.45	55°52.77 · · 38.42	81°4.39 · · 55.70	25°25.87 · · 30.35	87°35.92 · · 11.60	Elnath 278°2.90 28°37.70
16	90°12.91	70°52.38 39.61	96°5.07 54.93	40°27.76 30.50	102°38.16 11.51	Alnilam 275°38.56 -1°11.27
17	105° 15.38	85°51.98 40.80	111°5.75 54.17	55°29.64 30.65	117°40.39 11.42	Betelgeuse 270°52.94 7°24.65
18	120° 17.84	100°51.58 N06°41.99	126°6.43	70°31.53 N17°30.80	132°42.63 S 07°11.33	Canopus 263°52.92 -52°42.73 Sirius 258°26.92 -16°45.11
19	135°20.30	115°51.18 43.18	141°7.12 52.64	85°33.41 30.96	147°44.87 11.25	Adhara 255°6.48 -29°0.49
20	150°22.77	130°50.78 44.36	156°7.80 51.88	100°35.29 31.11	162°47.10 11.16	Procyon 244°51.54 5°9.72
21 22	165°25.23 180°27.70	145°50.38 · · 45.55	171°8.48 · · 51.11	115°37.18 · · 31.26 130°39.06 31.41	177°49.34 · · 11.07	Pollux 243°18.11 27°58.13
23	195°30.16	160°49.98 46.74 175°49.58 47.93	186°9.17 50.35 201°9.85 49.58	130°39.06 31.41 145°40.94 31.56	192°51.58 10.98 207°53.82 10.90	Avior 234°15.00 -59°35.48
		-				Suhail 222°46.69 -43°32.06
Mer.	pass. 10:00	ν-0.4' d1.2' m-3.90	ν 0.7′ <i>d</i> -0.8′ m1.14	$\nu 1.9' \ d0.2' \ \text{m-}2.02$	$\nu 2.2' \ d$ -0.1' m1.07	Miaplacidus 221°38.24 -69°49.25
						Alphard 217°48.27 -8°45.94 Regulus 207°34.95 11°50.90
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.27 61°37.39
0	210° 32.62	190°49.18 N06°49.12	216°10.53 S 03°48.82	160°42.83 N17°31.72	222°56.05 S 07°10.81	Denebola 182°25.31 14°26.15
1	225°35.09	205°48.78 50.30	231°11.22 48.05	175°44.71 31.87	237°58.29 10.72	Gienah 175°43.95 -17°40.74
2	240° 37.55	220° 48.38 51.49	246°11.90 47.29	190°46.59 32.02	253°0.53 10.64	Acrux 173°0.23 -63°14.18
3 4	255° 40.02 270° 42.48	235° 47.98 · · 52.68 250° 47.58 53.87	261°12.58 · · 46.52 276°13.27 45.76	205°48.47 · · 32.17 220°50.36 32.32	268°2.77 ·· 10.55 283°5.00 10.46	Gacrux 171°51.85 -57°15.10
5	285° 44.94	265° 47.18 55.05	291°13.95 45.00	235°52.24 32.48	298°7.24 10.38	Alioth 166°12.94 55°49.72
6	300° 47.41	280°46.78 N06°56.24	306°14.63 S03°44.23	250°54.12 N17°32.63	313°9.48 S07°10.29	Spica 158°22.64 -11°17.40
7	315° 49.87	295°46.38 57.43	321°15.32 43.47	265°56.01 32.78	328°11.72 10.20	Alkaid 152°51.98 49°11.47 Hadar 148°36.28 -60°29.46
8	$330^{\circ}52.34$	310°45.98 58.61	336°16.00 42.70	280°57.89 32.93	343°13.95 10.11	Menkent 147°57.97 -36°29.45
9	345°54.80	325°45.57 06°59.80	351°16.69 · · 41.94	295°59.77 · · 33.08	358°16.19 · · 10.03	Arcturus 145°48.14 19°3.24
10	0°57.26	340°45.17 07°0.98	6°17.37 41.17	311°1.65 33.24	13°18.43 9.94	Rigil Kent. 139°40.54 -60°56.16
11 12	15°59.73 31°2.19	355°44.77 2.17 10°44.37 N07°3.35	21°18.05 40.41 36°18.74 \$03°39.64	326° 3.54 33.39 341° 5.42 N17° 33.54	28°20.67 9.85 43°22.91 \$07°9.77	Kochab 137°18.56 74°3.21
13	46°4.66	25°43.96 4.54	51°19.42 38.88	356°7.30 33.69	58°25.15 9.68	Zuben'ubi 136°56.38 -16°8.66
14	61°7.12	40°43.56 5.72	66°20.11 38.11	11° 9.18 33.84	73°27.39 9.59	Alphecca 126°3.92 26°37.80
15	76°9.58	55°43.16 · · 6.91	81°20.79 · · 37.35	26°11.06 · · 33.99	88°29.62 · · 9.51	Antares 112°16.30 -26°29.18 Atria 107°10.70 -69°4.11
16	$91^{\circ}12.05$	70°42.76 8.09	96°21.48 36.58	41°12.95 34.15	103°31.86 9.42	Sabik 102°3.25 -15°45.37
17	106° 14.51	85°42.35 9.27	111°22.16 35.82	56°14.83 34.30	118°34.10 9.33	Shaula 96°10.95 -37°7.24
18	121°16.98	100°41.95 N07°10.46	126°22.84 \$03°35.05	71°16.71 N17°34.45	133°36.34 \$07°9.25	Rasalhague 95°58.91 12°32.33
19	136° 19.44 151° 21.90	115°41.54 11.64 130°41.14 12.82	141°23.53 34.29 156°24.21 33.52	86°18.59 34.60 101°20.47 34.75	148°38.58 9.16 163°40.82 9.08	Eltanin 90°42.17 51°28.78
20 21	166°24.37	130°41.14 12.82 145°40.74 · · 14.00	156°24.21 33.52 171°24.90 · · 32.76	101°20.47 34.75 116°22.36 · · 34.90	163°40.82 9.08 178°43.06 • 8.99	Kaus Aust. 83°33.15 -34°22.33
22	181°26.83	160°40.33 15.19	186°25.58 31.99	131°24.24 35.06	193°45.30 8.90	Vega 80°33.47 38°48.03
23	196°29.30	175°39.93 16.37	201°26.27 31.23	146°26.12 35.21	208°47.54 8.82	Nunki 75°48.40 -26°15.99 Altair 62°0.52 8°55.73
Meri	pass. 09:56	ν-0.4' d1.2' m-3.90	ν0.7' d-0.8' m1.14	ν1.9' d0.2' m-2.02	ν2.2' d-0.1' m1.07	Peacock 53°6.70 -56°39.23
- IVICI.	Dass. 09.30	ν-0.4 d1.2 III-3.90		ν1.9 d0.2 III-2.02	ν2.2 d-0.1 III1.07	Deneb 49°26.29 45°21.64
_						Enif 33°39.53 9°58.97
Tue	GHA 211°31.76	GHA Dec	GHA Dec 216°26.95 S 03°30.46	GHA Dec 161°28.00 N17°35.36	GHA Dec	Al Na'ir 27°33.88 -46°50.51
0 1	211°31.76 226°34.23	190°39.52 N07°17.55 205°39.12 18.73	216°26.95 \$03°30.46 231°27.64 29.70	176°29.88 35.51	223°49.78	Fomalhaut 15°15.42 -29°29.63
2	241°36.69	220°38.71 19.91	246°28.33 28.93	191°31.76 35.66	253°54.26 8.56	Scheat 13°46.06 28°12.62 Markab 13°30.75 15°19.94
3	256° 39.15	235°38.30 · · 21.09	261°29.01 · · 28.17	206°33.64 · · 35.81	268°56.50 · · 8.47	IVIdIKAD 13 30.75 13 19.94
4	271°41.62	250°37.90 22.27	276°29.70 27.40	221°35.53 35.96	283°58.74 8.39	Apr 21 Sun SHA Mer.pass
5	286° 44.08	265°37.49 23.45	291°30.38 26.63	236°37.41 36.12	299°0.98 8.30	Venus 341°25.24 11:16
6	301°46.55	280°37.09 N07°24.63	306°31.07 \$03°25.87	251°39.29 N17°36.27	314°3.22 \$07°8.21	Mars 6°20.67 09:36 Jupiter 310°24.12 13:18
7	316°49.01	295°36.68 25.81	321°31.75 25.10	266°41.17 36.42	329°5.46 8.13	Jupiter 310°24.12 13:18 Saturn 12°28.89 09:10
8 9	331°51.47 346°53.94	310°36.27 26.99 325°35.86 · · 28.17	336°32.44 24.34 351°33.12 · · 23.57	281°43.05 36.57 296°44.93 · · 36.72	344°7.70 8.04 359°9.94 · · 7.96	
10	1°56.40	340°35.46 29.35	6°33.81 22.81	311°46.81 36.87	14°12.18 7.87	Apr 22 Mon SHA Mer.pass
11	16°58.87	355°35.05 30.53	21°34.50 22.04	326°48.69 37.02	29°14.42 7.78	Venus 340°16.56 11:17
12	32°1.33	10°34.64 N07°31.71	36°35.18 S 03°21.28	341°50.57 N17°37.18	44°16.66 S 07°7.70	Mars 5°37.91 09:35 Jupiter 310°10.20 13:15
13	47°3.79	25°34.23 32.89	51°35.87 20.51	356°52.45 37.33	59°18.90 7.61	Saturn 12°23.43 09:07
14	62°6.26	40°33.83 34.06	66°36.55 19.74	11°54.33 37.48	74°21.14 7.53	
15 16	77°8.72 92°11.19	55°33.42 · · 35.24 70°33.01 36.42	81°37.24 · · 18.98 96°37.93 18.21	26°56.21 · · 37.63 41°58.09 37.78	89°23.38 · · 7.44 104°25.62 7.36	Apr 23 Tue SHA Mer.pass
10 17	92 11.19 107°13.65	85° 32.60 37.59	96 37.93 18.21 111°38.61 17.45	56°59.97 37.93	104 25.62 7.36 119°27.86 7.27	Venus 339°7.76 11:18 Mars 4°55.19 09:34
18	122° 16.11	100°32.19 N07°38.77	126°39.30 S03°16.68	72°1.86 N17°38.08	134°30.10 S07°7.19	Jupiter 309°56.24 13:12
19	137° 18.58	115°31.78 39.95	141°39.99 15.91	87°3.74 38.23	149°32.35 7.10	Saturn 12°18.02 09:03
20	$152^{\circ}21.04$	130°31.37 41.12	156° 40.67 15.15	102°5.62 38.39	164°34.59 7.01	
21	167°23.51	145°30.96 · · 42.30	171°41.36 · · 14.38	117°7.50 · · 38.54	179°36.83 · · 6.93	Horizontal parallax
22	182°25.97	160°30.55 43.47	186° 42.05 13.62	132°9.38 38.69	194°39.07 6.84	Venus: 0.1 Mars: 0.1
23	197°28.43	175°30.14 44.65	201°42.73 12.85	147°11.26 38.84	209°41.31 6.76	IVIAI3. U.1
Mer.	pass. 09:52	ν-0.4' d1.2' m-3.90	ν0.7′ d-0.8′ m1.14	ν1.9' d0.2' m-2.02	$\nu 2.2' \ d$ -0.1' m1.07	
			_		_	

1	h	Su	n			Moon		
1	Sun		Dec	GHA	ν	Dec	d	HP
2								54.0'
3								
5								54.1'
The color of the		240°19.95	12°0.67	88°46.79	17.4'	01°6.31	-14.2'	54.1'
The color of the								54.1'
Section Sect								
10 330°20,70 5,73 176°24,92 17.3 00°33.13 14.2 54.1 12 0°20,95 N12°7.42 200°37.57 17.3 500°33.13 14.2 54.1 13 15°21,07 8.26 220°13.87 17.3 500°43.75 14.2 54.1 14 30°21,20 9.10 234°50,17 17.3 10°15.77 14.2 54.1 15 45°21,32 9.94 249°26.45 17.3 10°15.77 14.2 54.1 16 60°21,44 10.78 264°2.71 17.3 10°45.79 14.2 54.1 17 75°21,57 11.62 278°38.96 17.2 502°12.69 14.2 54.2 18 90°21,69 N12°12.46 293°15.20 17.2 502°12.69 14.2 54.2 19 105°21.81 13.30 30°51.41 17.2 02°26.90 14.2 54.2 20 120°21.81 13.30 30°51.41 17.2 02°26.90 14.2 54.2 21 135°22.06 14.98 337°3.79 17.2 02°41.12 14.2 54.2 22 150°22.18 15.82 351°39.94 17.1 03°9.53 14.2 54.2 23 165°22.30 16.66 66°16.08 17.1 03°9.53 14.2 54.2 2 10°22.66 19.17 50°43.4 17.0 04°20.8 14.2 54.2 2 210°22.66 19.17 50°43.4 17.0 04°20.8 14.2 54.2 2 210°22.66 19.17 50°43.4 17.0 04°20.8 14.2 54.2 3 225°22.78 × 20.01 64°40.37 17.0 04°20.8 14.2 54.2 4 240°22.90 20.85 79°16.38 17.0 04°30.61 14.2 54.2 5 255°23.03 21.68 93°52.36 17.0 04°40.81 14.1 54.2 8 300°23.39 24.19 137°40.13 16.9 505°2.99 14.1 54.3 9 315°23.51 × 25.03 152°15.99 16.8 60°5.93 14.1 54.3 10 330°23.63 25.66 1665.181 16.8 60°5.94 14.1 54.3 10 330°23.63 25.66 1665.181 16.8 60°5.94 14.1 54.3 11 346°23.74 26.70 181°27.60 16.6 07°23.43 14.0 54.3 12 0°23.86 N12°37.51 119°28.0 16.9 05°31.12 14.1 54.3 13 15°24.93 × 35.00 325°25.50 16.5 16.6 06°5.46 14.0 54.3 14 36°24.10 29.20 225°41.5 16.6 06°5.46 14.0 54.3 15 47°24.46 31.70 04°40.81 14.1 54.3 15 48°24.22 30.33 30°40.16 16.6 07°23.43 14.0 54.3 16 60°27.34 30.66 256°45.20 16.6 07°93.61 14.0 54.3 17 5°24.46 31.70								54.1'
11 345°20.83 6.57 101°1.25 17.3 00°33.13 14.2 54.1 12 0°20.95 N12°7.42 205°37.57 17.3' \$00°47.35 14.2' 54.1 13 15°21.07 8.26 220°13.87 17.3' 01°1.57 14.2' 54.1 14 30°21.20 9.10 234°50.17 17.3' 01°1.57 14.2' 54.1 15 45°21.32 • 9.94 249°26.45 17.3' 01°3.00 14.2' 54.1 16 60°21.44 10.78 264°2.71 17.3' 01°3.00 14.2' 54.1 17 75°21.57 11.62 276°3.896 17.2' 01°58.46 14.2' 54.1 18 90°21.69 N12°12.46 293°15.20 17.2' 502°12.69 14.2' 54.2 19 105°21.81 13.30 307°51.41 17.2' 02°61.12 14.2' 54.2 20 120°21.93 14.14 322°27.61 17.2' 02°61.12 14.2' 54.2 21 135°22.06 · 14.98 337°3.79 17.2' 02°6.90 14.2' 54.2 22 150°22.18 15.52 35°39.99 17.1' 03°9.53 14.2' 54.2 23 166°22.30 16.66 6°16.08 17.1' 03°9.33 14.2' 54.2 24 11 195°22.54 18.34 35°28.28 17.1' 03°9.373 14.2' 54.2 25 120°22.66 19.17 50°6*3.41 17.0' 04°6.24 14.2' 54.2 25 120°22.66 19.17 50°6*3.41 17.0' 04°6.24 14.2' 54.2 25 120°22.66 19.17 50°6*3.41 17.0' 04°6.24 14.2' 54.2 25 120°22.66 19.17 50°6*3.43 17.0' 04°6.24 14.2' 54.2 26 120°22.66 19.17 50°6*3.43 17.0' 04°4.34 11 14.2' 54.2 27 120°22.65 19.17 50°6*3.43 17.0' 04°6.24 14.2' 54.2 28 165°22.30 12.68 93°52.36 17.0' 04°4.34 11 14.1' 54.2 29 120°22.65 19.17 50°6*3.41 10.0' 04°6.28 14.2' 54.2 30 225°22.78 · 20.01 64°40.37 17.0' 04°6.24 51 14.2' 54.2 31 225°22.78 20.30 16.66 6°16.08 17.1' 30°59.31 14.2' 54.2 31 235°22.78 20.16 69°8.32 16.9' 50°7.11 14.2' 54.2 31 30°33.63 25.66 16°6*16.1 16.8' 05°9.30 14.1' 54.3 31 31 5°23.98 23.6 10°0.00 14.2' 54.1 54.3 31 31 5°23.98 23.6 10°0.00 14.2' 54.1 54.3 31 31 5°23.98 23.6 10°0.00 16.8' 05°4.12 14.1' 54.3 31 31 5°23.98 23.6 10°0.00 16.8' 05°4.12 14.1' 54.3 31 31 5°23.98 23.6 10°0.00 16.8' 05°4.12 14.1' 54.3 31 15°23.98 23.6 10°0.00 16.8' 05°4.12 14.1' 54.3 31 31 5°23.98 23.6 10°0.00 16.8' 05°4.13 14.0' 54.4 31 10°524.69 33.36 296°4.00 16.6' 07°53.31 14.0' 54.4 31 10°524.69 33.36 298°12.16 16.5' 07°9.46 14.0' 54.3 31 10°524.69 33.36 298°12.16 16.5' 07°9.39 31.39 54.4 31 10°524.69 33.36 298°12.16 16.1' 09°41.91 13.7' 54.5 32 225°25.53 40.00 54°4.28 15.9' 11°2.29 13.6' 54.5 32 210°25.51 49								54.1'
13								54.1'
13								
15								54.1'
16								54.1'
18								
18								54.1'
20			N12°12.46		17.2'		14.2'	54.2'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								54.2'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								54.2'
Mon GHA Dec 0 180°22.42 N12°17.50 20°52.19 17.1° S03°37.92 14.2° 54.2° 210°22.66 19.17 50°4.34 17.0° 04°6.28 14.2° 54.2° 22 210°22.66 19.17 50°4.34 17.0° 04°6.28 14.2° 54.2° 424°22.90 20.85 79°16.38 17.0° 04°34.61 14.1° 54.2° 525°23.03 21.68 93°52.36 17.0° 04°34.61 14.1° 54.2° 54.2° 525°23.03 21.68 93°52.36 17.0° 04°34.61 14.1° 54.2° 54.								54.2'
1 180°22.42 N12°17.50 20°52.19 17.1′ S03°37.92 14.2′ 54.2 1 195°22.54 18.34 35°28.28 17.1′ 03°52.11 14.2′ 54.2 2 10°22.66 19.17 S0°4.34 17.0′ 04°6.28 14.2′ 54.2 3 225°22.78 · · · 20.01 64°40.37 17.0′ 04°0.245 14.2′ 54.2 4 240°22.90 20.85 79°16.38 17.0′ 04°34.61 14.1′ 54.2 54.2 55.5°23.03 21.68 93°52.36 17.0′ 04°34.87 14.1′ 54.2 54.2 54.2 31.5 N12°22.52 108°28.32 16.9′ 505°2.89 14.1′ 54.2 54.2 54.2 31.5 N12°22.52 108°28.32 16.9′ 505°2.89 14.1′ 54.3 8 300°23.39 24.19 137°40.13 16.9′ 505°31.12 14.1′ 54.3 10 330°23.63 25.86 166°51.81 16.8′ 505°35.12 14.1′ 54.3 11 345°23.51 · · 25.03 152°15.99 16.8′ 505°45.22 14.1′ 54.3 11 345°23.74 26.70 181°27.60 16.8′ 60°13.37 14.0′ 54.3 11 345°23.74 26.70 181°27.60 16.8′ 60°13.37 14.0′ 54.3 15°23.98 28.36 210°39.07 16.7′ 60°41.45 14.0′ 54.3 15.2 39.8 28.36 210°39.07 16.7′ 60°41.45 14.0′ 54.3 15.2 39.8 28.36 210°39.07 16.7′ 60°41.45 14.0′ 54.3 15.2 45°24.22 · · 30.03 230°50.40 16.6′ 07°9.46 14.0′ 54.3 16.6 60°24.34 30.86 254°25.00 16.6′ 07°9.46 14.0′ 54.3 17.7 5°24.46 31.70 269°1.56 16.5′ 07°37.39 13.9′ 54.4 18 90°24.57 N12°32.53 283°37.08 16.5′ 507°51.32 13.9′ 54.4 19 105°24.69 33.36 298°12.56 16.4′ 60°5.23 31.9′ 54.4 20 120°24.81 34.19 312°48.00 16.4′ 08°9.12 13.9′ 54.4 21 135°24.93 · · 35.02 327°23.39 16.3′ 60°5.23 13.8′ 54.2 2 150°25.04 35.85 34°58.40 16.2′ 09°28.18 13.7′ 54.5 2 2 210°25.51 39.17 40°19.63 16.1′ 09°41.91 13.7′ 54.5 3 255°25.86 41.66 84°4.78 15.9′ 10°22.92 13.6′ 54.5 4 2 2 210°25.51 39.17 40°19.63 16.1′ 09°41.91 13.7′ 54.5 3 255°25.86 41.66 84°4.78 15.9′ 10°22.92 13.6′ 54.5 4 1.2° 11.3° 50.2 14.14 127°49.45 15.8′ 11°3.63 13.5′ 54.6 6 270°25.98 N12°42.48 98°39.72 15.9′ 510°36.52 13.6′ 54.5 4 1.2° 11.3° 50.2 14.44 14 127°49.45 15.8′ 11°3.63 13.5′ 54.6 12° 10°25.04 43.8′ 11°3°4.00 15.3′ 12°29.9 13.6′ 54.5 4 1.2° 11°33.60 15.6′ 11°44.03 13.4′ 54.6 12° 11°35.63 13°5°25.86 40.66 11°3°4.97 11°33.60 15.6′ 11°44.03 13.4′ 54.6 12° 11°35.60 15.0′ 11°36.30 13.5′ 54.6 12° 11°35.60 15.5′ 11°44.03 13.4′ 54.6 12° 11°35.60 15.5′ 11°44.03 13.4′ 54.6 12° 11°35.60 15.5′ 11°44.03		SD = 15.9'	d = 0.8'		SI	D = 14.7'		
180°22.42 N12°17.50 20°52.19 17.1' S03°37.92 14.2' 54.2 1 195°22.54 18.34 35°28.28 17.1' 03°52.11 14.2' 54.2 2 210°22.66 19.17 50°4.34 17.0' 04°6.28 14.2' 54.2 3 225°22.78 · · · · · · · · · · · · · · · · · ·		CUA					,	
1 195°22.54 18.34 35°28.28 17.1′ 03°52.11 14.2′ 54.2 2 210°22.666 19.17 50°4.34 17.0′ 04°6.28 14.2′ 54.2 4 240°22.90 20.85 79°16.38 17.0′ 04°34.61 14.1′ 54.2 54.2 54.2 55°23.03 21.68 93°52.36 17.0′ 04°34.61 14.1′ 54.2 55°23.03 21.68 93°52.36 17.0′ 04°34.61 14.1′ 54.2 54.2 54.2 55°23.03 21.68 93°52.36 17.0′ 04°34.61 14.1′ 54.2 54.2 55°23.03 21.68 93°52.36 17.0′ 04°34.61 14.1′ 54.2 54.2 54.2 55°23.03 21.68 93°52.36 17.0′ 04°34.61 14.1′ 54.3 7 285°23.27 23.36 123°4.24 16.9′ 05°17.01 14.1′ 54.3 8 300°23.39 24.19 137°40.13 16.9′ 05°17.01 14.1′ 54.3 10 330°33.63 25.86 166°51.81 16.8′ 05°59.30 14.1′ 54.3 10 330°33.63 25.86 166°51.81 16.8′ 05°59.30 14.1′ 54.3 11 345°23.74 26.70 181°27.60 16.8′ 06°31.37 14.0′ 54.3 13 15°33.98 28.36 210°39.07 16.7′ 06°41.45 14.0′ 54.3 13 15°33.98 28.36 210°39.07 16.7′ 06°41.45 14.0′ 54.3 14 30°24.00 29.20 225°14.75 16.6′ 06°55.46 14.0′ 54.3 15 45°24.22 ··· 30.03 239°50.40 16.6′ 07°93.46 14.0′ 54.3 16 6°24.34 30.86 254°26.00 16.6′ 07°93.46 14.0′ 54.4 16 60°24.34 30.86 254°26.00 16.6′ 07°3.73.91 13.9′ 54.4 19 105°24.69 33.36 298°12.56 16.4′ 08°5.23 13.9′ 54.4 19 105°24.69 33.36 298°12.56 16.4′ 08°5.23 13.9′ 54.4 19 105°24.69 33.36 298°12.56 16.4′ 08°5.23 13.9′ 54.4 12 135°24.93 ··· 35.02 32°23.39 16.3′ 08°48.22 13.8′ 54.4 22 150°25.51 39.17 40°19.63 16.1′ 00°41.41 13.8′ 54.4 22 150°25.54 38.34 25°44.48 16.2′ 00°28.18 13.7′ 54.5 42 22 150°25.54 38.34 25°44.48 16.2′ 00°28.18 13.7′ 54.5 5 255°25.86 41.66 84°4.78 15.9′ 10°9.22 13.6′ 54.5 4.6 2 20°25.58 N12°47.44 40.83 66°29.78 16.0′ 00°55.61 13.7′ 54.5 4.2 210°25.51 39.17 40°19.63 16.1′ 00°41.91 13.7′ 54.5 5 255°25.86 41.66 84°4.78 15.9′ 10°9.22 13.6′ 54.5 4.9 315°26.65 46.62 17°33.60 15.6′ 11°44.03 13.4′ 54.6 11 345°26.55 46.62 17°33.60 15.6′ 11°44.03 13.4′ 54.6 11 345°26.55 46.62 17°33.60 15.6′ 11°44.03 13.4′ 54.6 11 345°26.55 46.62 17°33.60 15.6′ 11°44.03 13.4′ 54.6 11 345°26.55 46.62 17°33.60 15.6′ 11°44.03 13.4′ 54.6 11 34°20.20 13.3° 54.6 4.2 120°27.57 54.03 30°242.76 15.5′ 11°30.00 13.3′ 54.7 11°30.00 13.3′ 54.7 11°30.00 13.3′ 54.7 11°3								
3		195°22.54						54.2'
4 240°22.90 20.85 79°16.38 17.0' 04°34.61 14.1' 54.2 5 255°23.03 21.68 93°52.36 17.0' 04°34.67.5 14.1' 54.2 6 270°23.15 N12°22.52 108°28.32 16.9' S05°2.89 14.1' 54.3 7 285°23.27 23.36 123°4.24 16.9' 05°17.01 14.1' 54.3 8 300°23.39 24.19 137°40.13 16.9' 05°31.12 14.1' 54.3 10 330°23.63 25.86 166°51.81 16.8' 05°59.30 14.1' 54.3 11 345°23.74 26.70 181°27.60 16.8' 06°41.23 14.0' 54.3 11 345°23.74 26.70 181°27.60 16.8' 06°13.37 14.0' 54.3 13 15°23.98 28.36 210°39.07 16.7' 06°41.45 14.0' 54.3 14 30°24.10 29.20 225°14.75 16.6' 06°55.46 14.0' 54.3 15 45°24.22 ·· 30.03 239°50.40 16.6' 07°9.46 14.0' 54.4 17 75°24.46 31.70 269°1.56 16.5' 07°37.39 13.9' 54.4 18 90°24.57 N12°32.53 283°37.08 16.5' 507°51.32 13.9' 54.4 20 120°24.81 34.19 312°48.00 16.4' 08°5.23 13.9' 54.4 21 135°24.93 ·· 35.02 327°23.39 16.3' 08°46.82 13.8' 54.4 22 120°25.516 36.68 356°34.03 16.3' 09°0.64 13.8' 54.4 22 120°25.74 40.3 3.86 254°22.30 36.3' 08°40.80 13.8' 54.4 22 120°25.74 40.3 3.86 256°27.23 39 16.3' 08°3.29 813.8' 54.4 22 120°25.51 33.91 54.4 31.9 312°48.00 16.4' 08°19.12 13.9' 54.4 21 135°24.93 ·· 35.02 327°23.39 16.3' 08°3.298 13.8' 54.4 22 120°25.51 33.91 7 40°19.63 16.1' 09°41.91 13.7' 54.5 2210°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 54.5 255°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 255°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 525°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 525°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 525°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 525°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 525°25.86 41.66 84°4.78 15.8' 11°3.60 13.1' 54.5 54.5 54.5 54.5 54.5 54.5 54.5 54.								54.2'
5								
6 270°23.15 N12°22.52 108°28.32 16.9' S05°2.89 14.1' 54.3 7 285°23.27 2.336 123°4.24 16.9' 05°31.701 14.1' 54.3 8 300°23.39 24.19 137°40.13 16.9' 05°31.12 14.1' 54.3 9 315°23.51 · 25.03 152°15.99 16.8' 05°45.22 14.1' 54.3 10 330°23.63 25.86 166°51.81 16.8' 05°95.93 14.1' 54.3 11 345°23.74 26.70 181°27.60 16.8' 06°13.37 14.0' 54.3 12 0°23.86 N12°27.53 196°3.35 16.7' 506°27.42 14.0' 54.3 13 15°23.98 28.36 210°39.07 16.7' 06°41.45 14.0' 54.3 14 30°24.10 29.20 225°14.75 16.6' 06°55.46 14.0' 54.3 15 45°24.22 · 30.03 230°50.40 16.6' 07°9.46 14.0' 54.4 16 60°24.34 30.86 254°26.00 16.6' 07°3.39 13.9' 54.4 17 75°24.46 31.70 269°1.56 16.5' 507°51.32 13.9' 54.4 19 105°24.69 33.36 298°12.56 16.4' 08°5.23 13.9' 54.4 19 105°24.69 33.36 298°12.56 16.4' 08°5.23 13.9' 54.4 20 120°24.81 34.19 312°48.00 16.4' 08°19.12 13.9' 54.4 21 135°24.93 · 35.02 327°23.39 16.3' 08°32.98 13.8' 54.4 22 150°25.04 35.85 341°58.73 16.3' 08°46.82 13.8' 54.4 22 150°25.04 35.85 341°58.73 16.3' 08°46.82 13.8' 54.4 23 165°25.16 36.68 356°34.03 16.3' 09°0.64 13.8' 54.5 4 240°25.74 40.83 60°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°92.92 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°92.92 13.6' 54.5 6 270°25.98 N12°42.48 98°3.72 15.9' S10°36.52 13.6' 54.5 6 270°25.98 N12°42.48 98°3.72 15.9' S10°36.52 13.6' 54.5 6 270°25.98 N12°42.48 98°3.72 15.9' S10°36.52 13.6' 54.5 11 345°26.55 46.62 171°33.60 15.6' 11°3.63 13.5' 54.6 10 330°26.44 4.14 127°49.45 15.8' 11°3.63 13.5' 54.6 11 345°26.55 46.62 171°3.60 15.6' 11°3.63 13.5' 54.6 11 345°26.55 46.62 171°3.60 15.6' 11°44.03 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' S11°57.43 13.4' 54.6 13 15°27.73 51.56 259°0.9 15.2' 13°3.73 13.1' 54.7 16 60°27.12 50.74 424°26.00 15.3' 12°37.60 13.4' 54.6 13 15°27.86 49.90 15°67.73 15.5' 12°10.78 13.3' 54.6 14 30°26.89 49.90 15°67.73 15.5' 12°10.78 13.3' 54.6 15 45°77.01 · 49.91 220°51.64 15.6' 11°44.03 13.5' 54.6 16 60°27.12 50.74 54.80 50.74 14.9' 14°9.02 12.9' 54.8 11 33°27.68 54.85 317°16.9 15.0' 13°30.01 13.1' 54.7 11 35°27.68 54.85 317°16.9 15								54.2'
8 300°23.39								54.3'
9 315°23.51 · · · 25.03 152°15.99 16.8' 05°45.22 14.1' 54.3 10 330°23.63 25.86 166°51.81 16.8' 05°95.30 14.1' 54.3 11 345°23.74 26.70 181°27.60 16.8' 06°13.37 14.0' 54.3 12 0°23.86 N12°27.53 196°3.35 16.7' 506°27.42 14.0' 54.3 13 15°23.98 28.36 210°39.07 16.7' 06°41.45 14.0' 54.3 14 30°24.10 29.20 225°14.75 16.6' 06°55.46 14.0' 54.4 15 45°24.22 · · 30.03 230°50.40 16.6' 07°9.46 14.0' 54.4 16 60°24.34 30.86 254°26.00 16.6' 07°9.46 14.0' 54.4 17 75°24.46 31.70 269°1.56 16.5' 507°37.39 13.9' 54.4 18 90°24.57 N12°32.53 283°37.08 16.5' 507°51.32 13.9' 54.4 20 120°24.81 34.19 312°48.00 16.4' 08°5.23 13.9' 54.4 20 120°24.81 34.19 312°48.00 16.4' 08°19.12 13.9' 54.4 21 135°24.93 · · 35.02 327°23.39 16.3' 88°32.98 13.8' 54.4 22 150°25.04 35.85 341°58.73 16.3' 09°0.64 13.8' 54.4 23 165°25.16 36.68 356°34.03 16.3' 09°0.64 13.8' 54.4 23 165°25.16 36.68 356°34.03 16.3' 09°0.64 13.8' 54.4 24 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 88°4.78 16.9' 09°55.61 13.7' 54.5 5 255°25.86 41.66 88°4.78 15.9' 10°22.92 13.6' 54.5 6 270°25.98 N12°42.48 98°3.72 15.9' 510°36.52 13.6' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°3.60 13.4' 54.6 11 345°26.55 46.62 171°33.60 15.6' 11°41.03 13.4' 54.6 11 345°26.55 46.62 171°33.60 15.6' 11°41.03 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' 511°57.43 13.4' 54.6 15 45°27.01 · 49.91 229°51.64 15.4' 12°37.36 13.2' 54.7 16 60°27.12 50.74 424°2.00 15.3' 11°4.09 13.3' 54.6 15 45°27.01 · 49.91 229°51.64 15.4' 12°37.36 13.2' 54.7 16 60°27.15 50.74 244°2.00 15.3' 11°4.09 13.1' 54.7 17 75°27.23 51.56 529°0.29 15.2' 13°3.78 13.1' 54.7 18 90°27.35 N12°52.39 273°34.51 15.2' 513°16.92 13.1' 54.7 19 105°27.46 53.21 288°8.67 15.1' 13°3.001 13.1' 54.7 20 120°27.57 54.85 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8								54.3'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								54.3'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								54.3'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
17								54.4'
18 90°24.57 N12°32.53 283°37.08 16.5' S07°51.32 13.9' 54.4 19 105°24.69 33.36 298°12.56 16.4' 08°5.23 13.9' 54.4 20 120°24.81 34.19 312°48.00 16.4' 08°19.12 13.9' 54.4 21 135°24.93 · 35.02 327°23.39 16.3' 08°32.98 13.8' 54.4 22 150°25.04 35.85 341°58.73 16.3' 08°46.82 13.8' 54.4 23 165°25.16 36.68 356°34.03 16.3' 09°0.64 13.8' 54.4 SD = 15.9' d = 0.8' SD = 14.8' Tue GHA Dec GHA Dec 0 180°25.28 N12°37.51 11°9.28 16.2' S09°14.42 13.8' 54.5 1 195°25.40 38.34 25°44.48 16.2' 09°28.18 13.7' 54.5 2 210°25.51 39.17 40°19.63 16.1' 09°41.91 13.7' 54.5 3 225°25.63 · 40.00 54°54.73 16.0' 09°55.61 13.7' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 6 270°25.98 N12°42.48 98°39.72 15.9' S10°36.52 13.6' 54.5 6 270°25.98 N12°42.48 98°39.72 15.9' S10°36.52 13.6' 54.5 7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.6 10 330°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°17.14 13.5' 54.6 10 330°26.84 445.79 156°58.94 15.7' 11°30.60 13.4' 54.6 11 345°26.55 46.62 171°33.60 15.6' 11°44.03 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' S11°57.43 13.4' 54.6 13 15°26.78 48.27 200°42.75 15.5' 11°17.8 13.3' 54.6 15 45°27.01 · 49.91 229°51.64 15.4' 12°37.36 13.2' 54.7 16 60°27.12 50.74 244°26.00 15.3' 12°40.59 13.2' 54.7 17 75°27.23 51.56 259°0.29 15.2' 13°3.78 13.1' 54.7 18 90°27.35 N12°52.39 273°34.51 15.2' S13°16.92 13.1' 54.7 19 105°27.46 53.21 288°6.7 15.1' 13°30.01 13.1' 54.7 20 120°27.57 54.03 30°42.76 15.0' 13°43.07 13.0' 54.7 21 135°27.68 · 54.85 317°16.79 15.0' 13°56.07 13.0' 54.7 22 150°27.80 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8	16							54.4'
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								54.4'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								54.4'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						08°32.98	13.8'	54.4'
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								
Tue GHA Dec GHA ν Dec d HP 0 180°25.28 N12°37.51 11°9.28 16.2' S09°14.42 13.8' 54.5 1 195°25.40 38.34 25°44.48 16.2' 09°28.18 13.7' 54.5 2 210°25.51 39.17 40°19.63 16.1' 09°41.91 13.7' 54.5 3 225°25.63 · 40.00 54°54.73 16.0' 09°55.61 13.7' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.5 9 315°26.32 · 44.96 142°24.22 15.7' 11°17.14 13.5' 5	23			350 34.03			13.0	<u> </u>
0 180°25.28 N12°37.51 11°9.28 16.2' S09°14.42 13.8' 54.5 1 195°25.40 38.34 25°44.48 16.2' 09°28.18 13.7' 54.5 2 210°25.51 39.17 40°19.63 16.1' 09°41.91 13.7' 54.5 3 225°25.63 · 40.00 54°54.73 16.0' 09°55.61 13.7' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 6 270°25.98 N12°42.48 98°39.72 15.9' S10°36.52 13.6' 54.5 7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 9 315°26.32 · 44.96 142°24.22 15.7' 11°17.14 13.5' 54.6 10 330°26.44 45.79 156°58.94		3D = 15.9	u = 0.6		31	J = 14.0		
1 195°25.40 38.34 25°44.48 16.2' 09°28.18 13.7' 54.5 2 210°25.51 39.17 40°19.63 16.1' 09°41.91 13.7' 54.5 3 225°25.63 · 40.00 54°54.73 16.0' 09°55.61 13.7' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 6 270°25.98 N12°42.48 98°39.72 15.9' S10°36.52 13.6' 54.5 7 285°26.09 43.31 113°14.61 15.8' 10°30.60 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 9 315°26.32 · 44.96 142°24.22 15.7' 11°17.14 13.5' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°31.60 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20								
2 210°25.51 39.17 40°19.63 16.1' 09°41.91 13.7' 54.5 3 225°25.63 · 40.00 54°54.73 16.0' 09°55.61 13.7' 54.5 4 240°25.74 40.83 69°29.78 16.0' 10°9.28 13.6' 54.5 5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 6 270°25.98 N12°42.48 98°39.72 15.9' S10°36.52 13.6' 54.5 7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 9 315°26.32 · 44.96 142°24.22 15.7' 11°17.14 13.5' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°30.60 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' S11°57.43 13.4' 54.6 13 15°26.78 48.27 200°42.75								
3 225°25.63 ·· 40.00 54°54.73 16.0′ 09°55.61 13.7′ 54.5 4 240°25.74 40.83 69°29.78 16.0′ 10°9.28 13.6′ 54.5 5 255°25.86 41.66 84°4.78 15.9′ 10°22.92 13.6′ 54.5 6 270°25.98 N12°42.48 98°39.72 15.9′ S10°36.52 13.6′ 54.5 7 285°26.09 43.31 113°14.61 15.8′ 10°50.10 13.5′ 54.5 8 300°26.21 44.14 127°49.45 15.8′ 11°3.63 13.5′ 54.6 10 330°26.44 45.79 156°58.94 15.7′ 11°17.14 13.5′ 54.6 11 345°26.55 46.62 171°33.60 15.6′ 11°44.03 13.4′ 54.6 12 0°26.66 N12°47.44 186°8.20 15.5′ S11°57.43 13.4′ 54.6 13 15°26.78 48.27 200°42.75 15.5′ 12°10.78 13.3′ 54.6 14 30°26.89 49.09 215°17.23 15.4′ 12°24.09 13.3′ 54.6 15 45°27.01 · 49.91 229°51.64 15.4′ 12°37.36 13.2′ 54.7 17 75°27.23 51.56 259°0.29 15.2′ 13°3.78 13.1′ 54.7 18 90°27.35 N12°52.39 273°34.51 15.2′ S13°16.92 13.1′ 54.7 20 120°27.57 54.03 302°42.76 15.0′ 13°43.07 13.0′ 54.7 21 135°27.68 · 54.85 317°16.79 15.0′ 13°56.07 13.0′ 54.7 22 150°27.80 55.67 331°50.74 14.9′ 14°9.02 12.9′ 54.8 23 165°27.91 56.50 346°24.63 14.8′ 14°21.93 12.9′ 54.8								54.5
5 255°25.86 41.66 84°4.78 15.9' 10°22.92 13.6' 54.5 6 270°25.98 N12°42.48 98°39.72 15.9' \$10°36.52 13.6' 54.5 7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 9 315°26.32 · 44.96 142°24.22 15.7' 11°3.60 13.4' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°30.60 13.4' 54.6 11 345°26.55 46.62 171°33.60 15.6' 11°44.03 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' \$11°57.43 13.4' 54.6 13 15°26.78 48.27 200°42.75 15.5' 12°10.78 13.3' 54.6 14 30°26.89 49.09 215°17.23 15.4' 12°37.36	3			54°54.73				54.5'
6 270°25.98 N12°42.48 98°39.72 15.9' \$10°36.52 13.6' 54.5' 7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 9 315°26.32 · 44.96 142°24.22 15.7' 11°17.14 13.5' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°3.06 13.4' 54.6 11 345°26.55 46.62 171°33.60 15.6' 11°44.03 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' \$11°57.43 13.4' 54.6 13 15°26.78 48.27 200°42.75 15.5' \$12°10.78 13.3' 54.6 14 30°26.89 49.09 215°17.23 15.4' 12°37.36 13.2' 54.7 15 45°27.01 49.91 229°51.64 15.4' 12°37.36 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>54.5'</th>								54.5'
7 285°26.09 43.31 113°14.61 15.8' 10°50.10 13.5' 54.5 8 300°26.21 44.14 127°49.45 15.8' 11°3.63 13.5' 54.6 9 315°26.32 · 44.96 142°24.22 15.7' 11°17.14 13.5' 54.6 10 330°26.44 45.79 156°58.94 15.7' 11°30.60 13.4' 54.6 11 345°26.55 46.62 171°33.60 15.6' 11°44.03 13.4' 54.6 12 0°26.66 N12°47.44 186°8.20 15.5' S11°57.43 13.4' 54.6 13 15°26.78 48.27 200°42.75 15.5' 12°10.78 13.3' 54.6 14 30°26.89 49.09 215°17.23 15.4' 12°24.09 13.3' 54.6 15 45°27.01 · 49.91 229°51.64 15.4' 12°37.36 13.2' 54.7 16 60°27.12 50.74 244°26.00 15.3' 12°50.59 13.2' 54.7 18 90°27.35 N12°52.39 273°34.51<								54.5'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		285°26.09	43.31	113° 14.61	15.8'	$10^{\circ}50.10$	13.5'	54.5'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		0°26.66		186°8.20		S11°57.43		54.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								54.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
17 75°27.23 51.56 259°0.29 15.2' 13°3.78 13.1' 54.7 18 90°27.35 N12°52.39 273°34.51 15.2' S13°16.92 13.1' 54.7 19 105°27.46 53.21 288°8.67 15.1' 13°30.01 13.1' 54.7 20 120°27.57 54.03 302°42.76 15.0' 13°43.07 13.0' 54.7 21 135°27.68 · 54.85 317°16.79 15.0' 13°56.07 13.0' 54.7 22 150°27.80 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8								54.7'
19 105°27.46 53.21 288°8.67 15.1' 13°30.01 13.1' 54.7 20 120°27.57 54.03 302°42.76 15.0' 13°43.07 13.0' 54.7 21 135°27.68 54.85 317°16.79 15.0' 13°56.07 13.0' 54.7 22 150°27.80 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8		75°27.23	51.56	259°0.29		13°3.78		54.7'
20 120°27.57 54.03 302°42.76 15.0' 13°43.07 13.0' 54.7 21 135°27.68 • 54.85 317°16.79 15.0' 13°56.07 13.0' 54.7 22 150°27.80 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8								54.7'
21 135°27.68 · · 54.85 317°16.79 15.0' 13°56.07 13.0' 54.7 22 150°27.80 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8								54.7' 54.7'
22 150°27.80 55.67 331°50.74 14.9' 14°9.02 12.9' 54.8 23 165°27.91 56.50 346°24.63 14.8' 14°21.93 12.9' 54.8								54.7' 54.7'
	22	150°27.80		331°50.74	14.9'	14°9.02		54.8'
SD = 15.9' d = 0.8' $SD = 14.9'$	23	165°27.91	56.50	346°24.63	14.8'	14°21.93	12.9'	54.8'
		SD = 15.9'	d = 0.8'		SI	O = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	02:54	21:08	////	////
N 70°	////	01:35	03:18	20:42	22:30	////
68°	////	02:16	03:36	20:23	21:46	////
66°	////	02:43	03:51	20:08	21:18	////
64°	01:23	03:03	04:03	19:56	20:57	22:42
62°	01:59	03:20	04:13	19:46	20:40	22:02
60°	02:24	03:33	04:22	19:37	20:26	21:36
N 58°	02:44	03:44	04:29	19:29	20:14	21:16
56°	02:59	03:54	04:36	19:22	20:04	21:00
54°	03:12	04:03	04:42	19:16	19:55	20:46
52°	03:24	04:10	04:48	19:10	19:48	20:35
50°	03:33	04:17	04:52	19:05	19:41	20:25
45°	03:53	04:32	05:03	18:55	19:26	20:05
N 40°	04:09	04:43	05:12	18:46	19:15	19:49
35°	04:21	04:52	05:19	18:38	19:05	19:37
30°	04:31	05:01	05:25	18:32	18:57	19:26
20°	04:47	05:14	05:37	18:21	18:43	19:10
N 10°	04:59	05:25	05:46	18:11	18:32	18:58
0°	05:09	05:34	05:55	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:53	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:06	18:32
30°	05:31	05:59	06:24	17:33	17:57	18:25
35°	05:34	06:04	06:30	17:27	17:53	18:22
40°	05:37	06:09	06:36	17:20	17:48	18:19
45°	05:40	06:14	06:44	17:12	17:42	18:16
S 50°	05:42	06:20	06:54	17:02	17:36	18:14
52°	05:44	06:23	06:58	16:58	17:33	18:12
54°	05:45	06:26	07:03	16:53	17:30	18:11
56°	05:46	06:29	07:08	16:48	17:27	18:10
58°	05:47	06:33	07:14	16:42	17:23	18:09
S 60°	05:48	06:37	07:21	16:35	17:19	18:08

Lat.		Moonris	е		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	16:50	18:52	21:13	04:17	03:45	03:08
N 70°	16:47	18:39	20:43	04:16	03:51	03:24
68°	16:45	18:28	20:21	04:15	03:56	03:36
66°	16:43	18:20	20:04	04:14	04:01	03:46
64°	16:41	18:13	19:50	04:13	04:04	03:55
62°	16:40	18:07	19:38	04:12	04:07	04:02
60°	16:39	18:02	19:28	04:12	04:10	04:09
N 58°	16:38	17:57	19:20	04:11	04:13	04:15
56°	16:37	17:53	19:12	04:11	04:15	04:20
54°	16:36	17:49	19:06	04:10	04:17	04:24
52°	16:35	17:46	19:00	04:10	04:19	04:29
50°	16:34	17:43	18:54	04:10	04:21	04:32
45°	16:33	17:37	18:43	04:09	04:24	04:41
N 40°	16:31	17:31	18:33	04:08	04:27	04:48
35°	16:30	17:27	18:25	04:08	04:30	04:54
30°	16:29	17:23	18:18	04:07	04:32	04:59
20°	16:28	17:16	18:06	04:06	04:37	05:08
N 10°	16:26	17:10	17:56	04:05	04:40	05:16
0°	16:25	17:04	17:46	04:05	04:44	05:24
S 10°	16:24	16:59	17:36	04:04	04:47	05:32
20°	16:22	16:53	17:26	04:03	04:51	05:40
30°	16:21	16:46	17:14	04:02	04:55	05:49
35°	16:20	16:43	17:07	04:01	04:57	05:55
40°	16:19	16:38	17:00	04:01	05:00	06:01
45°	16:18	16:33	16:51	04:00	05:03	06:08
S 50°	16:16	16:28	16:40	03:59	05:07	06:17
52°	16:16	16:25	16:35	03:59	05:09	06:21
54°	16:15	16:22	16:30	03:58	05:11	06:26
56°	16:14	16:19	16:24	03:58	05:13	06:31
58°	16:13	16:15	16:17	03:57	05:16	06:36
S 60°	16:12	16:11	16:10	03:56	05:18	06:43
		C			Maan	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-99%	
21	01:18	01:24	11:59	22:34	10:15		
22	01:30	01:35	11:58	23:14	10:54		
23	01:41	01:47	11:58	23:56	11:35		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	212°30.90	190°29.73 N07°45.82	216°43.42 \$03°12.08	162°13.14 N17°38.99	224°43.55 \$07°6.67	
1	227°33.36	205°29.32 47.00	231° 44.11 11.32	177°15.02 39.14	239°45.80 6.59	Alpheratz 357°35.73 29°13.26
2	242°35.83	220°28.91 48.17	246° 44.80 10.55	192°16.89 39.29	254°48.04 6.50	Ankaa 353°8.10 -42°10.43
3	257°38.29	235°28.49 · · 49.35	261°45.48 · · 9.79	207°18.77 · · 39.44	269°50.28 · · 6.42	Schedar 349°32.30 56°40.03
4	272°40.75	250°28.08 50.52	276°46.17 9.02	222°20.65 39.59	284°52.52 6.33	Diphda 348°48.21 -17°51.28
5	287°43.22	265°27.67 51.69	291°46.86 8.25	237°22.53 39.75	299°54.76 6.25	Achernar 335°21.19 -57°6.81 Hamal 327°52.25 23°34.51
6	302°45.68	280°27.26 N07°52.87	306° 47.54 \$03° 7.49	252°24.41 N17°39.90	314°57.01 S 07°6.16	Polaris 314°49.57 89°22.03
7	317°48.15	295°26.85 54.04	321°48.23 6.72	267°26.29 40.05	329°59.25 6.08	Acamar 315°12.64 -40°12.53
8	332°50.61	310°26.43 55.21	336°48.92 5.96	282°28.17 40.20	345°1.49 5.99	Menkar 314°7.11 4°10.99
9	347°53.08	325°26.02 · · 56.39	351°49.61 · · 5.19	297°30.05 · · 40.35	0°3.73 · · 5.91	Mirfak 308°29.64 49°56.82
10 11	2°55.54 17°58.00	340°25.61 57.56 355°25.19 58.73	6°50.29 4.42 21°50.98 3.66	312°31.93 40.50 327°33.81 40.65	15°5.98 5.82 30°8.22 5.74	Aldebaran 290°40.62 16°33.44
12	33°0.47	10°24.78 N07°59.90	36°51.67 S03°2.89	342°35.69 N17°40.80	45°10.46 S07°5.65	Rigel 281°4.70 -8°10.52
13	48°2.93	25°24.37 08°1.07	51°52.36 2.12	357°37.57 40.95	60°12.71 5.57	Capella 280°23.15 46°1.42
14	63°5.40	40°23.95 2.24	66°53.05 1.36	12°39.45 41.10	75°14.95 5.48	Bellatrix 278°23.77 6°22.24
15	78°7.86	55°23.54 · · 3.41	81°53.73 03°0.59	27°41.33 · · 41.25	90°17.19 · · 5.40	Elnath 278°2.91 28°37.69 Alnilam 275°38.58 -1°11.27
16	93° 10.32	70°23.12 4.58	96°54.42 02°59.82	42°43.20 41.40	105°19.44 5.32	Betelgeuse 270°52.95 7°24.65
17	108° 12.79	85°22.71 5.75	111°55.11 59.06	57°45.08 41.56	120°21.68 5.23	Canopus 263°52.95 -52°42.72
18	123° 15.25	100°22.29 N08°6.92	126°55.80 S02°58.29	72°46.96 N17°41.71	135°23.92 S07°5.15	Sirius 258°26.94 -16°45.10
19	138° 17.72	115°21.88 8.09	141°56.49 57.52	87°48.84 41.86	150°26.17 5.06	Adhara 255°6.50 -29°0.48
20 21	153° 20.18 168° 22.64	130°21.46 9.26 145°21.05 • 10.43	156°57.18 56.76 171°57.86 • 55.99	102°50.72 42.01 117°52.60 •• 42.16	165°28.41 4.98 180°30.65 · · 4.89	Procyon 244°51.56 5°9.72
22	183°25.11	160°20.63 11.60	186°58.55 55.22	132°54.48 42.31	195°32.90 4.81	Pollux 243°18.13 27°58.13
23	198°27.57	175°20.21 12.76	201°59.24 54.46	147°56.35 42.46	210°35.14 4.72	Avior 234°15.03 -59°35.49
				-		Suhail 222°46.71 -43°32.07
Mer.	pass. 09:48	ν-0.4' d1.2' m-3.90	$\nu 0.7' \ d$ -0.8' m1.13	ν1.9' d0.2' m-2.02	$\nu 2.2' \ d$ -0.1' m1.07	Miaplacidus 221°38.28 -69°49.26
						Alphard 217°48.28 -8°45.94 Regulus 207°34.96 11°50.90
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.30 61°37.40
0	213°30.04	190°19.80 N08°13.93	216°59.93 S02°53.69	162°58.23 N17°42.61	225°37.39 S 07°4.64	Denebola 182°25.32 14°26.15
1	228°32.50	205°19.38 15.10	232°0.62 52.92	178° 0.11 42.76	240°39.63 4.56	Gienah 175°43.95 -17°40.74
2	243°34.97	220°18.96 16.27	247°1.31 52.16	193°1.99 42.91	255°41.87 4.47	Acrux 173°0.23 -63°14.19
3 4	258° 37.43 273° 39.89	235°18.54 · · 17.43 250°18.13 18.60	262°2.00 · · 51.39 277°2.68 50.62	208° 3.87 · · 43.06	270°44.12 · · 4.39 285°46.36 4.30	Gacrux 171°51.86 -57°15.12
5	273 39.69 288° 42.36	265°17.71 19.76	277°2.68 50.62 292°3.37 49.86	223° 5.75 43.21 238° 7.62 43.36	285°46.36 4.30 300°48.61 4.22	Alioth 166° 12.95 55° 49.74
6	303°44.82	280°17.29 N08°20.93	307°4.06 S02°49.09	253° 9.50 N17° 43.51	315°50.85 S07°4.14	Spica 158°22.64 -11°17.40
7	318° 47.29	295°16.87 22.10	322°4.75 48.32	268°11.38 43.66	330°53.10 4.05	Alkaid 152°51.98 49°11.49
8	333° 49.75	310°16.45 23.26	337°5.44 47.56	283°13.26 43.81	345°55.34 3.97	Hadar 148°36.28 -60°29.47
9	348° 52.21	325°16.03 · · 24.43	352°6.13 · · 46.79	298°15.14 · · 43.96	0°57.59 · · 3.88	Menkent 147°57.97 -36°29.46 Arcturus 145°48.13 19°3.25
10	3°54.68	340°15.61 25.59	7°6.82 46.02	313°17.01 44.11	15°59.83 3.80	Rigil Kent. 139°40.53 -60°56.17
11	18° 57.14	355°15.19 26.75	22°7.51 45.26	328°18.89 44.27	31°2.08 3.72	Kochab 137°18.56 74°3.23
12	33°59.61	10°14.77 N08°27.92	37°8.20 S02°44.49	343°20.77 N17°44.42	46°4.32 S 07°3.63	Zuben'ubi 136°56.37 -16°8.66
13	49°2.07	25°14.35 29.08	52°8.89 43.72	358°22.65 44.57	61°6.57 3.55	Alphecca 126°3.91 26°37.81
14	64°4.53	40°13.93 30.24	67°9.58 42.96	13°24.52 44.72	76°8.81 3.47	Antares 112°16.29 -26°29.18
15 16	79°7.00 94°9.46	55°13.51 · · 31.41 70°13.09 32.57	82°10.27 · · 42.19 97°10.96 41.42	28°26.40 · · 44.87 43°28.28 45.02	91°11.06 · · 3.38 106°13.30 3.30	Atria 107°10.66 -69°4.11
17	109° 11.93	85°12.67 33.73	112°11.65 40.65	58°30.16 45.17	121°15.55 3.21	Sabik 102°3.24 -15°45.36
18	124° 14.39	100°12.25 N08°34.89	127°12.34 S 02°39.89	73°32.03 N17°45.32	136°17.80 S07°3.13	Shaula 96°10.93 -37°7.24 Rasalhague 95°58.89 12°32.34
19	$139^{\circ}16.86$	115°11.83 36.06	142°13.03 39.12	88°33.91 45.47	151°20.04 3.05	
20	$154^{\circ}19.32$	130°11.41 37.22	157°13.72 38.35	103°35.79 45.62	166°22.29 2.96	Eltanin 90°42.15 51°28.80 Kaus Aust. 83°33.13 -34°22.33
21	$169^{\circ}21.78$	145°10.98 · · 38.38	172°14.41 · · 37.59	118°37.66 · · 45.77	181°24.53 · · 2.88	Vega 80°33.45 38°48.04
22	184°24.25	160°10.56 39.54	187° 15.10 36.82	133°39.54 45.92	196°26.78 2.80	Nunki 75°48.38 -26°15.98
23	199°26.71	175°10.14 40.70	202°15.79 36.05	148°41.42 46.07	211°29.03 2.71	Altair 62°0.50 8°55.74
Mer.	pass. 09:44	ν -0.4' $d1.2'$ m-3.90	ν0.7' d-0.8' m1.13	$\nu 1.9' \ d0.2' \ \text{m-}2.02$	$\nu 2.2' \ d$ -0.1' m1.07	Peacock 53°6.67 -56°39.23
						Deneb 49°26.27 45°21.65
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.51 9°58.97
0	214°29.18	190°9.71 N08°41.86	217°16.48 \$02°35.28	163°43.29 N17°46.22	226°31.27 S07°2.63	Al Na'ir 27°33.86 -46°50.50
1	229°31.64	205°9.29 43.02	232°17.17 34.52	178°45.17 46.37	241°33.52 2.55	Fomalhaut 15°15.41 -29°29.62 Scheat 13°46.04 28°12.62
2	244°34.10	220°8.87 44.18	247°17.86 33.75	193°47.05 46.52	256°35.77 2.46	Markab 13°30.73 15°19.95
3	259° 36.57	235°8.44 · · 45.34	262°18.55 · · 32.98	208°48.92 · · 46.67	271°38.01 · · 2.38	
4	274°39.03	250°8.02 46.49	277° 19.24 32.21	223°50.80 46.82	286°40.26 2.30	Apr 24 Wed SHA Mer.pass
5	289°41.50	265°7.59 47.65	292°19.93 31.45	238°52.68 46.97	301°42.51 2.22	Venus 337°58.83 11:18
6	304°43.96	280°7.17 N08°48.81	307°20.62 S02°30.68	253°54.55 N17°47.12	316°44.75 S07°2.13	Mars 4°12.52 09:33
7	319°46.43	295°6.74 49.97	322°21.31 29.91	268°56.43 47.27	331°47.00 2.05	Jupiter 309°42.24 13:09 Saturn 12°12.66 09:00
8 9	334° 48.89 349° 51.35	310°6.32 51.12 325°5.89 · · 52.28	337°22.00 29.15 352°22.69 · · 28.38	283°58.31 47.42 299°0.18 • 47.57	346°49.25 1.97 1°51.49 · · 1.88	Saturn 12 12:00 09:00
10	4° 53.82	340°5.47 53.44	7°23.38 27.61	314°2.06 47.72	1 51.49 · · 1.80 16°53.74 1.80	Apr 25 Thu SHA Mer.pass
11	19° 56.28	355°5.04 54.59	22°24.07 26.84	329° 3.94 47.87	31°55.99 1.72	Venus 336°49.76 11:19
12	34° 58.75	10°4.61 N08°55.75	37°24.77 S 02°26.08	344°5.81 N17°48.02	46°58.24 S 07°1.64	Mars 3°29.89 09:32
13	50°1.21	25°4.19 56.91	52°25.46 25.31	359°7.69 48.17	62°0.48 1.55	Jupiter 309°28.20 13:06 Saturn 12°7.35 08:56
14	65°3.67	40°3.76 58.06	67°26.15 24.54	14° 9.56 48.32	77°2.73 1.47	Saturn 12 1.35 08:50
15	80°6.14	55°3.33 08°59.22	82°26.84 · · 23.77	29°11.44 · · 48.47	92°4.98 · · 1.39	Apr 26 Fri SHA Mer.pass
16	95°8.60	70°2.91 09°0.37	97°27.53 23.01	44°13.32 48.62	107°7.23 1.31	Venus 335° 40.54 11:20
17 18	110° 11.07 125° 13.53	85°2.48 1.52 100°2.05 N09°2.68	112°28.22 22.24 127°28.91 \$02°21.47	59°15.19 48.77 74°17.07 N17°48.92	122°9.48 1.22 137°11.72 507°1.14	Mars 2°47.30 09:30
18 19	125 13.53 140°16.00	115°1.62 3.83	142°29.60 20.70	89°18.94 49.07	152°13.97 1.06	Jupiter 309°14.12 13:03 Saturn 12°2.10 08:53
20	155° 18.46	130°1.19 4.98	157°30.30 19.94	104°20.82 49.22	167°16.22 0.98	Saturn 12°2.10 08:53
21	170° 20.92	145°0.76 · · 6.14	172°30.99 · · 19.17	119°22.69 · · 49.36	182°18.47 · · 0.89	Horizontal parallax
22	185°23.39	160°0.33 7.29	187°31.68 18.40	134°24.57 49.51	197°20.72 0.81	Venus: 0.1
23	$200^{\circ}25.85$	174°59.90 8.44	202°32.37 17.63	149°26.44 49.66	212°22.97 0.73	Mars: 0.1
Mer.	pass. 09:40	ν-0.4' d1.2' m-3.91	ν0.7' d-0.8' m1.13	ν1.9' d0.2' m-2.01	ν2.2' d-0.1' m1.07	

h	Su	-0.0109 360		011 —			
h			-		Moon		
Wed	GHA 180°28.02	Dec N12°57.32	GHA 0°58.44	ν 147'	Dec \$14°34.78	d 12.0'	HP
0 1	180 28.02 195°28.13	58.14	0 58.44 15°32.19	14.7' 14.7'	14°47.59	12.8' 12.8'	54.8' 54.8'
2	210°28.24	58.96	30°5.86	14.6'	15°0.34	12.7'	54.8'
3	225°28.36	12°59.78	44°39.46	14.5'	15°13.04	12.6'	54.8'
4	240°28.47	13°0.60	59°12.98	14.4'	$15^{\circ}25.68$	12.6'	54.8'
5	255°28.58	1.42	73°46.43	14.4'	15°38.27	12.5'	54.9'
6 7	270°28.69 285°28.80	N13°2.24 3.05	88°19.81 102°53.10	14.3' 14.2'	\$15°50.80 16°3.27	12.5' 12.4'	54.9' 54.9'
8	300°28.91	3.05	102 53.10 117°26.32	14.2 14.1'	16° 3.27 16° 15.68	12.4'	54.9'
9	315°29.02	4.69	131°59.47	14.1'	16°28.04	12.3'	54.9'
10	330°29.13	5.51	146°32.53	14.0'	$16^{\circ}40.33$	12.2'	54.9'
11	345°29.24	6.32	161°5.52	13.9'	$16^{\circ}52.56$	12.2'	55.0'
12	0°29.35	N13°7.14	175°38.42	13.8'	\$17°4.72	12.1'	55.0'
13 14	15°29.46 30°29.57	7.96 8.77	190°11.24 204°43.98	13.7' 13.7'	17°16.82 17°28.86	12.0' 12.0'	55.0' 55.0'
14 15	30 29.57 45°29.68	• • 9.59	204 43.98 219°16.64	13.6'	17 28.80 17°40.82	12.0 11.9'	55.0'
16	60°29.78	10.40	233°49.22	13.5'	17°52.72	11.8'	55.0'
17	75°29.89	11.22	248°21.71	13.4'	18°4.55	11.8'	55.1'
18	90°30.00	N13°12.03	262°54.11	13.3'	S18°16.31	11.7'	55.1'
19	105°30.11	12.85	277°26.44	13.2'	18°28.00	11.6'	55.1'
20	120°30.22	13.66	291°58.67	13.1'	18°39.61	11.5'	55.1'
21 22	135°30.32 150°30.43	· · 14.47 15.28	306°30.82 321°2.88	13.1' 13.0'	18°51.15 19°2.62	11.5' 11.4'	55.1' 55.1'
23	165°30.54	15.28	321 2.88 335°34.86	12.9'	19 2.02 19°14.01	11.4	55.2'
	SD = 15.9'						
	-3D = 15.9'	d = 0.8'		5L	0 = 14.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°30.65 195°30.75	N13°16.91 17.72	350°6.74 4°38.54	12.8' 12.7'	\$19°25.32 19°36.55	11.2' 11.2'	55.2' 55.2'
2	210°30.86	17.72	4 38.54 19°10.25	12.7	19 30.55 19°47.70	11.1'	55.2'
3	225°30.96	. 19.34	33°41.86	12.5'	19°58.77	11.0'	55.2'
4	240°31.07	20.15	48°13.39	12.4'	20°9.75	10.9'	55.2'
5	255°31.18	20.96	62°44.83	12.3'	$20^{\circ}20.66$	10.8'	55.3'
6	270°31.28	N13°21.77	77°16.17	12.3'	S20°31.47	10.7'	55.3'
7 8	285°31.39 300°31.49	22.58 23.39	91°47.42 106°18.58	12.2' 12.1'	20°42.21 20°52.85	10.6' 10.6'	55.3' 55.3'
9	315°31.60	24.20	100 16.56 120°49.65	12.1	20 52.65 21°3.40	10.5	55.3'
10	330°31.70	25.01	135°20.63	11.9'	21°13.87	10.4	55.3'
11	345°31.81	25.82	149°51.51	11.8'	21°24.24	10.3'	55.4'
12	0°31.91	N13°26.62	164°22.30	11.7'	S21°34.52	10.2'	55.4'
13	15°32.02 30°32.12	27.43	178°52.99	11.6'	21°44.70	10.1'	55.4'
14 15	45°32.12	28.24 •• 29.04	193°23.59 207°54.10	11.5' 11.4'	21°54.79 22°4.79	10.0' 9.9'	55.4' 55.4'
16	60°32.33	29.85	222°24.51	11.3	22°14.68	9.8'	55.5'
17	75°32.43	30.66	236°54.82	11.2'	22°24.48	9.7'	55.5'
18	90°32.53	N13°31.46	251°25.04	11.1'	S22°34.18	9.6'	55.5'
19	105°32.64	32.27	265°55.17		22°43.77	9.5'	55.5'
20	120°32.74	33.07	280°25.20	10.9'	22°53.26 23°2.65	9.4'	55.5'
21 22	135°32.84 150°32.94	· · 33.87 34.68	294°55.13 309°24.97	10.8' 10.7'	23° 2.65 23° 11.93	9.3' 9.2'	55.5' 55.6'
23	165°33.05	35.48	323°54.71	10.6'	23°21.11	9.1'	55.6'
	SD = 15.9'	d = 0.8'			0 = 15.0'		
	<u> </u>	<u>u = 0.0</u>		- 52	7 = 13.0		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°33.15 195°33.25	N13°36.28 37.09	338°24.36 352°53.91	10.6' 10.5'	\$23°30.17 23°39.13	9.0' 8.8'	55.6' 55.6'
2	195°33.25 210°33.35	37.09 37.89	7°23.37	10.5	23° 47.98	8.8	55.6'
3	225°33.45	• • 38.69	21°52.73	10.4	23°56.71	8.6'	55.7'
4	240°33.55	39.49	36°21.99	10.2'	24°5.34	8.5'	55.7'
5	255°33.65	40.29	50°51.17	10.1'	24°13.84	8.4'	55.7'
6	270°33.75	N13°41.09	65°20.24	10.0'	\$24°22.23	8.3'	55.7'
7 8	285°33.85 300°33.95	41.89 42.69	79°49.22 94°18.11	9.9' 9.8'	24°30.51 24°38.66	8.2' 8.0'	55.7' 55.8'
9	300°33.95 315°34.05	42.69 •• 43.49	94°18.11 108°46.90	9.8° 9.7'	24° 38.66 24° 46.70	8.0 7.9'	55.8'
10	330°34.15	44.29	123°15.60	9.6'	24°54.61	7.8'	55.8'
11	345°34.25	45.09	137°44.21	9.5'	25°2.41	7.7'	55.8'
12	0°34.35	N13°45.89	152°12.72	9.4'	S25°10.08	7.5'	55.8'
13	15°34.45	46.69	166°41.14	9.3'	25°17.62	7.4'	55.9'
14 15	30°34.55 45°34.65	47.48 •• 48.28	181°9.47 195°37.70	9.2' 9.1'	25°25.04 25°32.33	7.3' 7.2'	55.9' 55.9'
16	60°34.75	49.08	210°5.85	9.1 9.1'	25 32.33 25°39.50	7.2 7.0'	55.9'
17	75°34.84	49.87	224°33.90	9.0'	25°46.53	6.9'	55.9'
	90°34.94	N13°50.67	239°1.87	8.9'	S25°53.43	6.8'	56.0'
18		51.46	253°29.74	8.8'	26°0.20	6.6'	56.0'
18 19	105°35.04					6.5'	56.0'
18 19 20	120°35.14	52.26	267°57.53	8.7'	26°6.84		
18 19 20 21	120°35.14 135°35.23	52.26 •• 53.05	282°25.23	8.6'	$26^{\circ}13.34$	6.4'	56.0'
18 19 20	120°35.14	52.26					
18 19 20 21 22	120°35.14 135°35.23 150°35.33	52.26 •• 53.05 53.85	282°25.23 296°52.84	8.6' 8.5' 8.4'	26°13.34 26°19.71	6.4' 6.2'	56.0' 56.0'

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Junser	Civil	Naut.
N 72°	////	////	02:34	21:27	////	////
N 70°	////	01:00	03:02	20:58	23:10	////
68°	////	01:55	03:23	20:36	22:07	////
66°	////	02:27	03:39	20:19	21:33	////
64°	00:53	02:50	03:53	20:05	21:09	23:16
62°	01:41	03:08	04:04	19:54	20:50	22:20
60°	02:11	03:23	04:13	19:44	20:35	21:49
N 58°	02:32	03:36	04:22	19:36	20:22	21:26
56°	02:49	03:46	04:29	19:28	20:11	21:09
54°	03:04	03:56	04:36	19:21	20:02	20:54
52°	03:16	04:04	04:41	19:16	19:53	20:42
50°	03:26	04:11	04:47	19:10	19:46	20:31
45°	03:47	04:26	04:58	18:59	19:30	20:09
N 40°	04:04	04:39	05:07	18:49	19:18	19:53
35°	04:17	04:49	05:15	18:41	19:08	19:40
30°	04:28	04:57	05:22	18:34	18:59	19:29
20°	04:45	05:12	05:34	18:22	18:44	19:11
N 10°	04:58	05:23	05:45	18:11	18:33	18:58
0°	05:09	05:33	05:54	18:01	18:23	18:47
S 10°	05:18	05:43	06:04	17:52	18:13	18:38
20°	05:26	05:52	06:14	17:41	18:04	18:30
30°	05:33	06:01	06:25	17:30	17:54	18:23
35°	05:36	06:06	06:32	17:23	17:49	18:19
40°	05:40	06:11	06:39	17:16	17:44	18:16
45°	05:43	06:18	06:48	17:07	17:38	18:12
S 50°	05:47	06:25	06:58	16:57	17:30	18:08
52°	05:48	06:28	07:03	16:52	17:27	18:07
54°	05:50	06:31	07:08	16:47	17:24	18:05
56°	05:51	06:35	07:14	16:41	17:20	18:04
58°	05:53	06:39	07:20	16:34	17:16	18:02
S 60°	05:54	06:43	07:28	16:27	17:11	18:00

Lat.		Moonris	е		Moonset	t
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°				02:14		
N 70°	23:44			02:47	01:19	_
68°	22:36			03:10	02:28	
66°	22:01		00:52	03:29	03:04	01:54
64°	21:36	23:39		03:44	03:31	03:07
62°	21:16	23:03		03:57	03:51	03:44
60°	21:00	22:38		04:08	04:08	04:10
N 58°	20:47	22:18	23:50	04:17	04:22	04:31
56°	20:35	22:01	23:27	04:26	04:35	04:48
54°	20:25	21:47	23:09	04:33	04:45	05:03
52°	20:16	21:35	22:53	04:40	04:55	05:15
50° 45°	20:08	21:24	22:40 22:13	04:46 04:59	05:03	05:26 05:50
	19:51	21:02			05:22	
N 40°	19:38	20:44	21:51	05:10	05:37	06:09
35° 30°	19:26	20:29	21:33	05:20	05:49	06:25
30° 20°	19:16 18:59	20:16 19:54	21:18 20:52	05:28 05:42	06:00 06:20	06:39 07:02
N 10°	18:44	19:35	20:32	05:55	06:36	07:02
0°	18:30	19:17	20:09	06:06	06:52	07:42
S 10°	18:16	19:00	19:48	06:18	07:08	08:01
20°	18:01	18:41	19:27	06:31	07:25	08:22
30°	17:45	18:20	19:01	06:46	07:45	08:46
35°	17:35	18:07	18:46	06:54	07:56	09:00
40°	17:24	17:53	18:29	07:04	08:09	09:16
45°	17:11	17:36	18:09	07:15	08:25	09:36
S 50°	16:56	17:16	17:43	07:29	08:44	10:01
52°	16:48	17:06	17:31	07:36	08:54	10:13
54°	16:40	16:55	17:17	07:43	09:04	10:26
56°	16:31	16:42	17:00	07:51	09:16	10:42
58°	16:21	16:28	16:41	08:01	09:30	11:01
S 60°	16:10	16:11	16:16	08:11	09:46	11:25

		Sun		Moon			
Day Eqn		Eqn.of Time		Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-96%	
24	01:52	01:57	11:58	-:-	12:18		
25	02:03	02:08	11:58	00:41	13:05		
26	02:13	02:17	11:58	01:29	13:55		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$215^{\circ}28.32$	189°59.47 N09°9.59	217°33.06 S 02°16.86	164°28.32 N17°49.81	227°25.22 S 07°0.65	Alpheratz 357°35.71 29°13.26
1	230° 30.78	204°59.04 10.74	232° 33.76 16.10	179°30.19 49.96	242°27.46 0.56	Ankaa 353°8.09 -42°10.41
2	245° 33.24	219°58.61 11.89	247° 34.45 15.33	194°32.07 50.11	257°29.71 0.48	Schedar 349°32.28 56°40.02
3	260° 35.71	234°58.18 · · 13.05	262°35.14 · · 14.56	209°33.95 · · 50.26	272°31.96 · · 0.40	Diphda 348°48.20 -17°51.27
4	275°38.17	249°57.75 14.20	277° 35.83 13.79	224°35.82 50.41	287°34.21 0.32	Achernar 335°21.18 -57°6.79
5	290° 40.64	264°57.32 15.35	292°36.52 13.03	239°37.70 50.56	302°36.46 0.24	Hamal 327°52.24 23°34.51
6	305°43.10	279°56.89 N09°16.49	307°37.22 S02°12.26	254°39.57 N17°50.71	317°38.71 S07°0.15	Polaris 314°49.42 89°22.01
7	320° 45.57	294°56.46 17.64	322°37.91 11.49	269°41.45 50.86	332°40.96 0.07	Acamar 315°12.64 -40°12.52
8	335°48.03	309°56.02 18.79	337°38.60 10.72	284°43.32 51.01	347°43.21 06°59.99	Menkar 314°7.11 4°11.00
9	350°50.49	324°55.59 · · 19.94	352°39.29 · · 9.96	299°45.20 · · 51.16 314°47.07 51.31	2°45.46 06°59.91	Mirfak 308°29.63 49°56.81
10	5°52.96 20°55.42	339°55.16 21.09 354°54.72 22.24	7°39.98 9.19 22°40.68 8.42	314°47.07 51.31 329°48.94 51.46	17°47.71 59.83 32°49.96 59.74	Aldebaran 290°40.61 16°33.44
11 12	35° 57.89	9°54.29 N09°23.38	37°41.37 S02°7.65	344°50.82 N17°51.61	47°52.21 S06°59.66	Rigel 281°4.71 -8°10.52
13	51°0.35	24°53.86 24.53	52°42.06 6.88	359°52.69 51.76	62°54.46 59.58	Capella 280°23.15 46°1.41
14	66°2.81	39°53.42 25.68	67°42.76 6.12	14°54.57 51.90	77°56.71 59.50	Bellatrix 278°23.78 6°22.24
15	81°5.28	54°52.99 · · 26.82	82°43.45 · · 5.35	29°56.44 · · 52.05	92°58.96 · · 59.42	Elnath 278° 2.91 28° 37.69
16	96°7.74	69°52.55 27.97	97°44.14 4.58	44°58.32 52.20	108°1.21 59.34	Alnilam 275°38.58 -1°11.26
17	111° 10.21	84°52.12 29.12	112°44.83 3.81	60° 0.19 52.35	123°3.46 59.26	Betelgeuse 270°52.96 7°24.65
18	126° 12.67	99°51.68 N09°30.26	127°45.53	75°2.07 N17°52.50	138°5.71 S06°59.17	Canopus 263°52.97 -52°42.72
19	141° 15.14	114°51.25 31.41	142° 46.22 2.28	90°3.94 52.65	153°7.96 59.09	Sirius 258°26.95 -16°45.10
20	156° 17.60	129° 50.81 32.55	157° 46.91 1.51	105° 5.81 52.80	168°10.21 59.01	Adhara 255°6.51 -29°0.48
21	171° 20.06	144°50.38 · · 33.69	172° 47.61 · · 0.74	120° 7.69 · · 52.95	183°12.46 · · 58.93	Procyon 244°51.56 5°9.72
22	186° 22.53	159°49.94 34.84	187°48.30 01°59.97	135° 9.56 53.10	198°14.71 58.85	Pollux 243°18.14 27°58.13
23	201°24.99	174°49.50 35.98	202°48.99 01°59.21	150°11.44 53.25	213°16.96 58.77	Avior 234°15.06 -59°35.49
		-				Suhail 222°46.72 -43°32.07
Mer.	pass. 09:37	ν -0.4' $d1.2'$ m-3.91	$ u 0.7' \ d$ -0.8' m1.13	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	$ u 2.2' \ d$ -0.1' m1.07	Miaplacidus 221°38.32 -69°49.27
						Alphard 217°48.29 -8°45.94
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.96 11°50.90
0	216° 27.46	189°49.07 N09°37.12	217°49.68	165°13.31 N17°53.40	228°19.21 \$06°58.69	Dubhe 193°41.32 61°37.41
1	231° 29.92	204°48.63 38.27	232°50.38 57.67	180°15.18 53.55	243°21.47 58.60	Denebola 182°25.32 14°26.16
2	246° 32.38	219°48.19 39.41	247°51.07 56.90	195°17.06 53.69	258°23.72 58.52	Gienah 175°43.95 -17°40.74
3	261° 34.85	234°47.75 · · 40.55	262°51.77 · · 56.13	210°18.93 · · 53.84	273°25.97 · · 58.44	Acrux 173°0.23 -63°14.20
4	276° 37.31	249° 47.31 41.69	277° 52.46 55.37	225°20.81 53.99	288°28.22 58.36	Gacrux 171°51.86 -57°15.13
5	291°39.78	264°46.87 42.83	292°53.15 54.60	240°22.68 54.14	303°30.47 58.28	Alioth 166°12.96 55°49.75
6	306° 42.24	279°46.44 N09°43.97	307°53.85 S 01°53.83	255°24.55 N17°54.29	318°32.72 S 06°58.20	Spica 158°22.64 -11°17.40
7	321°44.71	294°46.00 45.11	322°54.54 53.06	270°26.43 54.44	333°34.97 58.12	Alkaid 152°51.98 49°11.50
8	336°47.17	309° 45.56 46.25	337°55.23 52.29	285°28.30 54.59	348°37.23 58.04	Hadar 148°36.26 -60°29.48
9	351°49.63	324°45.12 · · 47.39	352°55.93 · · 51.53	300°30.17 · · 54.74	3°39.48 · · 57.96	Menkent 147°57.96 -36°29.47
10	6°52.10	339°44.68 48.53	7°56.62 50.76	315°32.05 54.88	18°41.73 57.88	Arcturus 145°48.13 19°3.26 Rigil Kent. 139°40.51 -60°56.18
11	21°54.56	354°44.24 49.67	22°57.31 49.99	330°33.92 55.03	33°43.98 57.80	Rigil Kent. 139°40.51 -60°56.18 Kochab 137°18.55 74°3.24
12	36°57.03	9°43.80 N09°50.81	37°58.01 S 01°49.22	345°35.79 N17°55.18	48°46.24 S 06°57.72	Zuben'ubi 136°56.36 -16°8.66
13	51°59.49	24°43.35 51.95	52°58.70 48.45	0°37.67 55.33	63°48.49 57.63	Alpheca 126°3.90 26°37.82
14	$67^{\circ}1.96$	39°42.91 53.08	67°59.40 47.69	15°39.54 55.48	78°50.74 57.55	Antares 112°16.27 -26°29.18
15	82°4.42	54°42.47 •• 54.22	83°0.09 · · 46.92	30°41.41 · · 55.63	93°52.99 · · 57.47	Atria 107°10.61 -69°4.12
16	97°6.88	69°42.03 55.36	98°0.79 46.15	45°43.29 55.78	108°55.25 57.39	Sabik 102°3.22 -15°45.36
17	$112^{\circ}9.35$	84°41.59 56.49	113°1.48 45.38	60°45.16 55.93	123°57.50 57.31	Shaula 96°10.90 -37°7.24
18	$127^{\circ}11.81$	99°41.14 N09°57.63	128°2.17 S 01°44.61	75°47.03 N17°56.07	138°59.75 S 06°57.23	Rasalhague 95°58.87 12°32.35
19	142° 14.28	114°40.70 58.77	143°2.87 43.85	90°48.90 56.22	154°2.00 57.15	Eltanin 90°42.12 51°28.81
20	$157^{\circ}16.74$	129°40.26 09°59.90	158°3.56 43.08	105°50.78 56.37	169°4.26 57.07	Kaus Aust. 83°33.10 -34°22.33
21	172° 19.20	144°39.81 10°1.04	173°4.26 · · 42.31	120°52.65 · · 56.52	184°6.51 · · 56.99	Vega 80°33.42 38°48.05
22	187° 21.67	159°39.37 2.17	188°4.95 41.54	135°54.52 56.67	199°8.76 56.91	Nunki 75°48.35 -26°15.98
23	202°24.13	174°38.92 3.30	203°5.65 40.77	150°56.40 56.82	214°11.02 56.83	Altair 62°0.48 8°55.75
Meri	pass. 09:33	ν-0.4' d1.1' m-3.91	ν 0.7' d-0.8' m1.13	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	ν2.3' d-0.1' m1.07	Peacock 53°6.63 -56°39.22
		- 0.1 41.1 11 0.91				Deneb 49°26.23 45°21.65
						Enif 33°39.49 9°58.98
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.83 -46°50.49
0	217° 26.60	189°38.48 N10°4.44	218°6.34 S01°40.01	165°58.27 N17°56.97	229°13.27 \$06°56.75	Fomalhaut 15°15.38 -29°29.61
1	232°29.06	204°38.03 5.57	233°7.04 39.24	181° 0.14 57.11	244°15.52 56.67	Scheat 13°46.02 28°12.62
2	247°31.53	219°37.59 6.70	248°7.73 38.47	196°2.01 57.26	259°17.78 56.59	Markab 13°30.71 15°19.95
3	262°33.99	234°37.14 · · 7.84	263°8.42 · · 37.70	211°3.89 · · 57.41	274°20.03 · · 56.51	
4	277° 36.45	249°36.70 8.97	278°9.12 36.93	226° 5.76 57.56	289°22.29 56.43	Apr 27 Sat SHA Mer.pass
5	292°38.92	264°36.25 10.10	293°9.81 36.17	241°7.63 57.71	304°24.54 56.35	Venus 334°31.16 11:20
6	307°41.38	279°35.80 N10°11.23	308°10.51 S01°35.40	256° 9.50 N17° 57.86	319°26.79	Mars 2°4.75 09:29
7	322°43.85	294°35.36 12.36	323°11.20 34.63	271°11.37 58.00	334°29.05 56.19	Jupiter 309°0.00 13:00
8	337°46.31	309°34.91 13.49	338°11.90 33.86	286°13.25 58.15	349°31.30 56.11	Saturn 11°56.90 08:49
9	352°48.77	324°34.46 · · 14.62	353°12.59 · · 33.09	301°15.12 · · 58.30	4°33.56 · · 56.03	Apr 28 Sun SHA Mer.pass
10	7°51.24	339°34.02 15.75	8°13.29 32.33	316°16.99 58.45	19°35.81 55.95	Venus 333°21.61 11:21
11	22°53.70	354°33.57 16.88	23°13.99 31.56	331°18.86 58.60	34°38.07 55.87	Mars 1°22.23 09:28
12	37°56.17	9°33.12 N10°18.01	38°14.68 S 01°30.79	346°20.73 N17°58.75	49°40.32 \$06°55.79	Jupiter 308°45.85 12:57
13	52°58.63	24°32.67 19.14	53°15.38 30.02	1°22.61 58.89	64°42.58 55.71	Saturn 11°51.76 08:45
14	68°1.10	39°32.22 20.27	68°16.07 29.25	16°24.48 59.04	79°44.83 55.63	
15	83°3.56	54°31.77 · · 21.40	83°16.77 · · 28.49	31°26.35 · · 59.19	94°47.09 · · 55.55	Apr 29 Mon SHA Mer.pass
16	98°6.02	69°31.32 22.52	98°17.46 27.72	46°28.22 59.34	109°49.34 55.48	Venus 332°11.88 11:22
17	113°8.49	84°30.87 23.65	113°18.16 26.95	61°30.09 59.49	124°51.60 55.40	Mars 0°39.74 09:27
18	128° 10.95	99°30.42 N10°24.78	128°18.85 S01°26.18	76°31.97 N17°59.63	139°53.85 \$06°55.32	Jupiter 308°31.67 12:55
19	143° 13.42	114°29.97 25.90	143°19.55 25.41	91°33.84 59.78	154°56.11 55.24	Saturn 11°46.67 08:42
20	158° 15.88	129°29.52 27.03	158° 20.25 24.65	106°35.71 17°59.93	169°58.36 55.16	Horizontal parallax
21	173° 18.35	144°29.07 · · 28.15	173°20.94 · · 23.88	121°37.58 18°0.08	185°0.62 · · 55.08	Venus: 0.1
22	188° 20.81	159°28.61 29.28	188°21.64 23.11	136°39.45 0.23	200°2.87 55.00	Venus: 0.1 Mars: 0.1
23	203°23.27	174°28.16 30.40	203°22.33 22.34	151°41.32 0.37	215°5.13 54.92	ividis. U.1
Mer.ı	pass. 09:29	ν -0.4 $'$ $d1.1'$ m-3.91	$ u 0.7' \ d$ -0.8' m1.12	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	$ u 2.3' \ d$ -0.1' m1.07	
	-					

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 35.52	N13°55.44	325°47.81	8.4'	\$26°32.04	6.0'	56.1'
1	195°35.62	56.23	340°15.16	8.3'	26°37.99	5.8'	56.1'
2	210°35.72	57.02	354°42.43	8.2'	26°43.80	5.7'	56.1'
3	225°35.81	• • 57.81	9°9.62	8.1'	26°49.48	5.5'	56.1'
4	240°35.91	58.61	23°36.73	8.0'	$26^{\circ}55.01$	5.4'	56.2'
5	255°36.00	13°59.40	38° 3.75	7.9'	27°0.39	5.2'	56.2'
6	270°36.10	$N14^{\circ}0.19$	52°30.70	7.9'	\$27°5.63	5.1'	56.2'
7	285°36.19	0.98	66°57.57	7.8'	$27^{\circ}10.73$	4.9'	56.2'
8	300°36.29	1.77	81°24.36	7.7'	$27^{\circ}15.68$	4.8'	56.3'
9	315°36.38	• • 2.56	95°51.07	7.6'	27°20.48	4.7'	56.3'
10	330°36.48	3.35	110°17.71	7.6'	27°25.13	4.5'	56.3'
11	345°36.57	4.14	124°44.27	7.5'	27°29.63	4.4'	56.3'
12	0°36.66	N14° 4.93	139°10.77	7.4'	S27°33.98	4.2'	56.3'
13	15°36.76	5.72	153°37.19	7.4'	27°38.18	4.0'	56.4'
14	30°36.85	6.50 • • 7.29	168°3.54 182°29.82	7.3'	27°42.23 27°46.12	3.9'	56.4
15 16	45°36.94 60°37.04	· · 7.29 8.08	182 29.82 196°56.03	7.2' 7.1'	27 40.12 27°49.86	3.7' 3.6'	56.4' 56.4'
17	75°37.13	8.86	211°22.18	7.1'	27 49.60 27°53.44	3.4'	56.4'
18	90°37.22	N14° 9.65	225°48.26	7.1	\$27°56.87	3.3'	56.5
19	105°37.31	10.44	240°14.28	7.0'	28°0.13	3.1'	56.5'
20	105 37.31 120°37.41	11.22	254° 40.24	6.9'	28°3.24	3.0'	56.5
21	135° 37.50	. 12.01	269°6.14	6.8'	28°6.19	2.8'	56.5
22	150° 37.59	12.79	283°31.98	6.8'	28°8.98	2.6'	56.6'
23	165° 37.68	13.58	297°57.77	6.7'	28°11.61	2.5'	56.6'
	SD = 15.9'	d = 0.8'		SI	O = 15.3'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	180°37.77	N14°14.36	312°23.50	6.7'	S28°14.08	2.3'	56.6'
1	195° 37.86	15.14	326°49.17	6.6'	28°16.39	2.1'	56.6'
2	210°37.95	15.93	341°14.80	6.6'	28°18.53	2.0'	56.6'
3	225°38.04	16.71	355°40.37	6.5	28°20.51	1.8'	56.7'
4	240°38.13	17.49	10°5.90	6.5'	28°22.32	1.6'	56.7'
5	255°38.22	18.27	24°31.37	6.4'	28°23.97	1.5'	56.7'
6	270°38.31	N14°19.06	38°56.81	6.4'	\$28°25.46	1.3'	56.7'
7	285°38.40	19.84	53°22.20	6.3'	28°26.78	1.2'	56.8'
8	300°38.49	20.62	67°47.55	6.3'	28°27.93	1.0'	56.8'
9	315°38.58	• • 21.40	82°12.86	6.3'	28°28.91	0.8'	56.8'
10	330°38.67	22.18	96°38.13	6.2'	28°29.73	0.6'	56.8'
11	345°38.76	22.96	111°3.37	6.2'	28°30.37	0.5'	56.8'
12	0°38.85	N14°23.74	125°28.57	6.2'	S28°30.85	0.3'	56.9'
13	15°38.93	24.51	139°53.74	6.1'	28°31.16	0.1'	56.9'
14	30°39.02	25.29	154°18.88	6.1'	28°31.30	-0.0'	56.9'
15	45°39.11	• • 26.07	168°44.00	6.1'	28°31.27	-0.2'	56.9'
16	60°39.20	26.85	183°9.08	6.1'	28°31.06 28°30.69	-0.4'	57.0'
17 18	75°39.28 90°39.37	27.62 N14°28.40	197°34.14 211°59.18	6.0' 6.0'	28 30.69 \$28°30.15	-0.5' -0.7'	57.0' 57.0'
19	90 39.37 105°39.46	29.18	211 59.18 226°24.20	6.0'	28°29.43	-0.7 -0.9'	57.0'
20	120° 39.54	29.16	240°49.20	6.0'	28°28.54	-0.9	57.0°
21	135° 39.63	30.73	255°14.19	6.0'	28°27.49	-1.1	57.1'
22	150°39.71	31.50	269°39.15	6.0'	28°26.25	-1.4'	57.1
23	165°39.80	32.28	284°4.11	5.9'	28°24.85	-1.6'	57.1
	SD = 15.9'	d = 0.8'		CI	D = 15.4'		
	<u> </u>	u = 0.8		JI	J = 13.4		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.89	N14°33.05	298°29.06	5.9'	S28°23.27	-1.7'	57.2'
1	195°39.97	33.83	312°53.99	5.9'	$28^{\circ}21.52$	-1.9'	57.2'
2	$210^{\circ}40.06$	34.60	$327^{\circ}18.92$	5.9'	$28^{\circ}19.60$	-2.1'	57.2'
3	$225^{\circ}40.14$	• • 35.37	341°43.85	5.9'	$28^{\circ}17.51$	-2.3'	57.2'
4	240° 40.23	36.14	356°8.77	5.9'	28°15.24	-2.4'	57.2'
5	255° 40.31	36.92	10°33.69	5.9'	28°12.80	-2.6'	57.3'
6	270° 40.39	N14°37.69	24°58.61	5.9'	\$28°10.19	-2.8'	57.3'
7	285° 40.48	38.46	39°23.53	5.9'	28°7.40	-3.0'	57.3'
8	300°40.56	39.23	53°48.46	5.9'	28°4.44	-3.1'	57.3'
9	315°40.64 330°40.73	· · 40.00	68°13.39 82°38.33	5.9' 6.0'	28°1.31 27°58.00	-3.3' -3.5'	57.4'
10 11	330°40.73 345°40.81	40.77 41.54	82°38.33 97°3.28	6.0'	27°58.00 27°54.53	-3.5' -3.6'	57.4' 57.4'
11	0°40.89	41.54 N14°42.31	97 3.28 111°28.25	6.0'	27 54.53 \$27°50.88	-3.8'	57.4 57.4'
13	15° 40.98	43.08	125°53.23	6.0'	27°47.06	-4.0'	57.5'
14	30°41.06	43.85	140°18.22	6.0'	27°43.07	-4.2	57.5'
15	45° 41.14	• • 44.61	154°43.23	6.0'	27°38.90	-4.3'	57.5'
16	60°41.22	45.38	169°8.26	6.0'	27°34.57	-4.5'	57.5'
17	75°41.30	46.15	183°33.30	6.1'	27°30.06	-4.7'	57.6'
18	90°41.38	N14°46.91	197°58.38	6.1'	S27°25.39	-4.8'	57.6'
19	$105^{\circ}41.47$	47.68	212°23.47	6.1'	$27^{\circ}20.54$	-5.0'	57.6'
20	120°41.55	48.45	226°48.59	6.1'	$27^{\circ}15.53$	-5.2'	57.6'
21	135° 41.63	• • 49.21	241°13.74	6.2'	27°10.34	-5.4'	57.7'
22	150°41.71	49.98	255°38.91	6.2'	27°4.99	-5.5'	57.7'
23	165°41.79	50.74	270°4.12	6.2'	26°59.47	-5.7'	57.7'
	SD = 15.9'	d = 0.8'	<u>-</u>	SI	D = 15.6'		

				.p	то л.р.	5 、	
Lat.	Twilight		Sunrise	Sunset	Twi	light	
	Naut.	Civil	•	Cunsce	Civil	Naut.	
N 72°	////	////	02:13	21:48	////	////	
N 70°	////	////	02:46	21:13	////	////	
68°	////	01:32	03:09	20:49	22:31	////	
66°	////	02:10	03:27	20:30	21:49	////	
64°	////	02:37	03:42	20:15	21:21	////	
62°	01:21	02:57	03:55	20:02	21:00	22:41	
60°	01:56	03:13	04:05	19:52	20:44	22:03	
N 58°	02:20	03:27	04:14	19:42	20:30	21:38	
56°	02:39	03:38	04:22	19:34	20:18	21:18	
54°	02:55	03:48	04:29	19:27	20:08	21:02	
52°	03:08	03:57	04:35	19:21	19:59	20:49	
50°	03:19	04:05	04:41	19:15	19:51	20:37	
45°	03:42	04:21	04:53	19:02	19:34	20:14	
N 40°	03:59	04:34	05:03	18:52	19:21	19:57	
35°	04:13	04:45	05:12	18:43	19:10	19:43	
30°	04:24	04:54	05:20	18:36	19:01	19:31	
20°	04:43	05:10	05:32	18:23	18:46	19:13	
N 10°	04:57	05:22	05:44	18:11	18:33	18:58	
0°	05:08	05:33	05:54	18:01	18:22	18:47	
S 10°	05:18	05:43	06:04	17:50	18:12	18:37	
20°	05:26	05:52	06:15	17:39	18:02	18:28	
30°	05:34	06:03	06:27	17:27	17:52	18:20	
35°	05:38	06:08	06:34	17:20	17:46	18:16	
40°	05:42	06:14	06:42	17:12	17:40	18:12	
45°	05:46	06:21	06:52	17:03	17:33	18:08	
S 50°	05:51	06:29	07:03	16:51	17:25	18:03	
52°	05:52	06:32	07:08	16:46	17:22	18:02	
54°	05:54	06:36	07:14	16:40	17:18	18:00	
56°	05:56	06:40	07:20	16:34	17:14	17:58	
58°	05:58	06:45	07:27	16:27	17:09	17:56	
S 60°	06:00	06:50	07:35	16:19	17:04	17:53	
Lat.		Moonris	ie		Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°							
N 70°							
68°							
66°							
C 4 0	l —			l			

Lat.		Moonris	e		Moonset	t
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°						
64°						
62°	01:05			03:31		
60°	00:20	01:53	02:51	04:17	04:40	05:44
N 58°		01:13	02:12	04:47	05:21	06:23
56°		00:45	01:44	05:10	05:49	06:51
54°		00:23	01:23	05:29	06:11	07:12
52°		00:06	01:05	05:45	06:29	07:30
50°	23:50		00:49	05:59	06:44	07:45
45°	23:20	•• ••	00:19	06:27	07:15	08:16
N 40°	22:56	23:55		06:49	07:39	08:39
35°	22:36	23:35		07:07	07:59	08:59
30°	22:19	23:18		07:23	08:16	09:15
20°	21:51	22:49	23:45	07:50	08:44	09:44
N 10°	21:27	22:25	23:22	08:13	09:09	10:08
0°	21:04	22:02	23:00	08:35	09:32	10:30
S 10°	20:42	21:39	22:39	08:57	09:55	10:52
20°	20:18	21:15	22:16	09:20	10:19	11:16
30°	19:50	20:46	21:49	09:47	10:48	11:44
35°	19:33	20:29	21:33	10:03	11:05	12:00
40°	19:14	20:10	21:15	10:22	11:24	12:19
45°	18:51	19:46	20:52	10:45	11:48	12:42
S 50°	18:22	19:15	20:24	11:14	12:19	13:11
52°	18:07	19:00	20:09	11:28	12:34	13:26
54°	17:50	18:42	19:53	11:45	12:52	13:42
56°	17:30	18:20	19:34	12:05	13:14	14:02
58°	17:05	17:53	19:10	12:30	13:42	14:26
S 60°	16:31	17:13	18:37	13:04	14:21	14:59

The GRA	h	Aries	Venus	Mars	Jupiter	Saturn
2 286 287 286 287 28	Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
12 237-28.2 0 2067-750 32.6 5 237-28.7 2 2000 1811-4.0 6 0.67 248*9.6 4 54.7 2 268*3.7 2 247-28.5 35 -3.40 0 237-51.2 1.97.7 211-4.8 1 0.07 175-14.1 5 4.54 1 3.4 3.3 3.2 347-38.5 3.40 0 237-51.2 1.97.7 211-4.8 1 0.07 175-14.1 5 4.54 1 3.4 3.3 3.4 347-38.5 3.40 0 237-51.2 1.97.7 211-4.8 1 0.07 175-14.1 5 4.54 1 3.4 3.3 3.4 347-38 1 3.0 347-32 1 3.0 347-3						
2 28*30.67 219*52.80 33.77 248*24.42 20.004 196*649 0.02 200*11.00 54.68 4 278*25.90 249*25.40 34.00 278*25.12 19.27 211*48.18 1.00 70.77 278*11.5 1.54.13 248*25.80 249*25.80 249*25.40 371.40 229*25.81 18.50 226*50.08 1.11 290*16.11 54.33 5.00 24.00 249*25.40 371.40 229*25.81 18.50 226*50.08 1.11 290*16.11 54.33 5.00 24.00 34.00 371.40 229*25.81 18.50 226*50.08 1.11 290*16.11 54.33 5.00 24.00 38.00						
3 263*3313 244*20.85 34.90 263*25.12 19.27 211*48.81 0.97 275*14.15 54.01						
1						
9 93°38'00 206°2544 3714 293°2651 17.73 241°255 1.26 305°18.67 94.65 303°372 279°2499 309°3208 303°37790 16.20 270°6629 1.56 335°33.18 54.20 333°37929 296°2453 303°33 333°7790 16.20 270°6629 1.56 335°33.18 54.20 333°37929 334°3202 34.66 320°38.16 1.70 390°32.16 54.20 333°37929 334°3202 34.66 320°38.16 320°38.16 320°38.16 335°37.09 34.10 333°37929 34.10 320°38.16 320°38.1						
0 308*405.2 279*4.99 N10*38.26 308*77.21 S01*16.96 226*54.2 N18*1.41 307*00.02 S06*54.37 3.33*4.95.45 300*24.08 40.50 338*28.60 15.43 206*58.16 1.70 350*25.44 54.21 3.33*4.54.5 300*24.08 40.50 338*28.60 15.43 206*58.16 1.70 350*25.44 54.21 3.35*4.75 328*23.16 42.74 8*2.99 91 13.89 31*71.00 2.00 20*29.59 5 4.05 1.0 8*50.38 38*23.16 42.74 8*2.99 91 13.89 31*71.00 2.00 20*29.59 5 4.05 1.1 8*50.38 38*23.16 42.74 8*2.99 91 13.89 31*71.00 2.00 20*29.59 5 4.05 1.3 83*75.77 24*21.79 46.10 53*32.08 11.99 2*75.00 14.11 1.4 66*0.20 38*21.31 0*22.25 N10*4.98 83*33.33 50*12.50 2.74*5.60 18*2.29 2.99 80*38.88 3.37*1.15 1.5 88*2.70 38*2.19 40.40 58*32.78 10.65 21*12.60 2.274 95*41.24 53.66 1.6 90*51.6 60*20.42 40.45 96*34.17 9.26 41*2.10 2.20 3.20 38.08 3.37*1.15 1.7 118*7.63 86*19.96 50.57 113*34.87 8.52 62*15.00 3.03 3.12*45.50 53.51 1.7 118*7.63 86*19.96 50.57 113*34.87 8.52 62*15.00 3.03 3.12*45.50 53.51 1.8 120*10.00 90*19.50 50*15.168 128*53.65 50*17.77 7*16.87 18*3.18 144*36.5 53.58 1.7 118*7.63 118*19.16 5.50 31*37*37.6 5.54 5.7 7*16.87 18*3.18 144*36.5 53.58 1.7 118*7.63 118*19.16 5.50 31*37*37.6 5.54 5.7 2*2*2.39 20*2*2*4 14*3.33 155*00.7 3.32 22 189*19.99 150*17.67 55.15 188*38.35 4.68 137*24.5 3.37 200*57.04 53.12 22 189*19.99 150*17.67 55.15 188*38.35 4.68 137*24.5 3.37 200*57.04 53.12 23 204*22.14 14*17.12 11*17*17.24 11*17*17.24 11*10*10*10*10*10*10*10*10*10*10*10*10*1						
1 3374-299 294-74-53 399-380 333*77.90 16.20 271*65-29 1.156 335*23.18 54.29 838*34*32 39*236 14.60 332*20.03 1.185 5*27.69 5.44 1.10 35*3*24*32.11 1.20 35*3*29.29 1.166 320*20.03 1.185 5*27.69 5.44 1.10 35*3*29.29 1.166 320*20.03 1.185 5*27.69 5.44 1.10 35*3*29.29 1.166 320*20.03 1.185 5*27.69 5.44 1.10 31*3*3*3*7*3*10 1.10 3*5*3*10 1.10 3*5*3*10 1.10 3*5*3*						
8 383*4545 309°2408						
9 353'47.92 324'23.62 · 14.62 353'29.92 · 14.66 300'00.03 · 1.85 5'27.09 · 54.13 10 8'50.33 339'23.16 42.74 8.09'2.99 5 34.09 21.00 2.00 20'9.95 5 4.05 11 275'52.84 333'22.17 3.36 22'30.09 131.2 335'32.1 5.36 22'2.15 335'32.21 5.3.08 11.2 335'53.1 9'22.25 N10'4.98 33'1.38 501'1.25 5 347'5.06 N18'2.29 50'34.47 50'53.1 5 5.36 11.59 27'5.1 5 35'32.21 5.3.08 11.59 27'5.1 5 35'32.21 5.3.08 11.59 27'5.1 5 35'32.21 5 3.3.09 11.59 27'5.1 5 35'32.21 5 3.3.09 11.59 27'5.1 5 35'32.21 5 3.3.09 11.59 27'5.1 5 35'32.21 5 3.3.09 11.59 27'5.1 5 35'32.21 5 3.3.09 11.59 31'1.25 5 2.28 11.59 5 2.20 11.59 31'34.7 5 2.50 11.59 11.0						
10						
11 23*59.24 39*62.71 43.86 23*30.69 13.12 33*32*37*						
12 88°55.31 9°22.25 NIO°44.89 38°31.38 SO1°12.36 44°5.66 NI8°2.29 50°34.74 SO6°35.30 13 35°57.77 24°21.79 46.10 53°32.08 11.0°35.00 12.0°12.05 12.44 66°0.24 39°31.36 47.20 66°32.78 10.0°2.17 10.0°2.05 10.0°3.00 12.0°12.05 12.0°4.00 13.0°3.0°3.00 13.0°3.0°3.00 13.0°3.0°3.00 13.0°3.0°3.0°3.0°3.0°3.0°3.0°3.0°3.0°3.0°						
13	11					
14 69°0.24 39°21.34 47.22 68°32.78 10.082 1.7°9.39 5.259 80°38.08 53.74 15 88°27.07 54°20.08 4.94.5 98°34.17 9.28 47°11.31 2.88 110°43.05 53.58 16 99°5.16 69°20.42 4.94.5 98°34.17 9.28 47°11.31 2.88 110°43.05 53.58 17 114°1.63 84°19.09 50.57 113°4.67 8.52 62°15.00 3.03 132°45.75 53.58 18 129°10.09 99°19.50 N10°51.06 128°35.65 6017.75 77°16.67 N18°3.18 140°48.01 506°33.43 19 144°12.56 114°19.05 52.30 143°36.26 60.69 92°18.74 3.33 155°50.27 53.52 19 150°10.02 129°18.59 53.02 158°36.06 6.21 10°720.61 4.33 158°50.27 53.52 12 174°17.04 144°18.15 55.03 173°7.66 5.45 122°22.46 3.50 138°54.78 53.27 12 174°17.04 144°18.15 55.03 173°7.66 5.46 122°22.46 3.50 138°54.78 53.27 12 169°19.59 19°16.02 57.36 30°9.05 3.31 152°36.22 3.59 215°5.35 53.27 18 18 19°19.56 19°17.67 56.15 188°38.55 46.68 13°724.85 3.77 200°57.04 53.12 19 19 19 19 19 19 19	12	$38^{\circ}55.31$	9°22.25 N10°44.98	38°31.38 S 01°12.36	347°5.64 N18°2.29	50°34.47 S 06°53.90
15	13	53°57.77	24°21.79 46.10	53°32.08 11.59	2°7.51 2.44	65°36.72 53.82
16 99"51.6 69"20.42 40.45 99"34.17 9.28 47"13.13 2.88 110"43.50 53.58 18 129"10.99 99"19.50 110"51.68 128"35.56 501"7.75 77"16.87 118"318 140"48.01 506"33.43 19 144"12.56 114"19.05 52.280 114"36.26 60.68 92"16.74 3.33 155"50.27 53.35 20 159"15.02 129"18.59 53.92 158"36.66 6.21 107"20.61 3.44 170"52.53 53.37 21 174"17.47 144"18.13 55.03 173"37.66 6.21 107"20.61 3.44 170"52.53 53.37 22 189"19.95 159"17.67 55.15 188"38.35 4.68 137"24.35 3.77 200"57.04 53.12 21 239"19.52 147"17.27 57.26 200"39.95 3.01 152"26.22 3.92 215"59.30 53.04 Mer.pass. 09:25 ν-0.5" d1.1" m-3.91 ν-0.7" d-0.8" m1.12 ν-1.9" d0.1" m-2.01 ν-2.3" d-0.1" m1.07 Ved GHA	14	69°0.24	39°21.34 47.22	68°32.78 10.82	17° 9.39 2.59	80°38.98 53.74
16 99°5.16 80°20.42 94.45 98°3.417 9.28 47°13.13 2.88 10°44.50 53.86 18 12°14.60 95.55 3.61 18 12°10.09 99°19.50 10°5.08 128°3.56 50°7.75 7°16.87 188°3.18 16°45.25 6°53.45 18 12°19.05 52.80 114°19.05 52.80	15	84°2.70	54°20.88 · · 48.33	83°33.47 · · 10.05	32°11.26 · · 2.74	95°41.24 · · 53.66
14 14 14 12 14 14 15 15 15 15 15 15		99°5.16				
18 129°110.99 99°19.95 N10°16.68 128°19.56 501°7.75 77°16.87 N18°3.18 140°48.01 S06°33.43 20 159°15.02 129°18.59 5.928 143°19.60 6.21 107°20.61 3.47 170°52.53 53.27 21 174°17.49 144°18.13 .55.03 173°37.66 6.21 107°20.61 3.47 170°52.53 53.27 22 189°19.95 159°17.67 55.15 188°38.35 4.68 137°24.35 3.77 200°57.04 53.12 21 23 204°22.41 174°17.21 57.26 203°39.05 3.01 152°26.22 3.92 215°59.30 53.04 Mer.pass. 0.9:25 \$\times_{0.5} \times_{0.5} \times_{0.						
19 144°1256 129°1879 5390 143°3676 698 92°18,74 3.33 155°50 27 53.35 33.7 21 174°17.49 144°18.13 55.03 173°37.66 545 122°2248 362 185°54.78 53.1 22 281°9195 159°17.67 55.15 188°38.35 468 137°24.35 3.77 200°57.04 53.12 23 204°2241 174°17.21 57.26 203°39.05 3.91 152°26.22 3.92 215′59.30 53.04 Mer. → S. 09:25 0.5′ d1.1′ m-3.91 0.7′ d-0.8′ m1.12 1.9′ d0.1′ m-2.01 23′ d-0.1′ m1.07 Wed GHA						
190 150						
21 11 74*17.49 144*18.13 · 55.03 173*37.66 · 5.45 122*22.48 · 3.62 188*54.76 · 53.12 22 20*24.21 174*17.21 r 57.26 203*39.05 3.91 152*26.22 3.92 215*95.30 53.04 Mer.pass. 09:25 v - 0.5* d 1.1* m - 3.91 v - 0.7* d - 0.8* m 1.2 v - 1.9* d 0.1* m - 2.01 v - 2.3* d - 0.1* m 1.00 Wed GHA GHA Dec GHA<						
Mer.						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
Wed GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA						
Wed GHA GHA Dec GHA GHA Dec GHA Dec <td>23</td> <td>204°22.41</td> <td>174° 17.21 57.26</td> <td>203°39.05 3.91</td> <td>152°26.22 3.92</td> <td>215°59.30 53.04</td>	23	204°22.41	174° 17.21 57.26	203°39.05 3.91	152°26.22 3.92	215°59.30 53.04
1 219°24.88 189°16.75 N10°58.37 218°39.75 501°3.14 167°28.09 N18°4.06 221°15.65 006°2.96 1 234°37.34 204°16.28 10°9.69 233°40.44 2.37 182°29.96 4.21 246°3.82 52.88 2 246°29.81 219°15.82 11°0.60 248°41.14 1.61 197°31.83 4.36 261°6.08 52.80 3 264°32.27 234°15.36 -1.71 263°41.84 -0.84 212°33.70 -4.51 276°8.34 -5.273 4 279°34.73 249°14.90 2.82 278°42.54 01°0.07 227°35.57 4.65 291°10.59 52.65 5 294°37.20 240°13.51 51.65 338°43.23 00°59.30 242°37.44 4.80 306°12.85 52.57 6 306°39.66 279°13.97 N11°5.05 308°43.93 500°5.65.3 257°39.31 N18°4.95 321°15.11 506°52.49 7 324°42.13 294°13.51 6.16 333°44.63 57.77 72°41.18 5.09 336°17.37 52.42 8 339°44.59 309°13.05 7.27 338°43.33 57.00 267°43.05 5.24 351°19.63 52.24 10 9°49.52 339°12.12 9.49 8°46.72 55.46 332°46.65 5.66 36°26.41 52.11 11 24°51.98 356°11.65 10.59 23°47.42 55.46 332°46.65 5.68 36°26.41 52.11 12 39°54.45 9°11.19 N11°11.70 38°48.12 500°53.93 332°48.65 5.68 36°26.41 52.11 13 46°59.91 32°10.12 1.281 53°48.82 53.16 2°52.39 5.98 66°30.93 51.95 15 85°1.84 54°9.79 1.50.2 83°50.21 55.62 32°56.13 6.62 6	Mer.p	pass. 09:25	ν-0.5′ d1.1′ m-3.91	ν0.7' d-0.8' m1.12	ν1.9' d0.1' m-2.01	ν2.3' d-0.1' m1.07
1 219°24.88 189°16.75 N10°58.37 218°39.75 501°3.14 167°28.09 N18°4.06 221°15.65 006°2.96 1 234°37.34 204°16.28 10°9.69 233°40.44 2.37 182°29.96 4.21 246°3.82 52.88 2 246°29.81 219°15.82 11°0.60 248°41.14 1.61 197°31.83 4.36 261°6.08 52.80 3 264°32.27 234°15.36 -1.71 263°41.84 -0.84 212°33.70 -4.51 276°8.34 -5.273 4 279°34.73 249°14.90 2.82 278°42.54 01°0.07 227°35.57 4.65 291°10.59 52.65 5 294°37.20 240°13.51 51.65 338°43.23 00°59.30 242°37.44 4.80 306°12.85 52.57 6 306°39.66 279°13.97 N11°5.05 308°43.93 500°5.65.3 257°39.31 N18°4.95 321°15.11 506°52.49 7 324°42.13 294°13.51 6.16 333°44.63 57.77 72°41.18 5.09 336°17.37 52.42 8 339°44.59 309°13.05 7.27 338°43.33 57.00 267°43.05 5.24 351°19.63 52.24 10 9°49.52 339°12.12 9.49 8°46.72 55.46 332°46.65 5.66 36°26.41 52.11 11 24°51.98 356°11.65 10.59 23°47.42 55.46 332°46.65 5.68 36°26.41 52.11 12 39°54.45 9°11.19 N11°11.70 38°48.12 500°53.93 332°48.65 5.68 36°26.41 52.11 13 46°59.91 32°10.12 1.281 53°48.82 53.16 2°52.39 5.98 66°30.93 51.95 15 85°1.84 54°9.79 1.50.2 83°50.21 55.62 32°56.13 6.62 6	Wed	GΗΔ	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 234°2734 204°16.28 11°06°9.49 233°40.44 2.37 182°29.96 4.21 246°3.82 52.88 2 249°4372 249°15.52 11°0.60 248°41.14 1.61 197°31.83 4.36 261°6.08 52.80 3 264°32.27 234°15.36 1.171 263°41.84 1.06.11 197°31.83 4.36 261°6.08 52.80 3 24°273.73 249°11.09 1.171 263°41.84 1.00.07 227°35.57 4.65 291°10.59 52.65 5 294°37.20 266°14.44 3.93 2278°42.94 10°0.07 227°35.57 4.46 8.09 306°12.85 52.57 6 306°39.66 279°31.97 N11°5.05 308°43.93 500°56.35 257°39.31 N18°4.95 232°15.11 506°52.04 7 324°42.13 294°31.51 6.16 323°44.63 57.77 272°41.18 5.09 336°17.37 52.42 83 336°45.95 300°31.05 7.77 338°45.3 57.00 227°43.05 5.24 351°16.15 261°6.20 336°4.07 338°4						
2 249°29.81 219°15.82 11°0.60 248°41.14 1.61 107°31.83 4.36 261°6.08 52.80 3 264°32.27 234′15.36 · · · 1.71 263°41.44 · · · 0.84 · · 0.84 212°33.70 · · 4.51 20°6.34 · · 5.72 4 279°34.73 20 264°14.90 2.82 278°42.54 01°0.07 227°35.57 4.65 201°10.59 52.65 5246°37.20 264°14.44 3.93 203°45.23 00°59.38 257°39.31 N18°4.95 321°15.11 506°52.49 7 324°42.13 294°13.51 6.16 323°44.63 300°59.85 3 257°39.31 N18°4.95 321°15.11 506°52.49 7 324°42.13 294°13.51 6.16 323°44.63 35°7.77 272°41.18 5.09 336°17.37 52.42 8 333°44.59 300°13.05 7.27 338°45.33 57.70 227°41.18 5.09 336°17.37 52.42 10 9°49.52 339°12.12 94.99 8°46.72 55.46 317°46.78 5.53 31°10.63 52.34 11 24°51.98 545°11.19 N11°11.70 38°48.12 500°55.93 302°44.91 5.5.39 6°21.89 5.2.61 12 39°54.45 9°11.19 N11°11.70 38°48.12 500°55.93 347°50.52 N18°5.83 31°33.19 52.31 11 24°51.98 545°10.22 4°10.72 12.81 53°48.22 500°55.93 347°50.52 N18°5.83 31°33.19 52.51 14 60°59.38 33°10.26 13.92 668°49.51 52.39 17°54.26 6.112 813.31 95.15 15.31 15°50.93 30°10.26 13.92 668°49.51 52.39 17°54.26 6.112 813.31 95.15 15.81 15°50.93 30°10.26 13.92 668°49.51 52.39 17°54.26 6.112 813.31 95.15 15.16 15°50.93 30°10.26 13.92 668°49.51 52.39 17°54.26 6.112 813.31 95.15 15.16 15°50.93 30°10.26 13.92 668°49.51 52.39 17°54.26 6.112 813.31 95.15 15.16 15°50.93 30°10.26 13.92 668°49.51 52.39 17°54.26 6.112 813.31 95.15 15°50.93 10°50.93 10°50.93 N11°18.34 128°50.31 800°40.93 17°50.94 6.12 11°77.71 115°6.77 84°8.86 17.24 113°51.61 50.09 62°59.87 6.66 126°39.97 51.64 110°50.72 115°6.73 116°6.75 116°6						
3 264°32.27 244°15.36 · · 1.71 263°41.84 · · 0.84 212°33.70 · · 4.65 291°0.59 52.65 52.44 273°2.00 264°14.44 3.93 203°43.23 00°59.30 242°37.44 4.80 306°12.95 52.55 52.97 324°37.20 264°14.44 3.93 203°43.23 00°59.30 242°37.44 4.80 306°12.95 52.55 52.97 324°42.13 294°13.51 6.16 323°44.63 57.77 272°41.18 5.59 336°17.37 506°52.49 339°44.59 300°13.05 7.27 338°45.33 500°58.30 32°43.91 5.59 336°17.37 5.24 311°16.53 52.34 310°16.53 310°16.						
4 279°34.73 20 264°14.00 2.82 278°42.54 01°0.07 227°35.57 4.65 201°10.59 52.65 5249 330°39.66 279°13.97 N11°5.05 308°43.93 500°58.53 257°93.31 N18°4.95 321°15.11 506°52.49 7 324°42.13 930°13.05 7.27 338°43.93 57.07 227°41.18 5.09 336°17.37 52.42 9 354°47.06 324°12.58 4.838 353°46.02 267°43.05 5.24 31°16.63 224°12.58 4.838 353°46.02 267°44.91 5.5.39 6°21.89 5.224 11.0 9°49.52 339°12.12 9.49 8°46.72 55.46 317°46.78 5.53 24°21.21 19 N11°11.70 38°48.12 500°59.33 347°50.52 N18°5.83 354°11.65 10.59 23°47.42 505°59.33 347°50.52 N18°5.83 354°11.65 10.59 23°47.42 505°59.33 347°50.52 N18°5.83 13°46.75 50.83 34°26.02 50°59.33 347°50.52 50°59.33 36°26.41 52.11 12.39°54.45 9°11.9 N11°11.70 38°48.12 500°59.33 347°50.52 N18°5.83 31°3.10 6°21.33 54°56.91 24°10.72 12.81 53°48.82 553.16 2°52.39 5.98 66°30.33 51.95 14.66°59.38 39°10.26 13.92 66°49.51 52.39 17°54.26 6.12 813.31 51.65 11.65						
5 294°37.20 264°14.44 3.93 292°43.23 00°59.30 242°37.44 4.80 306°12.85 5.2.57 6 309°3.96 6.279°13.97 N11°6.05 308°43.93 500°58.35 257°39.31 N18°4.95 321°5.11 \$06°52.49 7 324°42.13 294°13.51 6.16 323°44.63 57.77 272°41.18 5.09 336°17.37 5.24 8 339°44.59 300°13.05 7.27 338°45.33 57.00 287°43.05 5.24 351°10.63 5.2.34 9 354°47.06 324°12.58 .8.38 33°46.02 5.52.3 302°44.91 5.5.39 6°21.89 5.2.26 10 9°49.52 339°12.12 9.499 8'46.72 5.546 317°46.78 5.53 21°24.15 5.218 11 24°51.98 336°11.05 10.59 23°47.42 5.6.69 332°48.65 5.5.88 36°26.41 5.2.11 22 39°54.45 9°11.19 N1°11.70 38°48.12 500°55.93 347°50.52 N18°5.83 51°28.67 506°52.03 13 54°56.91 24°10.72 12.81 53°48.82 55.16 2°52.39 5.586 630.93 5.195 14 69°59.38 33°10.26 13.92 68°49.51 52.39 17°54.26 6.12 81°33.19 51.87 15 88°1.84 54°9.79 1.50.2 83°50.11 55.39 17°54.26 6.12 81°33.19 51.87 16 100°4.30 69°9.32 16.13 98°50.01 50.86 47°58.00 6.62 111°377.1 51.72 17 115°6.77 84°8.66 17.24 113°51.61 50.09 62°59.87 6.56 10°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 306°51.57 19 145°11.70 114°7.92 19.45 143°53.00 48.55 93°3.61 6.86 156°44.49 51.49 20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 171°46.75 51.41 21 175°16.63 144°6.99 -21.66 13°5.40 47.02 123°7.34 -7.15 186°4.901 -5.13 22 190°190 159°6.52 22.76 188°55.10 46.25 138°5.21 7.30 21°15.12 7.51.22 23 205°21.55 174°6.05 23.86 203°55.80 48.48 153°11.08 7.44 216°55.53 51.18 Mer.pass. 09-21						
6 309°39.66 279°13.97 N11°5.05 308°43.93 S00°58.53 25°39.31 N18°4.95 321°15.11 S06°52.49 336°34°47.06 324°12.58 3.36°17.37 52.42 338°45.33 57.00 287°33.05 5.24 351°19.63 5.23 48 339°44.59 309°13.05 7.27 338°45.33 57.00 287°33.05 5.24 351°19.63 5.23 49 354°47.06 324°12.58 8.38 353°40.02 5.56.23 302°44.91 5.39 6°21.89 5.22 6 10 9°49.52 339°12.12 9.49 8°46.72 55.46 317°46.78 5.53 21°24.15 52.18 11 24°51.98 354°11.05 10.59 23°47.42 54.69 317°46.78 5.53 21°24.15 52.18 11 24°51.98 354°11.05 10.59 23°47.42 54.69 313°248.05 5.68 36°26.41 52.11 12 39°54.45 9°11.19 N11°11.70 38°48.12 500°59.39 32°48.05 5.68 36°26.41 52.11 12 39°54.45 9°11.09 N11°11.70 38°48.12 500°59.39 332°48.05 5.68 36°26.41 52.11 14 69°9.38 39°10.26 13.92 68°49.45 15.23 91 17°54.26 6.12 81°33.19 51.87 15 85°1.84 54°9.79 · 15.02 83°50.21 · 51.62 32°56.13 · 6.62 36°30.93 51.95 16 100°4.30 6°9.32 161.3 98°50.91 5.08 64 47°8.00 6.42 111°37.71 51.72 17 115°6.77 84°8.86 17.24 113°51.61 50.09 62°89.87 6.56 126°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°47.92 19.45 143°55.00 48.55 93°3.51 6.86 126°39.97 51.49 145°11.70 114°7.92 19.45 143°55.00 48.55 93°3.51 6.86 156°44.49 51.49 11.17						
7 324°42.13 294°13.51 6.16 323°44.63 57.77 272°4.11.8 5.09 336°17.37 52.24 8 339°44.99 309°13.05 7.27 338°43.3 57.00 287°3.05 5.24 351°19.63 52.24 9 354°47.06 324°12.58 8.8.8 353°46.02 5.52.3 302°44.91 5.39 6°21.89 5.2.26 10 9°49.52 339°12.12 9.49 8°46.72 55.46 317°46.78 5.53 21°24.15 52.18 12 39°54.45 9°11.19 N11°11.70 38°48.12 500°53.93 347°50.52 N18°5.83 51°28.67 506°52.03 15.54 69 12 24°10.72 12.81 553°48.82 55.16 2°52.39 5.96 66°30.93 51.95 14 69°59.38 39°10.26 13.92 68°49.51 52.39 17°54.26 6.12 81°33.19 51.87 15.88°1.84 54°9.79 51.50 283°50.21 5.16 232°56.13 6.27 96°35.45 51.80 16 100°4.30 69°9.32 16.13 98°50.91 50.86 47°58.00 6.42 111°37.71 51.72 115°6.77 84°8.86 17.24 113°51.61 50.09 9°259.87 6.56 126°39.97 51.61 81 30°9.23 99°8.39 N11°8.44 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 506°51.57 19 146°11.70 1146°7.92 19.45 143°53.00 48.55 93°3.61 6.86 156°44.49 51.49 121 175°16.63 144°6.99 0.2166 173°54.40 4.70 1223°7.34 7.715 186°49.01 51.32 190°9.01 50°6.52 22.76 188°55.10 45.5 138°51.08 5.2 138°51.09 50°52.15 144°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°53.53 51.18 Mer.pass. 09:21 \$						
8 339°44.99 309°13.05 7.27 338°45.33 57.00 28°43.05 5.24 351°19.63 5.23 9 354°47.06 324°12.58 8.38 353°46.02 5.56.23 302°44.91 5.39 6°21.89 5.226 10 9°49.52 339°12.12 9.49 8°46.72 55.46 317°46.78 5.53 21°24.15 52.18 11 24°51.98 354°11.05 10.59 22°47.42 56.69 317°46.78 5.53 51°28.67 506°52.03 12 39°54.5 59 11.9 N11°11.07 318°48.12 500°53.93 347°50.52 N18°5.83 51°28.67 506°52.03 13 54°56.91 24°10.72 12.81 53°48.82 531.6 2°52.39 5.98 66°30.93 51.95 14 69°9.93 39°10.26 13.92 68°49.51 52.39 17°54.26 61.2 81°33.19 51.87 15 85°1.84 54°9.79 · 15.02 83°50.21 51.62 32°56.13 · 6.27 96°35.45 · 51.80 16 100°4.30 69°9.32 16.13 98°50.91 50.86 47°58.00 6.42 111°37.71 51.72 111°6.77 84°8.86 17.24 113°51.61 50.09 62°59.87 6.56 126°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 506°51.57 19 145°11.70 114°9.2 1945 143°53.00 4455 993°3.61 6.86 616°64.49 51.49 20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 171°46.75 51.41 11 175°6.63 1446.99 · 21.66 173°34.40 · 47.70 123°3.43 · 7.15 86°40.41 51.33 22 190°19.09 159°6.52 22.76 188°55.10 46.25 138°9.21 7.30 201°51.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°55.35 51.18 Mer.pass. 09:21 **D.O.5' d1.1' m-3.91 **D.O.7' d-0.8' m1.12 **D.O.7' d-0.8' m1.19 **D.O.7'	6					
9 354°4706 324°12.58 · 8.38 383°46.02 · 56.23 302°44.91 · 5.39 6°21.89 · 52.26 10 9°49.52 339°12.12 · 949 8°46.72 55.64 317°46.78 5.53 218 11 24°51.98 354°11.65 10.59 23°47.42 54.69 332°48.65 5.68 36°26.41 52.11 23°39°54.45 9°11.19 N11°11.70 38°48.12 500°55.93 37°50.52 N18°5.83 51°28.67 506°52.03 15.65 11 24°10.72 12.81 53°48.82 53.16 2°52.39 5.98 66°30.93 31.95 11.65 69°59.38 39°10.26 13.92 66°49.51 52.39 17°54.26 6.12 81°33.19 51.87 15 88°1.84 54°9.79 · 15.02 83°50.21 551.62 32°56.13 6.27 96°35.45 51.80 16 100°4.30 66°9.9.22 161.33 98°50.91 50.86 47°58.00 6.42 111°37.71 51.72 111°6.77 84°8.86 17.24 113°51.61 50.99 62°9.87 6.56 1226°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 506°51.57 19 145°11.70 1146°7.92 19.45 143°53.00 48.55 99°3.51 6.86 126°44.49 51.49 11.75°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.34 121 175°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.32 12 190°19 91 59°6.52 22.76 188°55.10 46.25 138°9.21 7.30 01°51.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°55.53 51.18 Mer.pass. 09:21						
9 354°4706 324°12.58 · 8.38 383°46.02 · 56.23 302°44.91 · 5.39 6°21.89 · 52.26 10 9°49.52 339°12.12 · 949 8°46.72 55.64 317°46.78 5.53 218 11 24°51.98 354°11.65 10.59 23°47.42 54.69 332°48.65 5.68 36°26.41 52.11 23°39°54.45 9°11.19 N11°11.70 38°48.12 500°55.93 37°50.52 N18°5.83 51°28.67 506°52.03 15.65 11 24°10.72 12.81 53°48.82 53.16 2°52.39 5.98 66°30.93 31.95 11.65 69°59.38 39°10.26 13.92 66°49.51 52.39 17°54.26 6.12 81°33.19 51.87 15 88°1.84 54°9.79 · 15.02 83°50.21 551.62 32°56.13 6.27 96°35.45 51.80 16 100°4.30 66°9.9.22 161.33 98°50.91 50.86 47°58.00 6.42 111°37.71 51.72 111°6.77 84°8.86 17.24 113°51.61 50.99 62°9.87 6.56 1226°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 506°51.57 19 145°11.70 1146°7.92 19.45 143°53.00 48.55 99°3.51 6.86 126°44.49 51.49 11.75°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.34 121 175°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.32 12 190°19 91 59°6.52 22.76 188°55.10 46.25 138°9.21 7.30 01°51.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°55.53 51.18 Mer.pass. 09:21	8	339°44.59	309°13.05 7.27	338°45.33 57.00	287°43.05 5.24	351°19.63 52.34
10 9°49.52 339°12.12 9.49 8°46.72 55.46 317°46.78 5.53 21°24.15 52.18 12 24°51.98 354°11.65 10.59 23°47.42 54.69 332°48.65 5.68 36°26.41 52.11 12 39°54.45 9°11.19 N11°11.70 38°48.12 500°53.93 347°50.52 N18°5.83 51°28.67 506°52.03 13 54°56.91 24°10.72 12.81 53°48.82 53.16 2°52.39 5.98 66°30.93 51.95 14.69°99.38 39°10.26 13.92 68°49.51 52.39 17°54.26 6.12 81°33.19 51.87 15 85°1.84 54°9.79 · 15.02 83°50.21 · 51.62 32°56.13 · 6.27 96°35.45 · 51.80 16 100°4.30 69°9.32 161.3 98°50.91 50.66 47°88.00 6.42 111°37.71 51.72 17 115°6.77 84°8.86 17.24 113°51.61 50.09 62°59.87 6.56 126°39.97 5.164 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 506°51.57 19 145°11.70 114°7.92 19.45 143°53.00 48.55 93°3.61 6.66 156°44.49 51.49 20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 171°46.75 51.41 121°15'16.63 144°6.99 21.66 173°54.40 47.02 123°7.34 7.15 186°49.01 51.33 22 1090°19.00 159°6.52 22.76 188°55.10 46.25 138°9.21 7.30 201°51.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°53.53 51.18 Mer.pass. 09:21	9	354°47.06	324°12.58 · · 8.38		302°44.91 · · 5.39	
11 24°51.98 354°11.65 10.59 23°47.42 54.69 332°48.65 5.68 36°26.41 52.11 23 9°64.45 0°11.19 N11°11.70 38°48.12 S00°53.93 347°50.52 N18°5.83 51°28.67 S06°52.03 13 54°56.91 24°10.72 12.81 53°48.82 53.16 2°25.239 5.98 66°30.93 51.95 14 69°59.38 39°10.26 13.92 68°49.51 52.39 17°54.26 6.12 81°33.19 51.87 15.87 81.84 54°9.79 15.02 83°50.21 51.62 32°56.13 6.27 96°35.45 51.81 16 100°4.30 69°9.32 16.13 98°50.21 51.62 32°56.13 6.27 96°35.45 51.81 11°56.77 84°8.86 17.24 113°51.61 50.09 62°59.87 6.55 126°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 S00°49.32 78°1.74 N18°6.71 141°42.23 S06°51.57 19 145°11.70 114°7.92 19.45 143°53.00 48.55 93°3.61 6.86 156°44.49 51.49 120 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.0 171°46.75 51.41 21 175°16.63 144°6.99 • 21.66 173°54.40 • 47.02 123°7.34 • 7.15 186°49.01 • 51.33 122 190°19.09 159°6.52 22.76 188°55.10 46.25 138°9.21 7.0 201°61.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°53.53 51.18 Mer.pass. 09:21	10	9°49.52	339°12.12 9.49			
12 39°84.45			354° 11.65 10.59	23°47.42 54.69	332°48.65 5.68	
13 54°56.91						
14 69° 59.38 39° 10.26 13.92 68° 49.51 52.39 17° 54.26 6.12 81° 33.19 51.87 15 85° 1.84 54° 9.79 · 15.02 83° 50.21 · 51.62 32° 56.13 · 6.27 96° 35.45 · 51.80 16 100° 4.30 69° 9.32 16.13 98° 50.91 50.66 47° 58.00 6.42 111° 37.71 51.72 17 115° 6.77 84° 8.86 17.24 113° 51.61 50.09 62° 59.87 6.56 126° 39.97 51.64 18 13° 92.23 99° 8.39 N11° 18.34 128° 52.31 500° 49.32 78° 1.74 N18° 6.71 141° 42.23 506° 51.57 19 145° 11.70 114° 7.92 19.45 143° 53.00 48.55 93° 3.61 6.66 156° 44.49 51.49 20 160° 14.16 129° 7.45 20.55 158° 53.70 47.70 103° 7.34 7.01 171° 46.75 51.49 21 19° 50.63 174° 6.05 23.86 203° 55.80 46.25						
15 85°1.84 54°9.79 · 15.02 83°5.021 · 51.62 32°56.13 · 6.27 96°35.45 · 51.80 16 100°4.30 69°9.32 16.13 98°50.91 50.86 47°58.00 6.22 111°37.71 51.72 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°42.23 506°51.57 19 145°11.70 114°7.92 19.45 143°53.00 48.75 93°3.61 6.66 166°44.49 51.49 20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 171°46.75 51.41 21 175°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.33 22 20°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°55.53 51.18 Mer.pass. 09:21 v-0.5′ d1.1′ m-3.91 v-0.7′ d-0.8′ m1.12 v-1.9′ d-0.1′ m-2.01 v-2.3′ d-0.1′ m-2.01						
16 100°4.30 69°9.32 16.13 98°5.91 50.86 47°58.00 6.42 111°37.71 51.72 17.15°1.67 84°8.86 17.24 113°51.61 50.09 62°59.87 6.56 126°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 500°49.32 78°1.74 N18°6.71 141°4.223 506°51.57 19 145°11.70 114′7.92 19.45 143°53.00 48.55 93°3.61 6.86 156°44.49 51.49 20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 17°46.75 51.41 121 175°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.33 122 190°19.09 159°6.52 22.76 188°55.10 46.25 138°9.21 7.30 201°51.27 51.26 1.23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°53.53 51.18 1.18 1.19 1.19 1.19 1.19 1.19 1.19						
17 115°6.77 84°8.86 17.24 113°51.61 50.09 62°59.87 6.56 126°39.97 51.64 18 130°9.23 99°8.39 N11°18.34 128°52.31 S00°49.32 78°1.74 N18°6.71 141°42.23 S06°51.57 91 145°11.70 114°7.92 19.45 143°53.00 48.55 93°3.61 6.86 156°44.49 51.49 20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 171°46.75 51.41 121 175°16.63 144°6.99 · 21.66 173°54.40 · 47.02 123°7.34 · 7.15 186°49.01 · 51.33 22 190°19.09 159°6.52 22.76 188°55.10 46.25 138°9.21 7.30 201°51.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°55.53 51.18 Mer.pass. 09:21 \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.8′ \(\nu \) d.1.12 \(\nu \) d.1′ \(\nu \)-0.01′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.8′ \(\nu \) d.1.10 \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.8′ \(\nu \) d.1.10 \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.8′ \(\nu \) d.1.12 \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.8′ \(\nu \) d.1.10 \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.8′ \(\nu \) d.1.12 \(\nu \) d.1′ \(\nu \)-0.20 \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.8′ \(\nu \) d.1.10′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.8′ \(\nu \) d.1.1 \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.8′ \(\nu \) d.1.1 \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.8′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \)-0.7′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\nu \) d.1′ \(\nu \) d.1′ \(\nu \)-0.5′ \(\nu \) d.1′ \(\			50°0 20 16 12			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
19 145°11.70 114°7.92 19.45 143°8.3.00 48.55 93°3.61 6.86 156°44.49 51.49						
20 160°14.16 129°7.45 20.55 158°53.70 47.79 108°5.48 7.00 171°46.75 51.41 21 175°16.63 144°6.99 ·21.66 173°54.40 ·47.02 123°7.34 ·7.15 186°49.01 ·51.33 22 190°19.09 159°6.52 22.76 188°55.80 45.48 153°11.08 7.44 216°53.53 51.18 Mer.pass. 09:21 ν-0.5′ d1.1′ m-3.91 ν0.7′ d-0.8′ m1.12 ν1.9′ d0.1′ m-2.01 ν2.3′ d-0.1′ m1.07 Thu GHA Dec GHA Dec GHA Dec GHA Dec 0 220°24.02 189°5.58 N11°24.97 218°56.49 500°44.71 166°12.95 N18°7.59 231°55.79 506°51.10 1 235° 26.48 204°5.11 26.07 233°57.19 43.95 183°14.82 7.74 246°58.06 51.03 2 250° 28.95 219°4.64 27.17 248°57.89 43.18 196°16.69 7.88 262°0.32 50.87 4 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
22 190°19.09 159°6.52 22.76 188°55.10 46.25 138°9.21 7.30 201°51.27 51.26 23 205°21.55 174°6.05 23.86 203°55.80 45.48 153°11.08 7.44 216°53.53 51.18 Mer.pass. 09:21 \$\nu_{\cdot 0.5'}\$ d1.1' m-3.91 \$\nu_{\cdot 0.7'}\$ d-0.8' m1.12 \$\nu_{\cdot 1.9'}\$ d0.1' m-2.01 \$\nu_{\cdot 2.3'}\$ d-0.1' m1.07 Thu GHA GHA Dec GHA Dec GHA Dec GHA Dec 0 220°24.02 189°5.58 N11°24.97 218°56.49 \$00°44.71 168°12.95 N18°7.59 231°55.79 \$06°51.10 1 235°26.48 204°5.11 26.07 233°57.19 43.95 183°14.62 7.74 246°58.06 51.03 2 50°38.95 219°4.64 27.17 248°57.89 43.18 198°16.69 7.88 262°0.32 50.95 3 295°36.34 264°3.23 30.48 293°59.99 41.64 223°29.83 307°7.10 50.72 6						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
Thu GHA GHA Dec GHA <td>22</td> <td>$190^{\circ}19.09$</td> <td>159°6.52 22.76</td> <td>188°55.10 46.25</td> <td>138° 9.21 7.30</td> <td>201°51.27 51.26</td>	22	$190^{\circ}19.09$	159°6.52 22.76	188°55.10 46.25	138° 9.21 7.30	201°51.27 51.26
Thu GHA GHA Dec GHA <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
1 235°26.48 204°5.11 26.07 233°57.19 43.95 183°14.82 7.74 246°58.06 51.03 2 250°28.95 219°4.64 27.17 248°57.89 43.18 198°16.69 7.88 262°0.32 50.95 3 265°31.41 234°4.17 28.27 263°58.59 42.41 213°18.56 8.03 277°2.58 50.87 4 280°33.87 249°3.70 29.37 278°59.29 41.64 228°20.43 8.18 292°4.84 50.80 5 295°36.34 264°3.23 30.48 293°59.99 40.88 243°2.29 8.32 307°7.10 50.72 6 310°38.80 279°2.76 N11°31.58 309°0.69 S00°40.11 258°24.16 N18°8.47 322°9.36 506°50.64 7 325°41.27 294°2.28 32.68 324°1.38 39.34 273°26.03 8.62 337°11.62 50.57 8 340°43.73 309°1.81 33.77 339°2.08 38.57 288°27.90 8.76 352°13.89 50.49 9 355°46.19 324°1.						
2 250°28.95 219°4.64 27.17 248°57.89 43.18 198°16.69 7.88 262°0.32 50.95 3 265°31.41 234°4.17 · 28.27 263°58.59 · 42.41 213°18.56 · 8.03 277°2.58 · 50.87 4 280°33.87 249°3.70 29.37 278°59.29 41.64 228°20.43 8.18 292°4.84 50.80 5 295°36.34 264°3.23 30.48 293°59.99 40.88 243°22.29 8.32 307°7.10 50.72 6 310°38.80 279°2.76 N11°31.58 300°0.69 500°40.11 258°24.16 N18°8.47 322°9.36 506°50.64 7 325°41.27 294°2.28 32.68 324°1.38 39.34 273°26.03 8.62 337°11.62 50.57 8 340°43.73 309°1.81 33.77 339°2.08 38.57 288°27.90 8.76 352°13.89 50.49 9 355°46.19 324°1.34 · 34.87 354°2.78 · 37.81 303°2.77	0		189°5.58 N11°24.97	218°56.49 \$00°44.71	168°12.95 N18°7.59	
2 250°28.95 219°4.64 27.17 248°57.89 43.18 198°16.69 7.88 262°0.32 50.95 3 265°31.41 234°4.17 · 28.27 263°58.59 · 42.41 213°18.56 · 8.03 277°2.58 · 50.87 4 280°33.87 249°3.70 29.37 278°59.29 41.64 228°20.43 8.18 292°4.84 50.80 5 295°36.34 264°3.23 30.48 293°59.99 40.88 243°22.29 8.32 307°7.10 50.72 6 310°38.80 279°2.76 N11°31.58 309°0.69 500°40.11 258°24.16 N18°8.47 322°9.36 506°50.64 7 325°41.27 294°2.28 32.68 324°1.38 39.34 273°26.03 8.62 337°11.62 50.57 8 340°43.73 309°1.81 33.77 339°2.08 38.57 288°27.90 8.76 352°13.89 50.49 9 355°46.19 324°1.34 · 34.87 354°2.78 · 37.81 303°2.77	1	235°26.48	204°5.11 26.07	233°57.19 43.95	183°14.82 7.74	246°58.06 51.03
3 265° 31.41 234° 4.17 · · 28.27 263° 58.59 · · 42.41 213° 18.56 · · 8.03 277° 2.58 · · 50.87 4 280° 33.87 249° 3.70 29.37 278° 59.29 41.64 228° 20.43 8.18 292° 4.84 50.80 5 295° 36.34 264° 3.23 30.48 293° 59.99 40.88 243° 22.29 8.32 307° 7.10 50.72 6 310° 38.80 279° 2.76 N11° 31.58 309° 0.69 S00° 40.11 258° 24.16 N18° 8.47 322° 9.36 S06° 50.64 7 325° 41.27 294° 2.28 32.68 324° 1.38 39.34 273° 26.03 8.62 337° 11.62 50.57 8 340° 43.73 309° 1.81 33.77 339° 2.08 38.57 288° 27.90 8.76 352° 13.89 50.49 9 355° 46.19 324° 1.34 · 34.87 354° 2.78 · 37.81 303° 29.77 · 8.91 7° 16.15 · 50.42 10 10° 48.66 339° 0.87 35.97 9° 3.48						
4 280° 33.87 249° 3.70 29.37 278° 59.29 41.64 228° 20.43 8.18 292° 4.84 50.80 5 295° 36.34 264° 3.23 30.48 293° 59.99 40.88 243° 22.29 8.32 307° 7.10 50.72 6 310° 38.80 279° 2.76 N11° 31.58 309° 0.69 500° 40.11 258° 24.16 N18° 8.47 322° 9.36 506° 50.64 7 325° 41.27 294° 2.28 32.68 324° 1.38 39.34 273° 26.03 8.62 337° 11.62 50.57 8 340° 43.73 309° 1.81 33.77 339° 2.08 38.57 288° 27.90 8.76 352° 13.89 50.49 9 355° 46.19 324° 1.34 · 34.87 354° 2.78 · 37.81 303° 29.77 · 8.91 7° 16.15 · 50.42 10 10° 48.66 339° 0.87 35.97 9° 3.48 37.04 318° 31.64 9.06 22° 18.41 50.34 11 25° 51.12 354° 0.39 37.07 24° 4.18 36.27 333° 3.50 9.20 37° 20.67 50.26 12 40						
5 295°36.34 264°3.23 30.48 293°59.99 40.88 243°22.29 8.32 307°7.10 50.72 6 310°38.80 279°2.76 N11°31.58 309°0.69 \$00°40.11 258°24.16 N18°8.47 322°9.36 \$06°50.64 7 325°41.27 294°2.28 32.68 324°1.38 39.34 273°26.03 8.62 337°11.62 50.57 8 340°43.73 309°1.81 33.77 339°2.08 38.57 288°27.90 8.76 352°13.89 50.49 9 355°46.19 324°1.34 34.87 354°2.78 37.81 303°29.77 8.91 7°16.15 50.42 10 10°48.66 339°0.87 35.97 9°3.48 37.04 318°31.64 9.06 22°18.41 50.34 11 25°51.12 354°0.39 37.07 24°4.18 36.27 333°33.50 9.20 37°20.67 50.26 12 40°53.59 8°59.92 N11°38.17 39°4.88 500°3.50 348°35.37 N18°9						
6 310°38.80 279°2.76 N11°31.58 309°0.69 S00°40.11 258°24.16 N18°8.47 322°9.36 S06°50.64 7 325°41.27 294°2.28 32.68 324°1.38 39.34 273°26.03 8.62 337°11.62 50.57 8 340°43.73 309°1.81 33.77 339°2.08 38.57 288°27.90 8.76 352°13.89 50.49 9 355°46.19 324°1.34 ·· 34.87 354°2.78 ·· 37.81 303°29.77 ·· 8.91 7°16.15 ·· 50.42 10 10°48.66 339°0.87 35.97 9°3.48 37.04 318°31.64 9.06 22°18.41 50.34 11 25°51.12 354°0.39 37.07 24°4.18 36.27 333°33.50 9.20 37°20.67 50.26 12 40°53.59 8°59.92 N11°38.17 39°4.88 500°35.50 348°35.37 N18°9.35 52°22.93 506°50.19 13 55°56.05 23°59.44 39.26 54°5.58 34.74 3°37.24						
7 325°41.27 294°2.28 32.68 324°1.38 39.34 273°26.03 8.62 337°11.62 50.57 8 340°43.73 309°1.81 33.77 339°2.08 38.57 288°27.90 8.76 352°13.89 50.49 9 355°46.19 324°1.34 · 34.87 354°2.78 · 37.81 303°29.77 · 8.91 7°16.15 · 50.42 10 10°48.66 339°0.87 35.97 9°3.48 37.04 318°31.64 9.06 22°18.41 50.34 11 25°51.12 354°0.39 37.07 24°4.18 36.27 333°33.50 9.20 37°20.67 50.26 12 40°53.59 8°59.92 N11°38.17 39°4.88 500°35.50 348°35.37 N18°9.35 52°22.93 506°50.19 13 55°56.05 23°59.44 39.26 54°5.58 34.74 3°37.24 9.49 67°25.20 50.11 14 70°58.51 38°58.89 40.36 69°6.28 33.97 18°39.11 9.64						
8 340° 43.73 309° 1.81 33.77 339° 2.08 38.57 288° 27.90 8.76 352° 13.89 50.49 9 355° 46.19 324° 1.34 · · 34.87 354° 2.78 · · 37.81 303° 29.77 · · 8.91 7° 16.15 · · 50.42 10 10° 48.66 339° 0.87 35.97 9° 3.48 37.04 318° 31.64 9.06 22° 18.41 50.34 11 25° 51.12 354° 0.39 37.07 24° 4.18 36.27 333° 33.50 9.20 37° 20.67 50.26 12 40° 53.59 8° 59.92 N11° 38.17 39° 4.88 S00° 35.50 348° 35.37 N18° 9.35 52° 22.93 S06° 50.19 13 55° 56.05 23° 59.44 39.26 54° 5.58 34.74 3° 37.24 9.49 67° 25.20 50.11 14 70° 58.51 38° 58.97 40.36 69° 6.28 33.97 18° 39.11 9.64 82° 27.46 50.03 15 86° 0.98 53° 58.50 · · 41.46 84° 6.98 · · 33.20 33° 40.98 · 9.79 97° 29.72 · · 49.96 16						
9 355°46.19 324°1.34 · · 34.87 354°2.78 · · 37.81 303°29.77 · · 8.91 7°16.15 · · · 50.42 10 10°48.66 339°0.87 35.97 9°3.48 37.04 318°31.64 9.06 22°18.41 50.34 11 25°51.12 354°0.39 37.07 24°4.18 36.27 333°33.50 9.20 37°20.67 50.26 12 40°53.59 8°59.92 N11°38.17 39°4.88 S00°35.50 348°35.37 N18°9.35 52°22.93 S06°50.19 13 55°56.05 23°59.44 39.26 54°5.58 34.74 3°37.24 9.49 67°25.20 50.11 14 70°58.51 38°58.97 40.36 69°6.28 33.97 18°39.11 9.64 82°27.46 50.03 15 86°0.98 53°58.50 · · 41.46 84°6.98 · · 33.20 33°40.98 · · 9.79 97°29.72 · · 49.96 16 101°3.44 66°58.02 42.55 99°7.68 32.43 48°42.84 9.93 112°31.98 49.88 17 116°5.91 83°57.54 43.65 114°8.37 31.67 63°44.71 10.08 127°34.25 49.81 18 131°8.37 98°57.07 N11°44.74 129°9.07 S00°30.90 78°46.58 N18°10.23 142°36.51 S06°49.73 19 146°10.84 113°56.59 45.83 144°9.77 30.13 93°48.45 10.37 157°38.77 49.65 20 161°13.30 128°56.12 46.93 159°10.47 29.36 108°50.32 10.52 172°41.04 49.58 21 176°15.76 143°55.64 · · 48.02 174°11.17 · · · 28.60 123°55.92 10.96 217°47.83 49.35 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
10 10°48.66 339°0.87 35.97 9°3.48 37.04 318°31.64 9.06 22°18.41 50.34 11 25°51.12 354°0.39 37.07 24°4.18 36.27 333°33.50 9.20 37°20.67 50.26 12 40°53.59 8°59.92 N11°38.17 39°4.88 500°35.50 348°35.37 N18°9.35 52°22.93 506°50.19 13 55°56.05 23°59.44 39.26 54°5.58 34.74 3°37.24 9.49 67°25.20 50.11 14 70°58.51 38°58.97 40.36 69°6.28 33.97 18°39.11 9.64 82°27.46 50.03 15 86°0.98 53°58.50 · 41.46 84°6.98 · 33.20 33°40.98 · 9.79 97°29.72 · 49.96 16 101°3.44 68°58.02 42.55 99°7.68 32.43 48°42.84 9.93 112°31.98 49.88 17 116°5.91 83°57.54 43.65 114°8.37 31.67 63°4.71 10.08						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
12 40°53.59 8°59.92 N11°38.17 39°4.88 S00°35.50 348°35.37 N18°9.35 52°22.93 S06°50.19 13 55°56.05 23°59.44 39.26 54°5.58 34.74 3°37.24 9.49 67°25.20 50.11 14 70°58.51 38°58.97 40.36 69°6.28 33.97 18°39.11 9.64 82°27.46 50.03 15 86°0.98 53°58.50 · 41.46 84°6.98 · 33.20 33°40.98 · 9.79 97°29.72 · 49.96 16 101°3.44 68°58.02 42.55 99°7.68 32.43 48°42.84 9.93 112°31.98 49.88 17 116°5.91 33°57.54 43.65 114°8.37 31.67 63°44.71 10.08 127°34.25 49.81 18 131°8.37 98°57.07 N11°44.74 129°9.07 500°30.90 78°46.58 N18°10.23 142°36.51 506°49.73 19 146°10.84 113°56.59 45.83 144°9.77 30.13 93°48.45						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	13	55° 56.05				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	14	$70^{\circ}58.51$	38°58.97 40.36	69°6.28 33.97	18°39.11 9.64	82°27.46 50.03
16 101°3.44 68°58.02 42.55 99°7.68 32.43 48°42.84 9.93 112°31.98 49.88 17 116°5.91 83°57.54 43.65 114°8.37 31.67 63°44.71 10.08 127°34.25 49.81 18 131°8.37 98°57.07 N11°44.74 129°9.07 S00°30.90 78°46.58 N18°10.23 142°36.51 S06°49.73 19 146°10.84 113°56.59 45.83 144°9.77 30.13 93°48.45 10.37 157°38.77 49.65 20 161°13.30 128°56.12 46.93 159°10.47 29.36 108°50.32 10.52 172°41.04 49.58 21 176°15.76 143°55.64 · 48.02 174°11.17 · 28.60 123°52.18 · 10.66 187°43.30 · 49.50 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55	15	86°0.98			33°40.98 · · 9.79	97°29.72 · · 49.96
17 116°5.91 83°57.54 43.65 114°8.37 31.67 63°44.71 10.08 127°34.25 49.81 18 131°8.37 98°57.07 N11°44.74 129°9.07 S00°30.90 78°46.58 N18°10.23 142°36.51 S06°49.73 19 146°10.84 113°56.59 45.83 144°9.77 30.13 93°48.45 10.37 157°38.77 49.65 20 161°13.30 128°56.12 46.93 159°10.47 29.36 108°50.32 10.52 172°41.04 49.58 21 176°15.76 143°55.64 · 48.02 174°11.17 · 28.60 123°52.18 · 10.66 187°43.30 · 49.50 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
18 131°8.37 98°57.07 N11°44.74 129°9.07 S00°30.90 78°46.58 N18°10.23 142°36.51 S06°49.73 19 146°10.84 113°56.59 45.83 144°9.77 30.13 93°48.45 10.37 157°38.77 49.65 20 161°13.30 128°56.12 46.93 159°10.47 29.36 108°50.32 10.52 172°41.04 49.58 21 176°15.76 143°55.64 · · 48.02 174°11.17 · · 28.60 123°52.18 · · 10.66 187°43.30 · · 49.50 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
19 146°10.84 113°56.59 45.83 144°9.77 30.13 93°48.45 10.37 157°38.77 49.65 20 161°13.30 128°56.12 46.93 159°10.47 29.36 108°50.32 10.52 172°41.04 49.58 21 176°15.76 143°55.64 · · 48.02 174°11.17 · · 28.60 123°52.18 · · 10.66 187°43.30 · · 49.50 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
20 161°13.30 128°56.12 46.93 159°10.47 29.36 108°50.32 10.52 172°41.04 49.58 21 176°15.76 143°55.64 ·· 48.02 174°11.17 ·· 28.60 123°52.18 ·· 10.66 187°43.30 ·· 49.50 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
21 176°15.76 143°55.64 · · 48.02 174°11.17 · · 28.60 123°52.18 · · 10.66 187°43.30 · · 49.50 22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
22 191°18.23 158°55.16 49.11 189°11.87 27.83 138°54.05 10.81 202°45.56 49.43 23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
23 206°20.69 173°54.68 50.21 204°12.57 27.06 153°55.92 10.96 217°47.83 49.35						
Mer.pass. 09:17 ν -0.5′ d 1.1′ m-3.91 ν 0.7′ d -0.8′ m1.12 ν 1.9′ d 0.1′ m-2.01 ν 2.3′ d -0.1′ m1.07			-			
	Mer.p	pass. 09:17	ν-0.5′ d1.1′ m-3.91	ν0.7' d-0.8' m1.12	ν1.9' d0.1' m-2.01	ν2.3' d-0.1' m1.07

	Stars	
	SHA	Dec
Alpheratz	357°35.68	29°13.26
Ankaa Schedar	353°8.07 349°32.25	-42°10.40 56°40.01
Diphda	348°48.18	-17°51.26
Achernar	335°21.17	-57°6.77
Hamal	327°52.23	23°34.51
Polaris Acamar	314°49.32 315°12.64	89°22.00 -40°12.50
Menkar	314°7.10	4°11.00
Mirfak	308°29.62	49°56.81
Aldebaran	290°40.61	16°33.44
Rigel	281°4.71 280°23.15	-8°10.51 46°1.41
Capella Bellatrix	280 23.15 278°23.78	6°22.25
Elnath	278°2.91	28°37.69
Alnilam	275°38.58	-1°11.26
Betelgeuse	270°52.96	7°24.65
Canopus Sirius	263°52.99 258°26.95	-52°42.71 -16°45.10
Adhara	255° 6.52	-10 45.10 -29°0.47
Procyon	244°51.57	5°9.72
Pollux	$243^{\circ}18.14$	27°58.13
Avior	234°15.09	-59°35.49
Suhail Miaplacidus	222°46.74 221°38.37	-43°32.07 -69°49.27
Alphard	221 36.37 217°48.30	-8°45.94
Regulus	207°34.97	11°50.90
Dubhe	193°41.33	61°37.42
Denebola	182°25.32	14°26.16
Gienah Acrux	175°43.95 173°0.24	-17°40.75 -63°14.22
Gacrux	173 0.24 171°51.86	-03 14.22 -57°15.15
Alioth	166°12.96	55°49.76
Spica	$158^{\circ}22.63$	-11°17.40
Alkaid	152°51.98	49°11.51
Hadar Menkent	148°36.25 147°57.95	-60°29.50 -36°29.48
Arcturus	147 37.93 145°48.12	19°3.27
Rigil Kent.	139°40.49	-60°56.20
Kochab	137°18.55	74°3.26
Zuben'ubi	136°56.35	-16°8.66 26°37.83
Alphecca Antares	126° 3.89 112° 16.24	-26°29.19
Atria	107°10.56	-69°4.14
Sabik	$102^{\circ}3.19$	-15°45.36
Shaula	96°10.87	-37°7.24
Rasalhague Eltanin	95°58.85 90°42.10	12°32.36 51°28.82
Kaus Aust.	83°33.07	-34°22.33
Vega	80°33.40	38°48.06
Nunki	75°48.32	-26°15.98
Altair	62°0.45	8°55.76 -56°39.22
Peacock Deneb	53° 6.58 49° 26.20	-56°39.22 45°21.66
Enif	33°39.46	9°58.99
Al Na'ir	27°33.80	-46°50.47
Fomalhaut	15°15.35	-29°29.59
Scheat Markab	13°45.99 13°30.68	28°12.62 15°19.96
Apr 30 Tue	SHA	Mer.pass
Venus Mars	331°1.97 359°57.29	11:22 09:26
Jupiter	308° 17.46	12:52
Saturn	11°41.65	08:38
May 01 Wed	SHA	Mer.pass
Venus	329°51.87	11:23
Mars	359°14.87	09:25
Jupiter Saturn	308° 3.21 11° 36.68	12:49 08:35
May 02 Thu Venus	SHA 328°41.56	Mer.pass 11:24
Mars	358°32.48	09:24
Jupiter	$307^{\circ}48.93$	12:46
Saturn	11°31.78	08:31
Horizon	ıtal parallax	
	Venus:	0.1
	Mars:	0.1

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.87	N14°51.51	284°29.36	6.3'	S26°53.78	-5.9'	57.7'
1	195°41.95	52.27	298°54.63	6.3'	26°47.92	-6.0'	57.8'
2	210°42.03	53.03	313°19.94 327°45.28	6.3'	26°41.90	-6.2'	57.8'
3 4	225°42.11 240°42.18	· · 53.79 54.56	327°45.28 342°10.66	6.4' 6.4'	26°35.71 26°29.35	-6.4' -6.5'	57.8' 57.8'
5	255°42.26	55.32	356°36.08	6.5	26°22.83	-0.5 -6.7'	57.8°
6	270°42.34	N14°56.08	11°1.54	6.5'	S26°16.15	-6.8'	57.9'
7	285°42.42	56.84	25°27.04	6.5'	$26^{\circ}9.30$	-7.0'	57.9'
8	300°42.50	57.60	39°52.58	6.6'	26°2.29	-7.2'	57.9'
9	315°42.57 330°42.65	· · 58.36 59.12	54°18.17 68°43.80	6.6' 6.7'	25°55.12 25°47.79	-7.3'	58.0'
10 11	345°42.73	14°59.88	83°9.48	6.7'	25°40.29	-7.5' -7.7'	58.0' 58.0'
12	0°42.81	N15°0.64	97°35.20	6.8'	S25°32.64	-7.8'	58.0'
13	15°42.88	1.40	112°0.98	6.8'	$25^{\circ}24.82$	-8.0'	58.1'
14	30°42.96	2.16	126°26.80	6.9'	25°16.85	-8.1'	58.1'
15	45°43.04 60°43.11	• • 2.92	140°52.68 155°18.60	6.9'	25°8.72 25°0.44	-8.3'	58.1'
16 17	75°43.11	3.67 4.43	169°44.58	7.0' 7.0'	25 0.44 24°52.00	-8.4' -8.6'	58.1' 58.2'
18	90°43.26	N15°5.19	184°10.61	7.1'	\$24°43.40	-8.7'	58.2'
19	105°43.34	5.94	198°36.70	7.1'	24°34.65	-8.9'	58.2'
20	120°43.41	6.70	213°2.84	7.2'	24°25.75	-9.1'	58.2'
21	135°43.49	• • 7.45	227°29.04	7.3'	24°16.70	-9.2'	58.3'
22 23	150°43.56 165°43.64	8.21 8.96	241°55.29 256°21.60	7.3' 7.4'	24°7.49 23°58.14	-9.4' -9.5'	58.3' 58.3'
23			250 21.00			-9.5	JO.3
	SD = 15.9'	d = 0.8'		SI	O = 15.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.71	N15°9.72	270°47.97	7.4'	\$23°48.63	-9.7'	58.3'
1	195°43.78	10.47	285°14.40	7.5'	23°38.98	-9.8'	58.4'
2	210°43.86	11.22	299°40.88	7.5'	23°29.19	-9.9'	58.4'
3 4	225°43.93 240°44.00	· · 11.97 12.73	314°7.43 328°34.03	7.6' 7.7'	23°19.24 23°9.15	-10.1' -10.2'	58.4' 58.4'
5	255°44.08	13.48	343°0.70	7.7'	23 9.15 22°58.92	-10.2 -10.4'	58.5'
6	270°44.15	N15°14.23	357°27.42	7.8'	S22°48.55	-10.5'	58.5'
7	285°44.22	14.98	11°54.21	7.8'	22°38.03	-10.7'	58.5'
8	300°44.29	15.73	26°21.06	7.9'	22°27.38	-10.8'	58.5'
9	315°44.37	• • 16.48	40°47.97	8.0'	22°16.58	-10.9'	58.6'
10 11	330°44.44 345°44.51	17.23 17.98	55°14.94 69°41.98	8.0' 8.1'	22°5.65 21°54.58	-11.1' -11.2'	58.6' 58.6'
12	0°44.58	N15°18.73	84°9.07	8.2'	S21°43.37	-11.3	58.6'
13	15°44.65	19.48	98°36.23	8.2'	21°32.03	-11.5'	58.7'
14	30°44.72	20.22	113°3.45	8.3'	$21^{\circ}20.56$	-11.6'	58.7'
15	45°44.79 60°44.86	• • 20.97	127°30.74	8.3'	21°8.96 20°57.22	-11.7'	58.7'
16 17	75°44.93	21.72 22.46	141°58.09 156°25.50	8.4' 8.5'	20°57.22 20°45.36	-11.9' -12.0'	58.7' 58.8'
18	90°45.00	N15°23.21	170°52.97	8.5	\$20°33.36	-12.1'	58.8'
19	105°45.07	23.96	185°20.51	8.6'	20°21.24	-12.2'	58.8'
20	120°45.14	24.70	199°48.11	8.7'	$20^{\circ}9.00$		58.8'
21	135°45.21	• • 25.45	214°15.77	8.7'	19°56.63	-12.5'	58.9'
22 23	150°45.28 165°45.35	26.19 26.93	228°43.49 243°11.28	8.8' 8.8'	19°44.13 19°31.52	-12.6' -12.7'	58.9' 58.9'
23			243 11.20			-12.7	30.9
	SD = 15.9'	d = 0.8'		SI	O = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.42	N15°27.68	257°39.13	8.9'	S19°18.78	-12.9'	58.9'
1	195°45.48	28.42	272°7.03	9.0'	19°5.93 18°52.96	-13.0'	58.9'
2	210°45.55 225°45.62	29.16 •• 29.90	286°35.00 301°3.04	9.0' 9.1'	18°52.96 18°39.87	-13.1' -13.2'	59.0' 59.0'
3 4	240°45.69	30.65	315°31.13	9.1 9.2'	18° 26.66	-13.2 -13.3'	59.0'
5	255°45.75	31.39	329°59.28	9.2'	$18^{\circ}13.34$	-13.4'	59.0'
6	270°45.82	N15°32.13	344°27.49	9.3'	S17°59.91	-13.5'	59.1'
7	285°45.89	32.87	358°55.76	9.3'	17°46.37	-13.7'	59.1'
8 9	300°45.95 315°46.02	33.61 •• 34.35	13°24.09 27°52.48	9.4' 9.4'	17°32.72 17°18.96	-13.8' -13.9'	59.1' 59.1'
10	315 46.02 330°46.08	35.09	42°20.92	9.4 9.5'	17°18.96 17°5.09	-13.9 -14.0'	59.1' 59.2'
11	345°46.15	35.82	56°49.43	9.6'	16°51.12	-14.1	59.2'
12	0°46.21	N15°36.56	71°17.98	9.6'	S16°37.04	-14.2'	59.2'
13	15°46.28	37.30	85°46.60	9.7'	16°22.86	-14.3'	59.2'
14	30°46.34	38.04	100°15.27	9.7'	16°8.58	-14.4'	59.3'
15 16	45°46.41 60°46.47	· · 38.77 39.51	114°44.00 129°12.77	9.8' 9.8'	15°54.20 15°39.72	-14.5' -14.6'	59.3' 59.3'
17	75°46.54	39.51 40.25	129 12.77 143°41.61	9.8 9.9'	15 39.72 15°25.15	-14.0 -14.7'	59.3'
18	90°46.60	N15°40.98	158°10.49	9.9'	S15°10.48	-14.8'	59.3'
19	105°46.66	41.72	172°39.43	10.0'	14°55.71	-14.9'	59.4'
20	120°46.73	42.45	187°8.42	10.0'	14°40.85	-14.9'	59.4'
21	135°46.79	• • 43.18	201°37.45	10.1'	14°25.90	-15.0'	59.4'
22 23	150°46.85 165°46.92	43.92 44.65	216°6.54 230°35.68	10.1' 10.2'	14°10.86 13°55.74	-15.1' -15.2'	59.4' 59.4'
23			230 33.00			-13.2	33.4
	SD = 15.9'	d = 0.7'		51	D = 16.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	01:49	22:13	////	////
N 70°	////	////	02:28	21:30	////	////
68°	////	01:02	02:55	21:02	23:04	////
66°	////	01:53	03:16	20:41	22:07	////
64°	////	02:23	03:32	20:24	21:35	////
62°	00:54	02:46	03:45	20:11	21:11	23:10
60°	01:40	03:03	03:57	19:59	20:53	22:19
N 58°	02:08	03:18	04:07	19:49	20:38	21:49
56°	02:29	03:31	04:15	19:40	20:25	21:28
54°	02:46	03:41	04:23	19:33	20:14	21:10
52°	03:00	03:51	04:30	19:26	20:05	20:56
50°	03:12	03:59	04:36	19:19	19:56	20:43
45°	03:36	04:16	04:49	19:06	19:39	20:19
N 40°	03:55	04:30	05:00	18:55	19:25	20:00
35°	04:09	04:42	05:09	18:46	19:13	19:46
30°	04:21	04:52	05:17	18:38	19:03	19:33
20°	04:40	05:08	05:31	18:24	18:47	19:14
N 10°	04:55	05:21	05:43	18:12	18:33	18:59
0°	05:07	05:32	05:54	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:49	18:11	18:36
20°	05:27	05:53	06:16	17:38	18:00	18:27
30°	05:36	06:04	06:29	17:24	17:49	18:18
35°	05:40	06:10	06:37	17:17	17:43	18:13
40°	05:45	06:17	06:45	17:08	17:36	18:09
45°	05:50	06:24	06:55	16:58	17:29	18:04
S 50°	05:55	06:33	07:07	16:46	17:20	17:59
52°	05:57	06:37	07:13	16:41	17:16	17:57
54°	05:59	06:41	07:19	16:34	17:12	17:54
56°	06:01	06:46	07:26	16:28	17:08	17:52
58°	06:04	06:51	07:33	16:20	17:03	17:49
S 60°	06:06	06:56	07:42	16:11	16:57	17:47

N 72° Wed Thu Tue Wed Thu N 70° ■ 05:22 ■ 09:11 68° ■ 04:42 ■ 09:49 66° 05:02 ■ 09:11 66° 05:02 ■ 09:49 66° 05:02 04:14 07:35 10:15 64° 04:13 03:53 08:22 10:35 62° 03:53 03:42 03:35 06:44 08:53 10:52 60° 03:12 03:19 03:21 07:25 09:15 11:05 N 58° 02:44 03:00 03:08 07:52 09:34 11:16 56° 02:22 02:44 02:57 08:14 09:49 11:26 54° 02:03 02:30 02:48 08:32 10:02 11:35 52° 01:48 02:18 02:39 08:47 10:13 11:43 50° 01:34 02:07 02:31 09:00 10:23 11:50 45° </th
N 70° ■ 05:22 ■ 09:11 68° ■ 04:42 ■ 09:49 66° ■ 05:02 04:14 ■ 07:35 10:15 64° ■ 04:13 03:53 ■ 08:22 10:35 62° 03:53 03:42 03:35 06:44 08:53 10:52 60° 03:12 03:19 03:21 07:25 09:15 11:05 N 58° 02:44 03:00 03:08 07:52 09:34 11:16 56° 02:22 02:44 02:57 08:14 09:49 11:26 54° 02:03 02:30 02:48 08:32 10:02 11:35 52° 01:48 02:18 02:39 08:47 10:13 11:43 50° 01:34 02:07 02:31 09:00 10:23 11:50 45° 01:07 01:45 02:15 09:27 10:45 12:05 N 40°<
68° 66° 66° 64° 64° 62° 63:53 62° 63:53 62° 63:12 63:19 63:21 63:53 62° 63:12 63:19 63:12 63:19 63:10 63:19 63:10
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
20° ···· 00:36 01:22 10:46 11:49 12:51 N 10° ···· 00:16 01:06 11:08 12:07 13:05
N 10°
0° 23.57 00.52 11.28 12.24 13.17
0 25.57 00.52 11.20 12.24 15.17
S 10° 23:39 ··· 00:37 11:48 12:40 13:29
20° 23:19 ···· 00:22 12:09 12:58 13:42
30° 22:56 ···· 00:04 12:34 13:18 13:57
35° 22:42 23:53 ··· 12:49 13:30 14:05
40° 22:26 23:41 ··· 13:05 13:43 14:15
45° 22:07 23:27 ··· 13:25 13:59 14:26
S 50° 21:44 23:09 ··· 13:50 14:18 14:39
52° 21:32 23:00 ···· 14:02 14:27 14:45
54° 21:19 22:51 ···· 14:15 14:37 14:52
56° 21:04 22:40 ··· 14:31 14:48 15:00
58° 20:46 22:28 ···· 14:49 15:01 15:08
S 60° 20:24 22:14 ···· 15:12 15:17 15:18

	Sun			Moon			
Day	Eqn.of Time				Mer.Pass.		Age
2,	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-44%	
30	02:47	02:51	11:57	05:14	17:43		
01	02:55	02:58	11:57	06:11	18:38		
02	03:02	03:05	11:57	07:04	19:30		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	221°23.16	188°54.20 N11°51.30		168°57.79 N18°11.10	232°50.09	
1	$236^{\circ}25.62$	203°53.73 52.39	234°13.97 25.53	183°59.65 11.25	247°52.35 49.20	Alpheratz 357°35.67 29°13.26 Ankaa 353°8.05 -42°10.38
2	251°28.08	218°53.25 53.48		199° 1.52 11.39	262°54.62 49.12	Ankaa 353°8.05 -42°10.38 Schedar 349°32.23 56°40.01
3	266° 30.55	233°52.77 · · 54.57		214°3.39 · · 11.54	277°56.88 · · 49.05	Diphda 348°48.16 -17°51.25
4	281°33.01	248°52.29 55.66		229°5.26 11.69	292°59.14 48.97	Achernar 335°21.15 -57°6.75
5	296°35.48	263°51.81 56.75		244°7.12 11.83	308°1.41 48.90	Hamal 327°52.22 23°34.51
6 7	311°37.94 326°40.40	278°51.33 N11°57.84 293°50.85 11°58.93		259°8.99 N18°11.98 274°10.86 12.12	323°3.67 S 06°48.82 338°5.94 48.75	Polaris 314°49.42 89°21.98
8	341°42.87	308°50.37 12°0.01		289°12.73 12.27	353°8.20 48.67	Acamar 315°12.63 -40°12.48
9	356° 45.33	323°49.88 · · 1.10		304°14.59 · · 12.41	8°10.47 · · 48.60	Menkar 314°7.09 4°11.01
10	11°47.80	338°49.40 2.19		319°16.46 12.56	23°12.73 48.52	Mirfak 308°29.62 49°56.80 Aldebaran 290°40.61 16°33.44
11	$26^{\circ}50.26$	353°48.92 3.27		334°18.33 12.71	38°15.00 48.45	Aldebaran 290°40.61 16°33.44 Rigel 281°4.71 -8°10.50
12	41°52.72	8°48.44 N12°4.36		349°20.19 N18°12.85	53°17.26	Capella 280°23.16 46°1.40
13	56° 55.19	23° 47.95 5.44		4°22.06 13.00	68°19.53 48.30	Bellatrix 278°23.78 6°22.25
14 15	71°57.65 87°0.12	38°47.47 6.53 53°46.99 · 7.61		19°23.93 13.14 34°25.79 · · 13.29	83°21.79 48.22 98°24.06 •• 48.15	Elnath 278°2.92 28°37.69
16	102°2.58	68° 46.50 8.70		49°27.66 13.43	113°26.32 48.07	Alnilam 275°38.59 -1°11.25
17	117°5.05	83°46.02 9.78		64°29.53 13.58	128°28.59 48.00	Betelgeuse 270°52.97 7°24.66
18	132°7.51	98°45.53 N12°10.86	129°25.87 S 00°12.49	79°31.39 N18°13.73	143°30.85 S06°47.92	Canopus 263°53.01 -52°42.69 Sirius 258°26.96 -16°45.09
19	$147^{\circ}9.97$	113°45.05 11.95		94°33.26 13.87	158°33.12 47.85	Sirius 258°26.96 -16°45.09 Adhara 255°6.53 -29°0.47
20	162° 12.44	128°44.56 13.03		109°35.13 14.02	173°35.38 47.77	Procyon 244°51.58 5°9.73
21	177° 14.90	143°44.07 · · 14.11		124°36.99 · · 14.16	188°37.65 · · 47.70	Pollux 243°18.15 27°58.13
22 23	192° 17.37 207° 19.83	158° 43.59 15.19 173° 43.10 16.27		139°38.86 14.31 154°40.73 14.45	203°39.92 47.62 218°42.18 47.55	Avior 234°15.12 -59°35.49
		-				Suhail 222°46.76 -43°32.07
Mer.	pass. 09:13	ν -0.5 $'$ $d1.1'$ m-3.91	$ u 0.7' \ d$ -0.8' m1.11	$ u 1.9' \ d 0.1' \ \text{m-} 2.01$	$ u 2.3' \ d\text{-}0.1' \ \text{m}1.07$	Miaplacidus 221°38.42 -69°49.27
						Alphard 217°48.31 -8°45.94
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.98 11°50.91 Dubhe 193°41.35 61°37.42
0	222°22.29	188°42.61 N12°17.35	219°30.07 S 00°7.89	169°42.59 N18°14.60	233°44.45 S06°47.48	Denebola 182°25.33 14°26.16
1	237°24.76	203°42.13 18.43		184°44.46 14.74	248°46.71 47.40	Gienah 175°43.95 -17°40.75
2	252°27.22	218° 41.64 19.51		199°46.33 14.89	263°48.98 47.33	Acrux 173°0.26 -63°14.23
3 4	267° 29.69 282° 32.15	233°41.15 · · 20.59 248°40.66 21.66		214°48.19 · · 15.03 229°50.06 15.18	278°51.25 · · 47.25 293°53.51 47.18	Gacrux 171°51.88 -57°15.16
5	202 32.13 297°34.61	263° 40.17 22.74		244°51.92 15.32	308°55.78 47.10	Alioth 166°12.97 55°49.77
6	312° 37.08	278°39.68 N12°23.82		259°53.79 N18°15.47	323°58.05 S06°47.03	Spica 158°22.63 -11°17.40
7	327°39.54	293°39.19 24.90	_	274°55.66 15.61	339°0.31 46.96	Alkaid 152°51.98 49°11.52 Hadar 148°36.25 -60°29.51
8	$342^{\circ}42.01$	308°38.70 25.97	339°35.68 1.76	289°57.52 15.76	354°2.58 46.88	Menkent 147°57.94 -36°29.49
9	357°44.47	323°38.21 · · 27.05		304°59.39 · · 15.90	9°4.85 · · 46.81	Arcturus 145°48.11 19°3.27
10	12°46.93	338° 37.72 28.12		320°1.26 16.05	24°7.12 46.73	Rigil Kent. 139°40.49 -60°56.21
11	27°49.40	353°37.23 29.20		335° 3.12 16.19	39°9.38 46.66	Kochab 137°18.54 74°3.27
12 13	42°51.86 57°54.33	8°36.73 N12°30.27 23°36.24 31.34		350°4.99 N18°16.34 5°6.85 16.48	54°11.65 \$06°46.59 69°13.92 46.51	Zuben'ubi 136°56.34 -16°8.67
14	72°56.79	38°35.75 32.42		20°8.72 16.63	84°16.19 46.44	Alphecca 126°3.88 26°37.84
15	87° 59.25	53°35.26 · · 33.49		35°10.58 · · 16.77	99°18.45 · · 46.36	Antares 112°16.23 -26°29.19
16	103°1.72	68°34.76 34.56		50°12.45 16.92	114°20.72 46.29	Atria 107°10.52 -69°4.15 Sabik 102°3.17 -15°45.36
17	$118^{\circ}4.18$	83°34.27 35.63		65°14.32 17.06	129°22.99 46.22	Shaula 96°10.85 -37°7.25
18	133°6.65	98°33.77 N12°36.70		80°16.18 N18°17.21	144°25.26	Rasalhague 95°58.83 12°32.36
19	148°9.11	113°33.28 37.77		95°18.05 17.35	159°27.53 46.07	Eltanin 90°42.07 51°28.83
20 21	163° 11.57 178° 14.04	128°32.78 38.8 ⁴ 143°32.29 · · 39.91		110°19.91 17.50 125°21.78 · · 17.64	174°29.79 46.00 189°32.06 • 45.92	Kaus Aust. 83°33.04 -34°22.33
22	193° 16.50	158°31.79 40.98	_	140°23.64 17.79	204°34.33 45.85	Vega 80°33.37 38°48.06
23	208° 18.97	173°31.30 42.05		155°25.51 17.93	219°36.60 45.78	Nunki 75°48.30 -26°15.98
						Altair 62°0.43 8°55.76 Peacock 53°6.54 -56°39.21
ivier.	pass. 09:09	ν-0.5′ d1.1′ m-3.91	$\nu 0.7' \ d$ -0.8' m1.11	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	ν2.3' d-0.1' m1.07	Deneb 49°26.18 45°21.66
						Enif 33°39.44 9°58.99
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 33.76 -46° 50.46
0 1	223° 21.43 238° 23.89	188°30.80 N12°43.11 203°30.30 44.18	_	170°27.37 N18°18.08 185°29.24 18.22	234°38.87 S 06°45.70 249°41.14 45.63	Fomalhaut 15°15.33 -29°29.58
2	253° 25.89 253° 26.36	218° 29.80 45.25		185°29.24 18.22 200°31.10 18.37	249°41.14 45.63 264°43.41 45.56	Scheat 13°45.97 28°12.63
3	268° 28.82	233°29.31 · · 46.31		215°32.97 · · 18.51	279°45.68 · · 45.48	Markab 13°30.66 15°19.96
4	283°31.29	248°28.81 47.38		230°34.83 18.65	294°47.94 45.41	May 03 Fri SHA Mer.pass
5	298°33.75	263°28.31 48.44	294°50.41 14.33	245°36.70 18.80	309°50.21 45.34	Venus 327° 31.05 11:25
6	313°36.22	278°27.81 N12°49.51		260°38.57 N18°18.94	324°52.48 S 06°45.26	Mars 357°50.11 09:23
7	328° 38.68	293°27.31 50.57		275°40.43 19.09	339°54.75 45.19	Jupiter 307°34.63 12:43
8	343°41.14	308°26.81 51.64		290°42.30 19.23	354°57.02 45.12	Saturn 11°26.93 08:27
9 10	358° 43.61 13° 46.07	323°26.31 · · 52.70 338°25.81 · · 53.70		305°44.16 · · 19.38 320°46.02 19.52	9°59.29 · · 45.05 25°1.56 44.97	May 04 Sat SHA Mer.pass
11	28° 48.54	353°25.31 54.82		335°47.89 19.67	40°3.83 44.90	Venus 326° 20.32 11:26
12	43°51.00	8°24.81 N12°55.88		350°49.75 N18°19.81	55°6.10 S06°44.83	Mars 357°7.78 09:22
13	58°53.46	23°24.30 56.94	_	5°51.62 19.95	70°8.37 44.75	Jupiter 307°20.30 12:40
14	73°55.93	38°23.80 58.00	69°56.72 21.22	20°53.48 20.10	85°10.64 44.68	Saturn 11°22.15 08:24
15	88° 58.39	53°23.30 12°59.00		35°55.35 · · 20.24	100°12.91 · · 44.61	May 05 Sun SHA Mer.pass
16	104°0.86	68°22.80 13°0.12		50°57.21 20.39	115°15.18 44.54	Venus 325°9.37 11:26
17	119°3.32	83°22.29 1.18		65°59.08 20.53	130°17.46 44.46	Mars 356°25.47 09:20
18 19	134°5.78 149°8.25	98°21.79 N13°2.24 113°21.28 3.30	_	81°0.94 N18°20.67 96°2.81 20.82	145°19.73 S06°44.39 160°22.00 44.32	Jupiter 307°5.94 12:37
20	149 6.25 164° 10.71	113 21.26 3.30 128°20.78 4.39		111° 4.67 20.96	175°24.27 44.25	Saturn 11°17.44 08:20
21	179° 13.18	143°20.27 · · 5.41		126°6.54 · · 21.11	190°26.54 · · 44.17	Horizontal parallax
22	194° 15.64	158°19.77 6.47	_	141°8.40 21.25	205°28.81 44.10	Venus: 0.1
23	209° 18.10	173°19.26 7.52	205°3.05 28.11	156°10.26 21.39	220°31.08 44.03	Mars: 0.1
Mer.	pass. 09:05	ν-0.5′ d1.1′ m-3.91	ν 0.7′ d0.8′ m1.11	ν1.9' d0.1' m-2.00	ν2.3' d-0.1' m1.07	

	0.10.0	-0.0101 3ec		011 -	- +09.2021		
h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.98	N15°45.38	245°4.86	10.2'	S 13°40.52	-15.3'	59.5'
1	195°47.04	46.12	259°34.09	10.3'	13°25.22	-15.4'	59.5'
2	210°47.10 225°47.16	46.85	274°3.36 288°32.69	10.3'	13°9.84 12°54.37	-15.5'	59.5'
3 4	240°47.23	· · 47.58 48.31	288° 32.69 303° 2.05	10.4' 10.4'	12°54.37 12°38.82	-15.5' -15.6'	59.5' 59.6'
5	255° 47.29	49.04	317°31.46	10.4	12° 23.20	-15.0 -15.7'	59.6'
6	270°47.35	N15°49.77	332°0.91	10.5'	\$12°7.49	-15.8'	59.6'
7	285°47.41	50.50	346°30.40	10.5'	11°51.71	-15.9'	59.6'
8	300°47.47	51.23	0°59.93	10.6'	11°35.86	-15.9'	59.6'
9	315°47.53	•• 51.96	$15^{\circ}29.50$	10.6'	11°19.93	-16.0'	59.7'
10	330°47.59	52.68	29°59.11	10.6'	11°3.93	-16.1'	59.7'
11	345°47.65	53.41 N15°54.14	44°28.75	10.7'	10°47.86 \$10°31.72	-16.1' -16.2'	59.7'
12 13	0°47.71 15°47.77	N15 54.14 54.87	58°58.43 73°28.15	10.7' 10.7'	10°15.51	-16.2 -16.3'	59.7' 59.7'
14	30°47.82	55.59	87°57.90	10.7	09°59.24	-16.3'	59.7'
15	45°47.88	• • 56.32	102°27.68	10.8'	09°42.91	-16.4	59.8'
16	60°47.94	57.04	116°57.49	10.8'	09°26.51	-16.5'	59.8'
17	75°48.00	57.77	131°27.34	10.9'	09°10.05	-16.5'	59.8'
18	90°48.06	N15°58.49	145°57.21	10.9'	S08°53.53	-16.6'	59.8'
19	105°48.12	59.22	160°27.11	10.9'	08°36.95	-16.6'	59.8'
20	120°48.17	15°59.94	174°57.04	11.0'	08°20.32	-16.7'	59.9'
21	135°48.23 150°48.29	16°0.66	189°26.99 203°56.97	11.0'	08°3.64 07°46.90	-16.7'	59.9'
22 23	150°48.29 165°48.34	1.39 2.11	203°56.97 218°26.97	11.0' 11.0'	07°46.90 07°30.11	-16.8' -16.8'	59.9' 59.9'
23						10.0	33.3
	SD = 15.9'	d = 0.7'		SI	O = 16.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.40	$N16^{\circ}2.83$	232°56.99	11.0'	S07°13.27	-16.9'	59.9'
1	195°48.46	3.55	247°27.04	11.1'	06°56.38	-16.9'	59.9'
2	210°48.51	4.27	261°57.10	11.1'	06°39.44	-17.0'	59.9'
3	225°48.57 240°48.62	• • 4.99	276°27.19 290°57.29	11.1'	06°22.46	-17.0'	60.0'
4 5	240 48.62 255°48.68	5.71 6.43	290 57.29 305°27.40	11.1' 11.1'	06°5.44 05°48.38	-17.1' -17.1'	60.0' 60.0'
6	270°48.73	N16°7.15	319°57.53	11.1'	S05°31.27	-17.1	60.0'
7	285°48.79	7.87	334°27.68	11.2'	05°14.13	-17.2'	60.0'
8	300°48.84	8.59	348°57.83	11.2'	04°56.95	-17.2'	60.0'
9	315°48.90	• • 9.30	3°28.00	11.2'	04°39.73	-17.2'	60.0'
10	330°48.95	10.02	$17^{\circ}58.18$	11.2'	04°22.49	-17.3'	60.1'
11	345°49.00	10.74	32°28.37	11.2'	04°5.21	-17.3'	60.1'
12	0°49.06	N16°11.45	46°58.56 61°28.76	11.2'	\$03°47.90 03°30.56	-17.3'	60.1'
13 14	15°49.11 30°49.16	12.17 12.89	75°58.96	11.2' 11.2'	03° 30.56 03° 13.20	-17.4' -17.4'	60.1' 60.1'
15	45°49.21	• • 13.60	90°29.17	11.2'	03°15.20	-17.4'	60.1
16	60°49.27	14.31	104°59.38	11.2'	02°38.40	-17.4	60.1
17	75°49.32	15.03	119°29.59	11.2'	02°20.96	-17.5'	60.1'
18	90°49.37	N16°15.74	133°59.80	11.2'	S02°3.51	-17.5'	60.2'
19	105°49.42	16.45	148°30.01		01°46.04		60.2'
20	120°49.47	17.17	163°0.21	11.2'	01°28.55	-17.5'	60.2'
21	135°49.52 150°49.58	· · 17.88 18.59	177°30.41 192°0.61	11.2' 11.2'	01°11.05 00°53.53	-17.5'	60.2'
22 23	150 49.58 165°49.63	18.59	206°30.79	11.2'	00°36.01	-17.5' -17.5'	60.2' 60.2'
23			200 30.19			-11.5	00.2
	SD = 15.9'	d = 0.7'		SI	D = 16.3'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.68	N16°20.01	221°0.97	11.2'	S00°18.47	-17.5'	60.2'
1	195°49.73	20.72	235°31.14	11.2'	S00°0.93	-17.5'	60.2'
2	210°49.78	21.43	250°1.30	11.1'	N00°16.62	17.6'	60.2'
3 4	225°49.83 240°49.88	· · 22.14 22.85	264°31.45 279°1.58	11.1' 11.1'	00°34.17 00°51.73	17.6'	60.2'
4 5	240°49.88 255°49.92	22.85	279°1.58 293°31.70	11.1'	00°51.73 01°9.29	17.6' 17.6'	60.2' 60.2'
6	270°49.97	N16°24.26	308°1.80	11.1'	N01°26.84	17.6'	60.3
7	285°50.02	24.97	322°31.88	11.1'	01°44.39	17.5	60.3
8	300°50.07	25.68	337°1.95	11.0'	$02^{\circ}1.94$	17.5'	60.3'
9	315°50.12	• • 26.39	351°31.99	11.0'	02°19.48	17.5'	60.3'
10	330°50.17	27.09	6°2.02	11.0'	02°37.01	17.5'	60.3'
11	345°50.21	27.80	20°32.02	11.0'	02°54.53	17.5'	60.3'
12 13	0°50.26 15°50.31	N16°28.50 29.21	35°2.00 49°31.95	11.0' 10.9'	N03°12.04 03°29.54	17.5' 17.5'	60.3' 60.3'
13 14	30°50.31	29.21 29.91	49°31.95 64°1.88	10.9'	03°29.54 03°47.02	17.5'	60.3
15	45°50.40	30.61	78°31.78	10.9	03 47.02 04°4.48	17.3	60.3'
16	60°50.45	31.32	93°1.65	10.8'	04°21.93	17.4	60.3'
17	75°50.49	32.02	107°31.49	10.8'	04°39.35	17.4	60.3'
18	90°50.54	N16°32.72	122°1.30	10.8'	N04°56.75	17.4'	60.3'
19	105°50.59	33.42	136°31.07	10.7'	05°14.13	17.3'	60.3'
20	120°50.63	34.12	151°0.81	10.7'	05°31.47	17.3'	60.3'
21 22	135°50.68 150°50.72	· · 34.82 35.52	165°30.52 180°0.19	10.7' 10.6'	05°48.79 06°6.08	17.3' 17.3'	60.3' 60.3'
23	150°50.72 165°50.77	35.52 36.22	180°0.19 194°29.83	10.6'	06°6.08 06°23.34	17.3'	60.3'
23						11.4	
	SD = 15.9'	d = 0.7'		SI	O = 16.4'		

Lat.	Twi	light	Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	////	////	01:20	22:44	////	////	
N 70°	////	////	02:10	21:49	////	////	
68°	////	////	02:41	21:16	////	////	
66°	////	01:32	03:04	20:52	22:27	////	
64°	////	02:09	03:22	20:34	21:49	////	
62°	////	02:34	03:36	20:19	21:22	////	
60°	01:22	02:54	03:49	20:06	21:02	22:37	
N 58°	01:55	03:10	03:59	19:56	20:46	22:02	
56°	02:19	03:23	04:09	19:46	20:32	21:37	
54°	02:37	03:34	04:17	19:38	20:21	21:18	
52°	02:52	03:44	04:24	19:31	20:10	21:03	
50°	03:05	03:53	04:31	19:24	20:01	20:50	
45°	03:31	04:12	04:45	19:10	19:43	20:24	
N 40°	03:50	04:26	04:56	18:58	19:28	20:04	
35°	04:06	04:38	05:06	18:48	19:16	19:49	
30°	04:18	04:49	05:14	18:40	19:05	19:36	
20°	04:38	05:06	05:29	18:25	18:48	19:15	
N 10°	04:54	05:20	05:42	18:12	18:34	19:00	
0°	05:07	05:32	05:53	18:00	18:22	18:47	
S 10°	05:18	05:43	06:05	17:48	18:10	18:35	
20°	05:28	05:54	06:17	17:36	17:59	18:25	
30°	05:38	06:06	06:31	17:22	17:47	18:15	
35°	05:43	06:13	06:39	17:14	17:40	18:10	
40°	05:48	06:20	06:48	17:05	17:33	18:05	
45°	05:53	06:28	06:59	16:54	17:25	18:00	
S 50°	05:59	06:37	07:12	16:41	17:16	17:54	
52°	06:01	06:41	07:18	16:35	17:11	17:52	
54°	06:04	06:46	07:24	16:29	17:07	17:49	
56°	06:06	06:51	07:32	16:21	17:02	17:46	
58°	06:09	06:56	07:40	16:13	16:56	17:43	
S 60°	06:12	07:03	07:49	16:03	16:50	17:40	

Lat.		Moonris	е		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	04:43	03:55	03:17	11:40	14:16	16:44
N 70°	04:22	03:47	03:17	11:59	14:20	16:38
68°	04:05	03:40	03:18	12:14	14:24	16:32
66°	03:51	03:34	03:18	12:26	14:28	16:28
64°	03:39	03:28	03:19	12:36	14:30	16:24
62°	03:29	03:24	03:19	12:44	14:33	16:21
60°	03:21	03:20	03:19	12:51	14:35	16:18
N 58°	03:13	03:17	03:20	12:57	14:37	16:16
56°	03:06	03:14	03:20	13:03	14:38	16:14
54°	03:00	03:11	03:20	13:08	14:40	16:12
52°	02:55	03:08	03:20	13:12	14:41	16:10
50°	02:50	03:06	03:20	13:16	14:42	16:08
45°	02:39	03:01	03:21	13:25	14:45	16:05
N 40°	02:30	02:56	03:21	13:32	14:47	16:02
35°	02:23	02:53	03:22	13:38	14:49	15:59
30°	02:16	02:49	03:22	13:43	14:50	15:57
20°	02:04	02:44	03:22	13:52	14:53	15:53
N 10°	01:54	02:39	03:23	14:00	14:55	15:50
0°	01:44	02:34	03:23	14:08	14:57	15:47
S 10°	01:34	02:29	03:24	14:15	14:59	15:44
20°	01:23	02:24	03:24	14:23	15:02	15:40
30°	01:11	02:18	03:25	14:31	15:04	15:37
35°	01:04	02:15	03:25	14:36	15:06	15:34
40°	00:56	02:11	03:26	14:42	15:07	15:32
45°	00:47	02:07	03:26	14:49	15:09	15:29
S 50°	00:35	02:01	03:27	14:56	15:11	15:26
52°	00:30	01:59	03:27	15:00	15:12	15:24
54°	00:24	01:56	03:28	15:04	15:13	15:22
56°	00:17	01:53	03:28	15:08	15:14	15:21
58°	00:10	01:50	03:29	15:13	15:16	15:18
S 60°	00:01	01:46	03:29	15:18	15:17	15:16

	Sun			Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	33-13%	
03	03:08	03:11	11:57	07:56	20:21		
04	03:14	03:16	11:57	08:46	21:10		
05	03:19	03:21	11:57	09:35	22:00		

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	224°20.57	188°18.76 N13°8.5		171°12.13 N18°21.54	235°33.35
1	239°23.03	203°18.25 9.6		186°13.99 21.68	250°35.63 43.89
2	254° 25.50	218°17.74 10.6		201°15.86 21.83	265°37.90 43.81
3	269° 27.96	233°17.23 · · 11.7		216°17.72 · · 21.97	280°40.17 · · 43.74
4	284°30.42	248°16.73 12.7		231°19.59 22.11	295°42.44 43.67
5	299°32.89	263°16.22 13.8		246°21.45 22.26	310°44.71 43.60
6	314°35.35	278°15.71 N13°14.8		261°23.31 N18°22.40	325°46.98 S06°43.53
7	329° 37.82	293°15.20 15.9		276°25.18 22.55	340°49.26 43.45
8	344°40.28	308°14.69 16.9		291°27.04 22.69	355°51.53 43.38
9	359° 42.74	323°14.18 · · 18.0		306°28.91 · · 22.83	10°53.80 · · 43.31
10	14°45.21	338°13.67 19.0		321°30.77 22.98	25°56.07 43.24
11	29° 47.67	353°13.16 20.1		336°32.63 23.12	40°58.35 43.17
12	44°50.14	8°12.65 N13°21.1		351°34.50 N18°23.26	56°0.62 S06°43.10
13	59°52.60	23°12.13 22.2		6°36.36 23.41	71°2.89 43.03
14	74°55.07	38°11.62 23.2		21°38.23 23.55	86°5.17 42.95
15	89°57.53	53°11.11 · · 24.3		36°40.09 · · 23.69	101°7.44 · · 42.88
16	104°59.99	68°10.60 25.3		51°41.95 23.84	116°9.71 42.81
17	120°2.46	83°10.08 26.4		66°43.82 23.98	131°11.99 42.74
18	135°4.92	98°9.57 N13°27.4		81°45.68 N18°24.12	146°14.26 S06°42.67
19	150°7.39	113°9.06 28.5		96°47.54 24.27	161°16.53 42.60
20	165° 9.85	128° 8.54 29.5		111°49.41 24.41	176°18.81 42.53
21	180° 12.31	143°8.03 · · 30.6		126°51.27 · · 24.55	191°21.08 · · 42.46
22	180 12.31 195°14.78	143 8.03 · · 30.6 158°7.51 31.6		120 51.27 · · · 24.55 141°53.13 24.70	206°23.36 42.38
23	195 14.78 210° 17.24	173°6.99 32.6		141 53.13 24.70 156°55.00 24.84	200 23.30 42.38 221°25.63 42.31
23	210 17.24	113 0.99 32.0		· · · · · · · · · · · · · · · · · · ·	
Mer.p	pass. 09:01	ν-0.5′ d1.1′ m-3.9	$\nu 0.7' \ d0.8' \ m1.11$	ν1.9' d0.1' m-2.00	ν2.3′ d-0.1′ m1.07
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	225° 19.71	188°6.48 N13°33.7		171°56.86 N18°24.98	236°27.90 S06°42.24
1	240° 22.17	203°5.96 34.7		186°58.72 25.13	251°30.18 42.17
2	255° 24.63	218° 5.44 35.8		202° 0.59 25.27	266°32.45 42.10
3	270° 27.10	233°4.93 · · 36.8		217° 2.45 · · 25.41	281°34.73 · · 42.03
4	285° 29.56	248° 4.41 37.8		232°4.31 25.56	296°37.00 41.96
5	300°32.03	263°3.89 38.9		247°6.18 25.70	311°39.28 41.89
6	315° 34.49	278°3.37 N13°39.9		262°8.04 N18°25.84	326°41.55 S06°41.82
7	330° 36.95	293°2.85 41.0		277°9.90 25.99	341°43.83 41.75
8	345° 39.42	308°2.33 42.0			
9	0°41.88	323°1.81 · · 43.0		292°11.77 26.13 307°13.63 · · 26.27	356°46.10 41.68 11°48.38 · · 41.61
	15° 44.35	338°1.29 44.1		322°15.49 26.41	26°50.65 41.54
10 11	30°46.81	353° 0.77 45.1		337°17.35 26.56	41°52.93 41.47
12	45° 49.28	8°0.25 N13°46.1		352°19.22 N18°26.70	56°55.20 S06°41.40
	45 49.26 60°51.74	22°59.73 47.2			
13	75°54.20	37°59.20 48.2		7°21.08 26.84 22°22.94 26.99	71°57.48 41.32 86°59.76 41.25
14	90°56.67				
15 16	105°59.13	52°58.68 · · 49.2 67°58.16 50.3		$37^{\circ}24.81 \cdot \cdot 27.13$ $52^{\circ}26.67 \qquad 27.27$	102°2.03 · · 41.18 117°4.31 41.11
17	105 59.15 121°1.60	82° 57.63 51.3		67°28.53 27.41	132°6.58 41.04
18	136°4.06	97°57.11 N13°52.3		82°30.39 N18°27.56	147°8.86 S06°40.97
19	151°6.52	112°56.59 53.4		97°32.26 27.70	162°11.14 40.90
	166°8.99	127°56.06 54.4		112°34.12 27.84	177°13.41 40.83
20 21	100 8.99 181°11.45	142°55.54 · · 55.4		112 34.12 27.04 127°35.98 · · 27.98	192°15.69 · · 40.76
22	196° 13.92	157°55.01 56.4		142°37.84 28.13	207°17.97 40.69
23	211°16.38	172°54.48 57.5		157°39.71 28.27	222°20.24 40.62
Mer.p	bass. 08:57	ν-0.5′ d1.0′ m-3.9	$\nu 0.7' \ d0.8' \ m1.10$	ν1.9' d0.1' m-2.00	ν2.3' d-0.1' m1.07
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
oved 0	226° 18.84	187°53.96 N13°58.5		172°41.57 N18°28.41	237°22.52 S06°40.56
1	241°21.31	202°53.43 13°59.5		187°43.43 28.55	252°24.80 40.49
2	256° 23.77	202 55.45 15 59.5 217°52.90 14°0.6		202°45.29 28.70	267°27.07 40.42
3	271° 26.24	232°52.38 · · 1.6		217°47.16 · · 28.84	282°29.35 · · 40.35
4	286° 28.70	247°51.85 2.6		232°49.02 28.98	297°31.63 40.28
5	301°31.17	262°51.32 3.6		247°50.88 29.12	312°33.91 40.21
6	316° 33.63	202 51.32 5.6 277°50.79 N14°4.7		262°52.74 N18°29.27	312 33.91 40.21 327°36.18 \$06°40.14
7	331° 36.09	292°50.26 5.7		277°54.60 29.41	342°38.46 40.07
8	346°38.56	307°49.73 6.7		292°56.47 29.55	357°40.74 40.00
9	1°41.02	322°49.20 · · 7.7		307°58.33 · · 29.69	12°43.02 · · 39.93
10	16°43.49	337°48.67 8.7		323° 0.19 29.83	27°45.30 39.86
11	31° 45.49	352°48.14 9.8		325 0.19 29.85 338°2.05 29.98	42°47.57 39.79
12	46° 48.41	7°47.61 N14°10.8		353° 3.91 N18° 30.12	57°49.85 S06°39.72
13	40 48.41 61°50.88	7 47.61 N14 10.8 22°47.07 11.8		8° 5.78 30.26	72°52.13 39.65
14	76°53.34	37°46.54 12.8		23°7.64 30.40	87°54.41 39.58
15	91°55.81	52°46.01 · · 13.8		38° 9.50 · · 30.54	102°56.69 · · 39.52
15 16	91 55.81 106°58.27	67°45.48 14.9		53°11.36 30.69	102 50.09 · · 39.52 117°58.97 39.45
	106 58.27 122° 0.74			68°13.22 30.83	
17 18	122°0.74 137°3.20				
	137° 3.20 152° 5.66	97°44.41 N14°16.9 112°43.87 17.9		83°15.09 N18°30.97 98°16.95 31.11	148°3.53 S06°39.31 163°5.81 39.24
19				98°16.95 31.11 113°18.81 31.25	
20 21	167°8.13 182°10.59	127°43.34 18.9 142°42.80 •• 19.9		113° 18.81 31.25 128° 20.67 · · 31.40	178°8.08 39.17 193°10.36 · · 39.10
21	182° 10.59 197° 13.06	142°42.80 · · 19.9 157°42.27 21.0		128°20.67 · · 31.40 143°22.53 31.54	208°12.64 39.03
23	212° 15.52	172°41.73 22.0		158°24.39 31.68	200 12.04 39.03 223°14.92 38.97
					
Mer.p	pass. 08:53	ν -0.5′ $d1.0$ ′ m-3.9	$ u 0.7' \ d0.8' \ m1.10 $	$ u 1.9' \ d 0.1' \ { m m-} 2.00$	$ u 2.3' \ d ext{-}0.1' \ \text{m}1.07$
			_		

Stars SHA

357°35.65 353°8.03

349° 32 21

348°48.15

 $335^{\circ}21.14$

 $327^{\circ}52.21$

314°49.32

315°12.63

 $314^{\circ}7.09$

308°29.62

290°40.62

281°4.72

280°23.17

278°23.79

278°2.93

275°38.60

270°52.98

263°53.03

Alpheratz

Ankaa Schedar

Diphda Achernar

Hamal

Polaris

Acamar

Menkar

Mirfak

Rigel Capella

Bellatrix

Elnath

Alnilam

Canopus

Betelgeuse

Aldebaran

Dec 29° 13.26

-42°10.37

56°40 00

-17°51.24

 $-57^{\circ}6.74$

23°34.51

89°21.97

40°12.47

4°11.01

49°56.79

16°33.44

-8°10.49

 $46^{\circ}1.40$

 $6^{\circ}22.25$

28°37.69

-1°11.25

 $7^{\circ}24.66$

-52°42.68

	C			J11 —	+09.20 11 3		
h	Su	<u>n</u>			Moon		
Mon	GHA 180°50.81	Dec N16° 36.92	GHA 208°59.42	ν 10.6'	Dec N06°40.56	d 17.2'	HP
0 1	180 50.81 195°50.85	37.62	208 59.42 223°28.98	10.6' 10.5'	06°57.75	17.2 17.1'	60.3' 60.3'
2	210°50.90	38.32	237°58.49	10.5'	07°14.90	17.1	60.3
3	225°50.94	• • 39.02	252°27.96	10.4'	07°32.01	17.1'	60.3'
4	240°50.98	39.71	266°57.39	10.4'	$07^{\circ}49.08$	17.0'	60.3'
5	255°51.03	40.41	281°26.78	10.3'	08°6.10	17.0'	60.3'
6 7	270°51.07 285°51.11	N16°41.11 41.80	295°56.12 310°25.41	10.3' 10.2'	N08°23.08 08°40.02	16.9' 16.9'	60.3' 60.3'
8	300°51.16	42.50	324°54.66	10.2'	08°56.90	16.8'	60.3
9	315°51.20	43.19	339°23.85	10.1'	09°13.73	16.8	60.3'
10	330°51.24	43.89	353°53.00	10.1'	09°30.51	16.7'	60.3'
11	345°51.28	44.58	8°22.10	10.0'	09°47.24	16.7'	60.3'
12 13	0°51.32 15°51.36	N16°45.27 45.97	22°51.14 37°20.13	10.0' 9.9'	N10°3.90 10°20.51	16.6' 16.5'	60.3' 60.3'
14	30°51.40	46.66	51°49.07	9.9 9.9'	10°20.51 10°37.06	16.5	60.3
15	45°51.44	47.35	66°17.96	9.8'	10°53.55	16.4	60.2
16	60°51.48	48.04	80°46.78	9.8'	$11^{\circ}9.97$	16.4'	60.2'
17	75°51.52	48.73	95°15.56	9.7'	11°26.33	16.3'	60.2
18 19	90°51.56 105°51.60	N16°49.42 50.11	109°44.27 124°12.92	9.7' 9.6'	N11°42.61 11°58.83	16.2' 16.1'	60.2' 60.2'
20	105 51.60 120°51.64	50.11	138°41.52	9.0 9.5'	11 56.65 12°14.98	16.1	60.2
21	135°51.68	51.49	153°10.06	9.5'	12°31.05	16.0'	60.2
22	150°51.72	52.18	167°38.53	9.4'	12°47.05	15.9'	60.2'
23	165°51.76	52.87	182°6.94	9.4'	13°2.97	15.8'	60.2'
	SD = 15.8'	d = 0.7'		SE	0 = 16.4'		
Tue	GHA 180°51.80	Dec	GHA	ν	Dec	d	HP 60.2'
0 1	180°51.80 195°51.84	N16°53.56 54.24	196°35.29 211°3.58	9.3' 9.2'	N13°18.81 13°34.56	15.8' 15.7'	60.2
2	210°51.87	54.93	225°31.80	9.2'	13°50.24	15.6'	60.1
3	225°51.91	• • 55.62	239°59.96	9.1'	14°5.83	15.5'	60.1'
4	240°51.95	56.30	254°28.06	9.0'	14°21.33	15.4'	60.1'
5	255°51.99	56.99	268°56.08	9.0'	14°36.75	15.3'	60.1
6 7	270°52.02 285°52.06	N16°57.67 58.36	283°24.04 297°51.94	8.9' 8.8'	N14°52.07 15°7.30	15.2' 15.1'	60.1' 60.1'
8	300°52.10	59.04	312°19.76	o.o 8.8'	15 7.30 15°22.44	15.1	60.1
9	315°52.13	16°59.72	326°47.52	8.7'	15°37.48	14.9'	60.0'
10	330°52.17	17°0.40	341°15.21	8.6'	$15^{\circ}52.42$	14.8'	60.0'
11	345°52.20	1.09	355°42.82	8.5'	16°7.26	14.7'	60.0'
12 13	0°52.24 15°52.27	N17°1.77 2.45	10°10.37 24°37.85	8.5' 8.4'	N16°22.00 16°36.64	14.6' 14.5'	60.0'
14	30°52.31	3.13	39°5.26	8.3'	16°51.17	14.4	60.0' 60.0'
15	45°52.34	3.81	53°32.60	8.3'	17°5.59	14.3'	60.0'
16	60°52.38	4.49	67°59.86	8.2'	$17^{\circ}19.90$	14.2'	59.9'
17	75°52.41	5.17	82°27.06	8.1'	17°34.11	14.1'	59.9'
18 19	90°52.45 105°52.48	N17°5.85 6.53	96°54.18 111°21.23	8.1' 8.0'	N17°48.20 18°2.17	14.0' 13.9'	59.9' 59.9'
20	120°52.51	7.20	125°48.21	7.9'	18° 16.03	13.7	59.9'
21	135°52.55	• • 7.88	140°15.12	7.8'	18°29.77	13.6'	59.8'
22	150°52.58	8.56	154°41.95	7.8'	18°43.40	13.5'	59.8'
23	165°52.61	9.23	169°8.72	7.7'	18°56.90	13.4'	59.8'
	SD = 15.8'	d = 0.7'		SE	0 = 16.4'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 0	180°52.64	N17°9.91	183°35.41	ν 7.6'	N19° 10.27	13.3'	59.8'
1	195°52.68	10.58	198°2.03	7.5'	19°23.52	13.1'	59.8'
2	210°52.71	11.26	212°28.57	7.5'	19°36.65	13.0'	59.7'
3	225°52.74	•• 11.93	226°55.04	7.4'	19°49.65	12.9'	59.7'
4 5	240°52.77 255°52.80	12.61 13.28	241°21.45 255°47.78	7.3' 7.3'	20°2.51 20°15.25	12.7' 12.6'	59.7' 59.7'
6	270°52.83	N17°13.95	270°14.04	7.2'	N20°27.85	12.5'	59.7'
7	285°52.86	14.63	284°40.22	7.1'	20°40.32	12.3'	59.6'
8	300°52.89	15.30	299°6.34	7.0'	20°52.65	12.2'	59.6'
9	315°52.92	• • 15.97	313°32.39	7.0'	21°4.84	12.1'	59.6'
10 11	330°52.95 345°52.98	16.64 17.31	327°58.36 342°24.27	6.9' 6.8'	21°16.89 21°28.80	11.9' 11.8'	59.6' 59.5'
12	0°53.01	N17°17.98	356°50.11	6.8	N21°40.57	11.6'	59.5
13	15°53.04	18.65	11°15.88	6.7'	21°52.20	11.5'	59.5'
14	30°53.07	19.32	25°41.58	6.6'	22°3.68	11.3'	59.5'
15	45°53.10	• • 19.98	40°7.21	6.6'	22°15.01	11.2'	59.4'
16 17	60°53.13 75°53.16	20.65 21.32	54°32.78 68°58.28	6.5' 6.4'	22°26.19 22°37.22	11.0' 10.9'	59.4' 59.4'
18	90°53.18	N17°21.99	83°23.72	6.4	N22°48.11	10.9	59.4'
19	105°53.21	22.65	97°49.09	6.3'	22°58.83	10.6'	59.3'
20	120°53.24	23.32	112°14.40	6.2'	23°9.41	10.4'	59.3'
21	135°53.27	• • 23.98	126°39.64	6.2'	23°19.83	10.3'	59.3'
22 23	150°53.29 165°53.32	24.65 25.31	141°4.83 155°29.95	6.1' 6.1'	23°30.09 23°40.19	10.1' 9.9'	59.3' 59.2'
23		_	133 29.93			9.9	33.4
	SD = 15.8'	d = 0.7'		SL	0 = 16.3'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	00:37	23:51	////	////
N 70°	////	////	01:50	22:09	////	////
68°	////	////	02:27	21:30	////	////
66°	////	01:08	02:52	21:04	22:53	////
64°	////	01:53	03:12	20:44	22:04	////
62°	////	02:22	03:28	20:27	21:34	////
60°	01:01	02:44	03:41	20:14	21:12	23:00
N 58°	01:42	03:01	03:52	20:02	20:54	22:15
56°	02:08	03:15	04:02	19:52	20:39	21:48
54°	02:28	03:28	04:11	19:43	20:27	21:27
52°	02:45	03:38	04:19	19:36	20:16	21:10
50°	02:59	03:48	04:26	04:26 19:28		20:56
45°	03:26	04:07	04:40	19:13	19:47	20:29
N 40°	03:46	04:23	04:53	19:01	19:31	20:08
35°	04:02	04:35	05:03	18:51	19:18	19:52
30°	04:15	04:46	05:12	18:42	19:07	19:38
20°	04:37	05:04	05:27	18:26	18:49	19:17
N 10°	04:53	05:19	05:41	18:12	18:35	19:00
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:10	18:35
20°	05:29	05:55	06:18	17:35	17:58	18:24
30°	05:39	06:08	06:33	17:20	17:45	18:13
35°	05:45	06:15	06:42	17:11	17:38	18:08
40°	05:50	06:23	06:51	17:01	17:30	18:02
45°	05:56	06:31	07:02	16:50	17:21	17:57
S 50°	06:02	06:41	07:16	16:36	17:11	17:50
52°	06:05	06:46	07:22	16:30	17:07	17:47
54°	06:08	06:51	07:29	16:23	17:02	17:44
56°	06:11	06:56	07:37	16:15	16:56	17:41
58°	06:14	07:02	07:46	16:06	16:50	17:38
S 60°	06:18	07:09	07:56	15:56	16:43	17:34

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	02:37	01:45		19:26		
N 70°	02:47	02:10	00:55	19:04	22:13	
68°	02:56	02:29	01:47	18:47	21:22	
66°	03:03	02:45	02:20	18:33	20:50	
64°	03:09	02:58	02:44	18:22	20:27	22:50
62°	03:14	03:09	03:03	18:12	20:09	22:14
60°	03:19	03:18	03:19	18:04	19:54	21:48
N 58°	03:23	03:27	03:33	17:57	19:42	21:28
56°	03:26	03:34	03:45	17:51	19:31	21:12
54°	03:30	03:41	03:55	17:45	19:21	20:57
52°	03:33	03:47	04:05	17:40	19:13	20:45
50°	03:35	03:52	04:13	17:36	19:05	20:34
45°	03:41	04:04	04:31	17:26	18:49	20:12
N 40°	03:46	04:14	04:45	17:18	18:36	19:54
35°	03:51	04:22	04:58	17:11	18:25	19:39
30°	03:55	04:30	05:09	17:05	18:15	19:26
20°	04:01	04:43	05:28	16:55	17:58	19:04
N 10°	04:08	04:54	05:44	16:46	17:44	18:45
0°	04:13	05:05	06:00	16:38	17:31	18:27
S 10°	04:19	05:16	06:15	16:29	17:17	18:09
20°	04:25	05:28	06:32	16:20	17:03	17:50
30°	04:33	05:42	06:52	16:10	16:47	17:28
35°	04:37	05:50	07:04	16:04	16:38	17:16
40°	04:42	05:59	07:17	15:58	16:27	17:01
45°	04:47	06:09	07:33	15:50	16:15	16:44
S 50°	04:54	06:23	07:52	15:41	16:00	16:23
52°	04:57	06:29	08:02	15:37	15:53	16:13
54°	05:01	06:36	08:12	15:32	15:45	16:02
56°	05:04	06:43	08:24	15:27	15:36	15:49
58°	05:09	06:52	08:38	15:22	15:27	15:35
S 60°	05:14	07:02	08:55	15:16	15:16	15:17

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	28-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%
06	03:23	03:25	11:57	10:25	22:51	
07	03:27	03:29	11:57	11:18	23:45	
08	03:31	03:32	11:56	12:13	-:-	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	227° 17.98	187°41.19 N14°23.		173°26.26 N18°31.82	238°17.20 \$06°38.90	
1	242°20.45	202°40.66 24.		188°28.12 31.96	253°19.48 38.83	Alpheratz 357°35.63
2	257°22.91	217°40.12 25.		203°29.98 32.10	268°21.76 38.76	Ankaa 353°8.01 Schedar 349°32.18
3	$272^{\circ}25.38$	232°39.58 · · 26.	06 265°56.55 · · 26.15	218°31.84 · · 32.25	283°24.04 · · 38.69	Schedar 349°32.18 Diphda 348°48.13
4	287° 27.84	247°39.04 27.		233°33.70 32.39	298°26.32 38.62	Achernar 335°21.13
5	302°30.31	262°38.50 28.		248°35.56 32.53	313°28.60 38.56	Hamal 327° 52.20
6 7	317° 32.77 332° 35.23	277°37.96 N14°29. 292°37.42 30.		263°37.42 N18°32.67 278°39.29 32.81	328°30.88	Polaris 314°48.80
8	347° 37.70	307°36.88 31.		293°41.15 32.95	358°35.45 38.35	Acamar 315° 12.63
9	2°40.16	322°36.34 · · 32.		308°43.01 · · 33.10	13°37.73 · · 38.28	Menkar 314°7.08
10	17°42.63	337°35.80 33.	12 11°1.49 31.48	323°44.87 33.24	28°40.01 38.22	Mirfak 308°29.61 Aldebaran 290°40.61
11	32°45.09	352°35.26 34.		338°46.73 33.38	43°42.29 38.15	Rigel 281° 4.72
12	47° 47.55	7°34.72 N14°35.		353°48.59 N18°33.52	58°44.57 S06°38.08	Capella 280°23.17
13	62° 50.02 77° 52.48	22°34.18 36. 37°33.63 37.		8°50.45 33.66 23°52.31 33.80	73°46.85 38.01 88°49.13 37.94	Bellatrix 278°23.79
14 15	92° 54.95	52°33.09 · · 38.		38°54.18 · · 33.94	103°51.41 · · 37.88	Elnath 278°2.93
16	107°57.41	67°32.55 39.		53°56.04 34.08	118°53.70 37.81	Alnilam 275°38.60
17	122°59.88	82°32.00 40.		68°57.90 34.23	133°55.98 37.74	Betelgeuse 270°52.98
18	138°2.34	97°31.46 N14°41.	16 131°7.13 N01°37.57	83°59.76 N18°34.37	148°58.26 S 06°37.67	Canopus 263°53.05 Sirius 258°26.98
19	153°4.80	112°30.91 42.		99° 1.62 34.51	164°0.54 37.61	Adhara 255°6.55
20	168°7.27	127°30.37 43.		114° 3.48 34.65	179°2.82 37.54	Procyon 244°51.60
21 22	183° 9.73 198° 12.20	142°29.82 · · 44. 157°29.27 45.		129°5.34 · · 34.79 144°7.20 34.93	194°5.11 · · 37.47 209°7.39 37.40	Pollux 243°18.18
23	213° 14.66	172°28.73 46.		159° 9.06 35.07	224°9.67 37.34	Avior 234° 15.18
						Suhail 222°46.79
Mer.	pass. 08:49	ν-0.5′ d1.0′ m-3.9	$\frac{1}{1} \frac{\nu 0.7' \ d0.8' \ m1.10}{1}$	ν1.9' d0.1' m-2.00	ν2.3' d-0.1' m1.06	Miaplacidus 221°38.50 Alphard 217°48.33
						Regulus 207°35.00
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.40
0	228° 17.13	187°28.18 N14°47.		174°10.92 N18°35.21	239°11.95	Denebola 182°25.34
1 2	243° 19.59 258° 22.05	202°27.63 48. 217°27.08 49.		189°12.78 35.35 204°14.65 35.49	254°14.24 37.20 269°16.52 37.13	Gienah 175°43.96
3	273° 24.52	217°27.08 49. 232°26.53 · · 50.		219°16.51 · · 35.64	269°16.52 37.13 284°18.80 · · 37.07	Acrux 173°0.28
4	288° 26.98	247°25.98 51.		234°18.37 35.78	299°21.09 37.00	Gacrux 171°51.89
5	303°29.45	262°25.44 52.		249°20.23 35.92	314°23.37 36.93	Alioth 166°12.99 Spica 158°22.63
6	318°31.91	277°24.89 N14°53.		264°22.09 N18°36.06	329°25.65 S 06°36.87	Alkaid 152°51.99
7	333° 34.37	292°24.34 54.		279°23.95 36.20	344°27.94 36.80	Hadar 148° 36.24
8	348° 36.84	307°23.78 55.		294°25.81 36.34	359°30.22 36.73	Menkent 147° 57.94
9	3°39.30 18°41.77	322°23.23 · · · 56. 337°22.68 57.		309°27.67 · · · 36.48 324°29.53	14°32.50 · · 36.67 29°34.79 36.60	Arcturus 145°48.11
10 11	33°44.23	337°22.68 57. 352°22.13 58.		324°29.53 36.62 339°31.39 36.76	29°34.79 36.60 44°37.07 36.53	Rigil Kent. 139°40.47
12	48° 46.70	7°21.58 N14°59.		354°33.25 N18°36.90	59°39.35 S06°36.47	Kochab 137°18.56
13	63°49.16	22°21.02 15°0.		9°35.11 37.04	74°41.64 36.40	Zuben'ubi 136° 56.33 Alphecca 126° 3.86
14	$78^{\circ}51.62$	37°20.47 1.	06 71°21.26 52.78	24°36.97 37.18	89°43.92 36.33	Antares 112° 16.20
15	93°54.09	52°19.92 · · 2.		39°38.83 · · 37.32	104°46.21 · · 36.27	Atria 107°10.45
16	108° 56.55		04 101°22.67 54.30	54°40.69 37.46	119°48.49 36.20	Sabik 102°3.14
17 18	123°59.02 139°1.48	82°18.81 4. 97°18.25 N15°5.		69°42.55 37.60 84°44.41 N18°37.74	134°50.78 36.13 149°53.06 \$06°36.07	Shaula 96° 10.81
19	154°3.95	112°17.70 6.		99°46.27 37.89	164°55.35 36.00	Rasalhague 95°58.80
20	169°6.41		99 161°25.50 57.33	114°48.13 38.03	179°57.63 35.93	Eltanin 90°42.03
21	184°8.87	142°16.58 · · 7.		129°49.99 · · 38.17	194°59.92 · · 35.87	Kaus Aust. 83°33.00 Vega 80°33.33
22	199°11.34		95 191°26.91 58.85	144°51.85 38.31	210°2.20 35.80	Nunki 75°48.25
23	214° 13.80	172°15.47 9.	94 206° 27.62 59.61	159°53.71 38.45	225°4.49 35.74	Altair 62°0.39
Mer.	pass. 08:45	ν -0.5' $d1.0'$ m-3.9	$\nu 0.7' \ d0.8' \ m1.10$	$ u 1.9' \ d0.1' \ \text{m-}2.00$	$ u 2.3' \ d$ -0.1' m1.06	Peacock 53°6.47
						Deneb 49°26.12
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.39
0	229° 16.27	187°14.91 N15°10.		174°55.57 N18°38.59	240°6.77 S 06°35.67	Al Na'ir 27°33.71 Fomalhaut 15°15.29
1	$244^{\circ}18.73$	202°14.35 11.	90 236°29.03 1.13	189°57.43 38.73	255°9.06 35.60	Scheat 13°45.93
2	259°21.19	217°13.79 12.		204°59.29 38.87	270°11.34 35.54	Markab 13° 30.62
3	274°23.66	232°13.23 · · 13.		220°1.15 · · 39.01	285°13.63 · · 35.47	May 09 Thu SHA
4 5	289° 26.12 304° 28.59	247°12.67 14. 262°12.11 15.		235° 3.01 39.15 250° 4.87 39.29	300°15.92 35.41 315°18.20 35.34	Venus 320°23.21
6	319° 31.05	277°11.55 N15°16.		265° 6.73 N18° 39.43	330°20.49 S06°35.28	Mars 353°36.45
7	334°33.52	292°10.99 17.		280° 8.59 39.57	345°22.78 35.21	Jupiter 306°8.27
8	349°35.98	307°10.43 18.	_	295°10.45 39.71	0°25.06 35.14	Saturn 10°59.22
9	4°38.44	322°9.87 · · 19.		310°12.31 · · 39.85	15°27.35 · · 35.08	May 10 Fri SHA
10	19°40.91	337°9.30 20.		325°14.17 39.99	30°29.63 35.01	Venus 319°11.05
11	34° 43.37 49° 45.84	352°8.74 21. 7°8.18 N15°22.		340°16.03 40.13 355°17.89 N18°40.27	45°31.92 34.95 60°34.21 \$06°34.88	Mars 352°54.24
12 13	49°45.84 64°48.30	7°8.18 N15°22. 22°7.61 23.		10°19.75 40.41	75°36.50 34.82	Jupiter 305°53.80
14	79° 50.77	37°7.05 24.		25°21.61 40.55	90°38.78 34.75	Saturn 10°54.83
15	94°53.23	52°6.49 · · 25.		40°23.47 · · 40.69	105°41.07 · · 34.69	May 11 Sat SHA
16	109° 55.69	67°5.92 26.		55°25.33 40.83	120°43.36 34.62	Venus 317°58.64
17	124° 58.16	82°5.35 27.		70°27.19 40.96	135°45.65 34.56	Mars 352° 12.06
18 19	140°0.62 155°3.09	97°4.79 N15°28. 112°4.22 29.		85°29.05 N18°41.10 100°30.91 41.24	150°47.93 S06°34.49 165°50.22 34.43	Jupiter 305°39.31
20	155° 3.09 170° 5.55	112°4.22 29. 127°3.65 30.		100°30.91 41.24 115°32.77 41.38	180°52.51 34.36	Saturn 10°50.51
21	170 5.55 185°8.02	142°3.09 · · 31.		130°34.63 · · 41.52	195°54.80 · · 34.30	Horizontal parallax
22	200° 10.48	157°2.52 32.	_	145°36.49 41.66	210°57.09 34.23	Venus:
23	$215^{\circ}12.94$	172°1.95 33.	34 206°44.59 17.81	160°38.35 41.80	225°59.37 34.17	Mars:
Mer	pass. 08:41	ν-0.6′ d1.0′ m-3.9	$\nu 0.7' \ d0.8' \ m1.09$	ν1.9' d0.1' m-2.00	ν2.3' d-0.1' m1.06	

29°13.26

-42°10.35 56°39.99

-17°51.22 -57°6.72

 $23^{\circ}34.51$

 $89^{\circ}21.95$

-40° 12.45

4°11.02

49°56.78

16°33.44

-8°10.49

 $46^{\circ}1.39$ 6°22.25

28°37.68

 $-1^{\circ}11.25$

7°24.66

-52°42.68

-16°45.08

-29°0.45 $5^{\circ}9.73$

27°58.13

-59°35.48

-43°32.07

-69°49.28 -8°45.94

11°50.91 61°37.44

14°26.17

-17°40.75

-63°14.26 -57° 15.18

55°49.80

-11°17.40

49°11.55 -60°29.54

-36°29.50

 $19^{\circ}3.29$

74°3.31

-16°8.67

26°37.86

-26°29.20

-69°4.17

 $-37^{\circ}7.25$

 $12^{\circ}32.38$

51°28.86

-34°22.33

38°48.09 -26° 15.97

8°55.78

-56°39.21

45°21.68

 $9^{\circ}59.01$

-46°50.44

-29°29.56

28°12.63

15° 19.97

Mer.pass

11:30

09:16

12:25

08:06

11:31

09:15

12:22

08:02

09:14

12:19

07:58

0.1

0.1

Mer.pass 11:31

Mer.pass

-15°45.36

-60° 56.24

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.35	N17°25.98	169°55.02	6.0'	N23°50.14	9.8'	59.2'
1	195°53.37	26.64	184°20.03	6.0'	23°59.92	9.6'	59.2'
2	210°53.40	27.30	198°44.98	5.9'	24°9.55	9.5'	59.1'
3	225°53.42	• • 27.96	213°9.87	5.8'	24°19.01	9.3'	59.1'
4	240°53.45	28.62	227°34.71	5.8'	24°28.30	9.1'	59.1'
5	255°53.47	29.29	241°59.50	5.7'	24°37.43	9.0'	59.1'
6	270°53.50 285°53.52	N17°29.95	256°24.23 270°48.91	5.7'	N24°46.40 24°55.19	8.8'	59.0'
7 8	285°53.52 300°53.55	30.61 31.27	270°48.91 285°13.55	5.6' 5.6'	24°55.19 25°3.82	8.6' 8.5'	59.0' 59.0'
9	315°53.57	31.92	200 13.55 200°38 13	5.5'	25° 12.28	8.3'	59.0 58.9'
10	330° 53.60	32.58	314°2.67	5.5'	25°20.57	8.1'	58.9'
11	345°53.62	33.24	328°27.17	5.5'	25°28.69	7.9'	58.9'
12	0°53.64	N17°33.90	342°51.62	5.4'	N25°36.63	7.8'	58.8'
13	15°53.67	34.56	357°16.03	5.4'	25°44.41	7.6'	58.8'
14	30°53.69	35.21	11°40.40	5.3'	25°52.01	7.4'	58.8'
15	45°53.71	• • 35.87	26°4.73	5.3'	25°59.43	7.2'	58.7'
16	60°53.73	36.52	40°29.03	5.3'	26°6.68	7.1'	58.7'
17	75°53.76	37.18	54°53.29	5.2'	26°13.75	6.9'	58.7'
18	90°53.78	N17°37.83	69°17.52	5.2'	N26°20.65	6.7'	58.6'
19	105°53.80	38.49	83°41.72	5.2'	26°27.37	6.5'	58.6'
20	120°53.82	39.14	98°5.88	5.1'	26°33.91	6.4'	58.6'
21	135°53.84	• • 39.79	112°30.03	5.1'	26°40.27	6.2'	58.6'
22	150°53.86	40.45 41.10	126°54.14	5.1'	26°46.46	6.0'	58.5'
23	165°53.89		141°18.23	5.1'	26°52.46	5.8'	58.5'
	SD = 15.8'	d = 0.7'		SI	D = 16.1'		
	CUA					,	
Fri	GHA 180°53.91	Dec N17°41.75	GHA 155°42.30	u 5.1'	Dec N26°58.29	<i>d</i> 5.6'	HP 58.5'
0 1	180 53.91 195°53.93	42.40	170°6.36	5.1 5.0'	27°3.93	5.5'	58.4'
2	210° 53.95	43.05	184°30.39	5.0'	27°9.39	5.3'	58.4
3	225°53.97	43.70	198°54.41	5.0'	27°14.67	5.1'	58.4
4	240°53.99	44.35	213°18.41	5.0'	27°19.77	4.9'	58.3'
5	255°54.00	45.00	227°42.41	5.0'	27°24.69	4.7'	58.3'
6	270°54.02	N17°45.65	242°6.39	5.0'	N27°29.43	4.6'	58.3'
7	285°54.04	46.29	256°30.37	5.0'	27°33.98	4.4'	58.2'
8	300°54.06	46.94	270°54.35	5.0'	27°38.35	4.2'	58.2'
9	315°54.08	• • 47.59	285°18.32	5.0'	27°42.54	4.0'	58.1'
10	330°54.10	48.23	299°42.29	5.0'	27°46.55	3.8'	58.1'
11	345°54.12	48.88 N17°49.52	314°6.26	5.0'	27°50.37	3.6'	58.1'
12 13	0°54.13 15°54.15	50.17	328°30.24 342°54.23	5.0' 5.0'	N27°54.01 27°57.47	3.5' 3.3'	58.0' 58.0'
14	30°54.17	50.17	357°18.22	5.0'	28°0.74	3.1'	58.0'
15	45°54.18	51.46	11°42.22	5.0'	28°3.83	2.9'	57.9
16	60°54.20	52.10	26°6.24	5.0'	28°6.74	2.7'	57.9'
17	75°54.22	52.74	40°30.27	5.1'	28°9.47	2.5'	57.9'
18	90°54.23	N17°53.38	54°54.32	5.1'	N28°12.01	2.4'	57.8'
19	105°54.25	54.03	69°18.39	5.1'	28°14.38	2.2'	57.8'
20	120°54.26	54.67	83°42.49	5.1'	28°16.56	2.0'	57.8'
21	135°54.28	• • 55.31	98°6.60	5.1'	28°18.55	1.8'	57.7'
22	150°54.30	55.95	112°30.75	5.2'	28°20.37	1.6'	57.7'
23	165°54.31	56.59	126°54.92	5.2'	28°22.01	1.5'	57.7'
	SD = 15.8'	d = 0.7'		SI	O = 15.9'		
_		_			_		
Sat	GHA	Dec	GHA	ν	Dec	d 1.2'	HP
0 1	180° 54.32 195° 54.34	N17°57.22 57.86	141°19.12 155°43.36	5.2' 5.3'	N28°23.47 28°24.74	1.3' 1.1'	57.6' 57.6'
2	210° 54.35	57.80 58.50	155 43.30 170°7.63	5.3'	28°25.84	0.9'	57.6'
3	210 54.35 225°54.37	59.14	184°31.94	5.3'	28°26.76	0.9	57.5'
4	240°54.38	17°59.77	198°56.28	5.4	28°27.50	0.6	57.5'
5	255°54.39	18°0.41	213°20.68	5.4'	28°28.06	0.4	57.4
6	270°54.41	N18° 1.05	227°45.11	5.5'	N28°28.44	0.2'	57.4'
7	285°54.42	1.68	242°9.59	5.5'	28°28.65	0.0'	57.4'
8	300°54.43	2.32	256°34.12	5.6'	$28^{\circ}28.68$	-0.1'	57.3'
9	315°54.45	• • 2.95	270°58.70	5.6'	28°28.54	-0.3'	57.3'
10	330°54.46	3.58	285°23.33	5.7'	28°28.22	-0.5'	57.3'
11	345°54.47	4.22	299°48.01	5.7'	28°27.73	-0.7'	57.2'
12	0°54.48 15°54.49	N18° 4.85 5.48	314°12.76 328°37.56	5.8'	N28°27.06 28°26.23	-0.8'	57.2'
13 14	30° 54.49	5.48 6.11	328° 37.50 343° 2.42	5.9' 5.9'	28° 25.23 28° 25.22	-1.0' -1.2'	57.2' 57.1'
14 15	45° 54.52	. 6.74	343 2.42 357°27.34	5.9 6.0'	28°24.04	-1.2 -1.3'	57.1'
16	60° 54.53	7.37	11°52.32	6.1	28°22.69	-1.5'	57.1'
17	75°54.54	8.00	26°17.38	6.1	28°21.17	-1.7'	57.0'
18	90°54.55	N18° 8.63	40°42.49	6.2'	N28°19.48	-1.9'	57.0'
19	105°54.56	9.26	55°7.68	6.3'	28°17.63	-2.0'	57.0'
20	$120^{\circ}54.57$	9.89	69°32.94	6.3'	$28^{\circ}15.61$	-2.2'	56.9'
21	135° 54.58	• • 10.52	83°58.27	6.4'	28°13.43	-2.3'	56.9'
22	150°54.59	11.15	98°23.68	6.5'	28°11.08	-2.5'	56.9'
23	165°54.59	11.77	112°49.16	6.6'	28°8.57	-2.7'	56.8'
	SD = 15.8'	d = 0.6'		SI	D = 15.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°	////	////	01:28	22:33	////	////
68°	////	////	02:11	21:46	////	////
66°	////	00:34	02:40	21:16	23:41	////
64°	////	01:37	03:02	20:53	22:21	////
62°	////	02:10	03:19	20:36	21:46	////
60°	00:30	02:34	03:33	20:21	21:21	23:42
N 58°	01:27	02:53	03:46	20:09	21:02	22:30
56°	01:57	03:08	03:56	19:58	20:46	21:58
54°	02:20	03:21	04:05	19:49	20:33	21:36
52°	02:37	03:32	04:13	19:40	20:22	21:17
50°	02:52	03:42	04:21	19:33	20:12	21:02
45°	03:21	04:03	04:37	19:17	19:51	20:33
N 40°	03:42	04:19	04:49	19:04	19:34	20:12
35°	03:59	04:32	05:00	18:53	19:21	19:55
30°	04:13	04:44	05:10	18:43	19:09	19:40
20°	04:35	05:02	05:26	18:27	18:51	19:18
N 10°	04:52	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:06	17:47	18:09	18:34
20°	05:30	05:56	06:19	17:33	17:56	18:23
30°	05:41	06:10	06:35	17:18	17:43	18:11
35°	05:47	06:17	06:44	17:09	17:35	18:06
40°	05:53	06:25	06:54	16:58	17:27	18:00
45°	05:59	06:34	07:06	16:46	17:18	17:53
S 50°	06:06	06:45	07:20	16:32	17:07	17:46
52°	06:09	06:50	07:27	16:25	17:02	17:43
54°	06:12	06:55	07:35	16:18	16:57	17:40
56°	06:16	07:01	07:43	16:09	16:51	17:36
58°	06:20	07:08	07:52	16:00	16:44	17:32
S 60°	06:24	07:15	08:03	15:49	16:37	17:28

Lat.		Moonris	e		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°	01:08			00:01		
64°	02:21					
62°	02:57	02:47			00:28	
60°	03:24	03:35	04:09	23:40		01:13
N 58°	03:44	04:06	04:48	23:10		00:34
56°	04:02	04:29	05:15	22:47		00:06
54°	04:16	04:48	05:36	22:28	23:45	
52°	04:29	05:04	05:54	22:13	23:27	•• ••
50°	04:40	05:18	06:09	21:59	23:12	
45°	05:04	05:47	06:40	21:31	22:41	23:38
N 40°	05:23	06:09	07:04	21:09	22:17	23:15
35°	05:39	06:28	07:24	20:51	21:58	22:56
30°	05:53	06:44	07:41	20:36	21:41	22:39
20° N 10°	06:17	07:11	08:09	20:09	21:13	22:11
0°	06:38 06:57	07:35 07:57	08:34 08:57	19:47 19:26	20:48 20:26	21:47 21:25
1						
S 10°	07:17	08:19	09:19	19:05	20:03	21:02
20°	07:38	08:43	09:44	18:42	19:39	20:38
30° 35°	08:03	09:11	10:13	18:16	19:10	20:09
40°	08:17 08:34	09:27 09:46	10:30 10:49	18:01 17:43	18:53 18:34	19:52 19:33
45°	08:55	10:10	10:49	17:43	18:10	19:33
1						
S 50°	09:20	10:40	11:45	16:55	17:40	18:38
52° 54°	09:33	10:55	12:00	16:42	17:24	18:22
54°	09:47 10:04	11:12 11:33	12:18 12:40	16:27 16:10	17:07 16:46	18:04 17:43
56°	10:04	11:33 12:00	12:40 13:08	15:49	16:46 16:19	17:43 17:15
S 60°	10:24	12:00	13:08	15:49	15:41	16:34
3 00	10.50	12.31	13.49	15.23	15.41	10.34

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-10%	
09	03:33	03:35	11:56	13:11	00:42		
10	03:36	03:37	11:56	14:11	01:41		
11	03:37	03:38	11:56	15:11	02:41		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230° 15.41	187°1.38	N15°34.31	221° 45.29	N02°18.57	175°40.21	N18°41.94	241°1.66	S06°34.10
1	245° 17.87	202°0.81	35.28	236° 46.00	19.33	190°42.07	42.08	256°3.95	34.04
2	245 17.87 260°20.34	202 0.81 217°0.24		250 46.00 251°46.71	20.09	205°43.92	42.06	250 3.95 271°6.24	33.97
			36.24						
3	275°22.80	231°59.67	• • 37.21	266° 47.42	• • 20.84	220°45.78	• • 42.36	286°8.53	• • 33.91
4	290°25.26	246°59.10	38.17	281°48.12	21.60	235°47.64	42.50	301°10.82	33.85
5	305°27.73	261°58.53	39.14	296°48.83	22.36	250°49.50	42.64	316°13.11	33.78
6	320°30.19	276°57.96	N15°40.10	311°49.54	N02°23.12	265°51.36	N18°42.78	331°15.39	S06°33.72
7	335°32.66	291°57.39	41.06	326°50.25	23.87	280°53.22	42.92	346°17.68	33.65
8	350°35.12	306°56.81	42.02	341°50.96	24.63	295°55.08	43.06	1°19.97	33.59
9	5°37.59	321°56.24	• • 42.98	356°51.66	• • 25.39	310°56.94	• • 43.19	16°22.26	• • 33.52
10	20° 40.05	336°55.67	43.94	11°52.37	26.14	325°58.80	43.33	31°24.55	33.46
11	35° 42.51	351°55.09	44.90	26°53.08	26.90	341°0.66	43.47	46°26.84	33.40
12	50°44.98	6°54.52	N15°45.86	41°53.79	N02°27.66	356° 2.52	N18°43.61	61°29.13	S06°33.33
13	65° 47.44	21°53.94	46.82	56°54.49	28.41	11°4.38	43.75	76°31.42	33.27
14	80°49.91	36°53.37	47.78	71°55.20	29.17	26° 6.23	43.89	91°33.71	33.20
15	95°52.37	51°52.79	• • 48.73	86°55.91	29.93	41°8.09	• • 44.03	106°36.00	33.14
16	110°54.83	66°52.22	49.69	101°56.62	30.68	56° 9.95	44.17	121°38.29	33.08
17	125°57.30	81°51.64	50.65	116°57.33	31.44	71°11.81	44.31	136°40.58	33.01
18	140°59.76	96°51.06	N15°51.60	131°58.03	N02°32.20	86°13.67	N18°44.44	151°42.87	S06°32.95
19	156°2.23	111°50.49	52.55	146°58.74	32.95	101°15.53	44.58	166°45.16	32.88
20	171°4.69	126°49.91	53.51	161°59.45	33.71	116°17.39	44.72	181°47.46	32.82
21	186°7.16	141°49.33	• • 54.46	177°0.16	• • 34.46	131°19.25	• • 44.86	196°49.75	• • 32.76
22	201°9.62	156° 48.75	55.41	192°0.86	35.22	146°21.11	45.00	211°52.04	32.69
23	216° 12.08	171°48.17	56.36	207°1.57	35.98	161°22.96	45.14	226°54.33	32.63
			.0′ m-3.92		.8′ m1.09		1′ m-2.00		.1′ m1.06
ivier.	pass. 08:38	ν -0.6° a_1	.0' m-3.92	$\frac{\nu_{0.7}}{}$ au	0.8° m1.09	ν 1.9° a 0.	.1° m-2.00	ν 2.3 a-0	0.1' m1.06
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231° 14.55	186°47.59	N15°57.31	222°2.28	N02°36.73	176°24.82	N18°45.28	241°56.62	S06°32.57
1	246° 17.01	201°47.01	58.26	237°2.99	37.49	191°26.68	45.41	256°58.91	32.50
2	261°19.48	216°46.43	15°59.21	252°3.70	38.24	206°28.54	45.55	272°1.20	32.44
3	201 19.46 276°21.94	210 40.43 231°45.85	16°0.16	252 3.70 267°4.40	39.00	200 26.54 221°30.40	· · 45.69	287° 3.50	. 32.38
3 4	270 21.94 291°24.40	231 45.65 246° 45.27	1.11	282°5.11	39.75	236°32.26	45.83	302°5.79	32.31
5	306°26.87	261°44.69	2.06	297°5.82	40.51	251°34.12	45.97	317°8.08	32.25
6	321°29.33	276°44.10	N16°3.00	312°6.53	N02°41.26	266°35.98	N18°46.11	332°10.37	S06°32.19
7	336°31.80	291°43.52	3.95	327°7.24	42.02	281°37.83	46.25	347°12.66	32.13
8	351°34.26	306°42.94	4.89	342°7.95	42.78	296°39.69	46.38	2°14.96	32.06
9	6°36.73	321°42.35	• • 5.84	357°8.65	• • 43.53	311°41.55	• • 46.52	17°17.25	• • 32.00
10	21°39.19	336°41.77	6.78	12°9.36	44.29	326°43.41	46.66	32°19.54	31.94
11	36°41.65	351°41.18	7.72	27°10.07	45.04	341°45.27	46.80	47°21.83	31.87
12	51°44.12	6°40.60	N16°8.66	42°10.78	N02°45.80	356°47.13	N18°46.94	62°24.13	S06°31.81
13	66° 46.58	21°40.01	9.61	57° 11.49	46.55	11°48.99	47.07	77°26.42	31.75
14	81°49.05	36°39.42	10.55	72°12.20	47.31	26°50.84	47.21	92°28.71	31.69
15	96°51.51	51°38.84	. 11.49	87° 12.90	• • 48.06	41°52.70	• • 47.35	107°31.01	31.62
16	111°53.97	66°38.25	12.43	102° 13.61	48.81	56°54.56	47.49	122°33.30	31.56
17	126° 56.44	81°37.66	13.36	117° 14.32	49.57	71°56.42	47.43	137°35.59	31.50
	141°58.90	96°37.07	N16°14.30	132° 15.03		86°58.28		152° 37.89	506°31.44
18					N02°50.32		N18°47.76		
19	157°1.37	111°36.49	15.24	147°15.74	51.08	102°0.14	47.90	167°40.18	31.37
20	172°3.83	126°35.90	16.18	162° 16.45	51.83	117° 1.99	48.04	182°42.47	31.31
21	187°6.30	141°35.31	• • 17.11	177° 17.15	•• 52.59	132° 3.85	• • 48.18	197°44.77	• • 31.25
22	202°8.76	156°34.72	18.05	192°17.86	53.34	$147^{\circ}5.71$	48.32	212°47.06	31.19
23	$217^{\circ}11.22$	171°34.13	18.98	207° 18.57	54.09	162°7.57	48.45	227°49.36	31.12
Mer.	pass. 08:34	ν-0.6′ d0	.9′ m-3.92	ν0.7′ d0	.8′ m1.09	$\nu 1.9' \ d0.$	1′ m-2.00	$\nu 2.3' \ d-0$.1′ m1.06
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	232° 13.69	186°33.54	N16°19.91	222° 19.28	N02°54.85	177° 9.43		242°51.65	S06°31.06
1	247° 16.15	201°32.94	20.85	237°19.99	55.60	192°11.29	48.73	257°53.94	31.00
2	262° 18.62	201 32.94 216°32.35	20.83	252° 20.70	56.36	207°13.14	48.87	272°56.24	30.94
3				252 20.70 267°21.41	57.11	207 13.14 222°15.00			
	277°21.08	231°31.76	• • 22.71				• • 49.00	287°58.53	30.88
4	292°23.54	246°31.17	23.64	282°22.11	57.86	237°16.86	49.14	303°0.83	30.81
5	307°26.01	261°30.57	24.57	297°22.82	58.62	252°18.72	49.28	318°3.12	30.75
6	322°28.47	276°29.98	N16°25.50		N02°59.37	267°20.58	N18°49.42	333°5.42	S06°30.69
7	337°30.94	291°29.39	26.43	327° 24.24	03°0.12	282°22.43	49.55	348°7.71	30.63
8	$352^{\circ}33.40$	306°28.79	27.36	342°24.95	0.88	297°24.29	49.69	3°10.01	30.57
9	7°35.87	321°28.20	• • 28.28	357°25.66	• • 1.63	$312^{\circ}26.15$	• • 49.83	18°12.30	• • 30.51
10	22°38.33	336°27.60	29.21	12°26.37	2.38	327°28.01	49.97	33°14.60	30.45
11	37° 40.79	351°27.00	30.14	27° 27.07	3.14	342°29.87	50.10	48°16.90	30.38
12	52°43.26	6°26.41		42°27.78	N03°3.89	357°31.72		63°19.19	506°30.32
13	67° 45.72	21°25.81	31.98	57° 28.49	4.64	12°33.58	50.38	78°21.49	30.26
	82°48.19							93°23.78	
14		36°25.21	32.91	72°29.20	5.40	27°35.44	50.52		30.20
15	97°50.65	51°24.61	• • 33.83	87°29.91	• • 6.15	42°37.30	• • 50.65	108°26.08	30.14
16	112°53.11	66°24.02	34.75	102°30.62	6.90	57°39.16	50.79	123°28.38	30.08
17	$127^{\circ}55.58$	81°23.42	35.67	117°31.33	7.65	$72^{\circ}41.01$	50.93	138°30.67	30.02
18	142°58.04	96°22.82	N16°36.59	132°32.04	N03°8.41	87°42.87	N18°51.06	153°32.97	S06°29.96
19	158°0.51	111°22.22	37.51	147° 32.75	9.16	102°44.73	51.20	168°35.27	29.89
20	173°2.97	126°21.62	38.43	162°33.45	9.91	117°46.59	51.34	183°37.56	29.83
21	188°5.44	141°21.02	39.35	177°34.16	. 10.66	132°48.45	• 51.48	198°39.86	29.77
22	203°7.90	156° 20.42	40.27	177 34.10 192°34.87	11.41	132 46.45 147°50.30	51.46	213°42.16	29.71
23	218° 10.36	171°19.81	41.19	207°35.58	12.17	162°52.16	51.75	228°44.45	29.65
Mer.	pass. 08:30	ν -0.6' d0	.9′ m-3.92	$ u$ 0.7 $^{\prime}$ d 0	.8′ m1.09	ν 1.9′ d0.	1' m-2.00	ν 2.3′ d-0	.1′ m1.06

	SHA	Dec
Alpheratz	357°35.60	29° 13.27
Ankaa Schedar	353°7.99 349°32.14	-42°10.33 56°39.99
Diphda	$348^{\circ}48.11$	-17°51.21
Achernar Hamal	335°21.11 327°52.18	-57°6.70 23°34.51
Polaris	327°52.18 314°48.30	23°34.51 89°21.94
Acamar	315°12.62	-40°12.43
Menkar	314°7.07 308°29.59	4°11.03 49°56.77
Mirfak Aldebaran	290°40.61	49 50.77 16°33.44
Rigel	281°4.72	-8°10.48
Capella Bellatrix	280°23.16 278°23.79	46°1.38 6°22.26
Elnath	278°2.92	28° 37.68
Alnilam	275°38.59	-1°11.24
Betelgeuse	270°52.98 263°53.06	7°24.66 -52°42.67
Canopus Sirius	258° 26.98	-52 42.07 -16°45.07
Adhara	255°6.56	-29°0.45
Procyon	244°51.60 243°18.18	5°9.73 27°58.13
Pollux Avior	243 18.18 234°15.20	-59°35.48
Suhail	222°46.81	-43°32.07
Miaplacidus	221°38.55 217°48.33	-69°49.28 -8°45.94
Alphard Regulus	217°48.33 207°35.00	-8° 45.94 11° 50.91
Dubhe	193°41.42	61°37.44
Denebola	182°25.34 175°43.96	14°26.18 -17°40.76
Gienah Acrux	175°43.96 173°0.29	-17° 40.76 -63° 14.27
Gacrux	$171^{\circ}51.90$	-57° 15.19
Alioth	166°13.00	55° 49.81
Spica Alkaid	158°22.63 152°51.99	-11°17.40 49°11.56
Hadar	148°36.23	-60° 29.55
Menkent	147°57.93	-36°29.51
Arcturus Rigil Kent.	145°48.10 139°40.46	19°3.30 -60°56.25
Kochab	137° 18.57	74°3.32
Zuben'ubi	136°56.32	-16°8.67
Alphecca Antares	126°3.85 112°16.18	26°37.87 -26°29.20
Atria	$107^{\circ}10.41$	-69°4.18
Sabik	102°3.12 96°10.78	-15°45.36 -37°7.26
Shaula Rasalhague	90°10.78°	12° 32.39
Eltanin	90°42.01	51°28.87
Kaus Aust.	83°32.97 80°33.31	-34°22.33 38°48.10
Vega Nunki	75°48.22	-26° 15.97
Altair	$62^{\circ}0.36$	8°55.79
Peacock	53°6.42	-56°39.20 45°21.69
Deneb Enif	49°26.09 33°39.37	45°21.69 9°59.02
Al Na'ir	$27^{\circ}33.67$	-46°50.43
Fomalhaut Scheat	15° 15.26 13° 45.90	-29°29.55 28°12.64
Markab	13° 45.90 13° 30.59	28° 12.64 15° 19.98
May 12 Sun	SHA	Mer.pass
Venus	316°45.97	11:32
Mars	351°29.89	09:13
Jupiter Saturn	305°24.80 10°46.25	12:16 07:55
May 13 Mon	SHA	Mer.pass
Venus	$315^{\circ}33.04$	11:33
Mars Jupiter	350°47.73 305°10.28	09:11 12:13
Saturn	10°42.07	07:51
May 14 Tue	SHA	Mer.pass
Venus	$314^{\circ}19.85$	11:34
Mars	350°5.59	09:10
Jupiter Saturn	304°55.74 10°37.96	12:10 07:47
	ital parallax	VI.TI
11011201	Venus:	0.1
	Mars:	0.1

Stars

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.60	N18° 12.40	$127^{\circ}14.72$	6.6'	N28°5.89	-2.8'	56.8'
1	195°54.61	13.02	141°40.36	6.7'	28°3.06	-3.0'	56.7'
2	210°54.62	13.65	156°6.08	6.8'	28°0.06 27°56.91	-3.2'	56.7'
3 4	225°54.63 240°54.64	· · 14.27 14.90	170°31.88 184°57.77	6.9' 7.0'	27°56.91 27°53.60	-3.3' -3.5'	56.7' 56.6'
5	255°54.64	15.52	199° 23.73	7.0	27°50.13	-3.6'	56.6'
6	270°54.65	N18° 16.14	213°49.79	7.1'	N27°46.51	-3.8'	56.6'
7	285°54.66	16.77	$228^{\circ}15.93$	7.2'	27° 42.74	-3.9'	56.5'
8	300°54.67	17.39	242°42.16	7.3'	27°38.81	-4.1'	56.5'
9 10	315°54.67 330°54.68	· · 18.01 18.63	257°8.49 271°34.90	7.4' 7.5'	27°34.73 27°30.50	-4.2' -4.4'	56.5' 56.4'
11	345°54.68	19.25	271 34.90 286°1.40	7.5 7.6'	27° 26.11	-4.4 -4.5'	56.4'
12	0°54.69	N18° 19.87	300°28.00	7.7'	N27°21.59	-4.7'	56.4'
13	15°54.70	20.49	$314^{\circ}54.69$	7.8'	$27^{\circ}16.91$	-4.8'	56.3'
14	30°54.70	21.11	329°21.48	7.9'	27°12.09	-5.0'	56.3'
15 16	45°54.71 60°54.71	· · 21.73 22.34	343° 48.36 358° 15.34	8.0' 8.1'	27°7.12 27°2.02	-5.1' -5.2'	56.3' 56.2'
17	75°54.72	22.96	12° 42.42	8.2'	26° 56.77	-5.4'	56.2'
18	90°54.72	N18°23.58	27°9.59	8.3'	N26°51.38	-5.5'	56.2'
19	105°54.73	24.19	$41^{\circ}36.87$	8.4'	$26^{\circ}45.85$	-5.7'	56.1'
20	120°54.73	24.81	56°4.24	8.5'	26°40.18	-5.8'	56.1'
21 22	135°54.73 150°54.74	· · 25.42 26.04	70°31.72 84°59.30	8.6' 8.7'	26°34.38 26°28.44	-5.9' -6.1'	56.1' 56.1'
23	165°54.74	26.65	99°26.98	8.8'	26°22.37	-6.1 -6.2	56.0'
	SD = 15.8'	d = 0.6'			D = 15.5'		
	JD — 13.0°	u = 0.0		اد	_ 13.3°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.74	N18° 27.26	113°54.76 128°22.64	8.9'	N26°16.16	-6.3'	56.0'
1 2	195°54.75 210°54.75	27.88 28.49	128°22.64 142°50.63	9.0' 9.1'	26°9.82 26°3.36	-6.5' -6.6'	56.0' 55.9'
3	210 54.75 225°54.75	29.10	157° 18.72	9.1	25° 56.76	-6.7'	55.9'
4	240°54.75	29.71	171°46.92	9.3'	25° 50.04	-6.8'	55.9'
5	255°54.75	30.32	186° 15.22	9.4'	25°43.19	-7.0'	55.8'
6	270°54.76	N18° 30.93	200°43.63	9.5'	N25°36.22	-7.1'	55.8'
7 8	285°54.76 300°54.76	31.54 32.15	215° 12.14 229° 40.76	9.6' 9.7'	25°29.12 25°21.91	-7.2' -7.3'	55.8' 55.8'
9	315°54.76	32.76	244°9.48	9.8'	25° 14.57	-7.5'	55.7'
10	330°54.76	33.37	258° 38.31	9.9'	25°7.11	-7.6'	55.7'
11	345°54.76	33.97	273°7.24	10.0'	24°59.53	-7.7'	55.7'
12	0°54.76	N18°34.58	287°36.28	10.1'	N24°51.84	-7.8'	55.6'
13 14	15°54.76 30°54.76	35.19 35.79	302°5.43 316°34.68	10.3' 10.4'	24° 44.04 24° 36.11	-7.9' -8.0'	55.6' 55.6'
15	45°54.76	36.40	331°4.04	10.5	24° 28.08	-8.1'	55.5'
16	60°54.76	37.00	345°33.50	10.6'	24° 19.93	-8.3'	55.5'
17	75°54.76	37.60	0°3.07	10.7'	24° 11.68	-8.4'	55.5'
18	90°54.76	N18° 38.21	14°32.75	10.8'	N24°3.31 23°54.84	-8.5'	55.5'
19 20	105°54.75 120°54.75	38.81 39.41	29°2.53 43°32.41	10.9' 11.0'	23° 54.84 23° 46.27	-8.6' -8.7'	55.4' 55.4'
21	135°54.75	40.01	58°2.40	11.1'	23°37.58	-8.8'	55.4'
22	150°54.75	40.62	72°32.50	11.2'	23°28.80	-8.9'	55.4'
23	165°54.75	41.22	87°2.70	11.3'	23° 19.91	-9.0'	55.3'
	SD = 15.8'	d = 0.6'		SI	D = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.74	N18° 41.82	101°33.00	11.4'	N23° 10.92	-9.1'	55.3'
1	195°54.74	42.42	$116^{\circ}3.41$	11.5'	23°1.83	-9.2'	55.3'
2	210°54.74	43.01	130° 33.92	11.6'	22°52.64	-9.3'	55.3'
3 4	225°54.73 240°54.73	· · 43.61 44.21	145° 4.54 159° 35.25	11.7' 11.8'	22°43.36 22°33.98	-9.4' -9.5'	55.2' 55.2'
4 5	240 54.73 255°54.73	44.21 44.81	159 35.25 174°6.07	11.8 11.9'	22°24.50	-9.5 -9.6'	55.2'
6	270°54.72	N18° 45.41	188° 36.99	12.0'	N22° 14.93	-9.7	55.2'
7	285°54.72	46.00	203°8.01	12.1'	22°5.27	-9.8'	55.1'
8	300°54.71	46.60	217°39.13	12.2'	21°55.52	-9.8'	55.1'
9 10	315°54.71 330°54.70	· · 47.19 47.79	232° 10.35 246° 41.67	12.3' 12.4'	21°45.67 21°35.74	-9.9' -10.0'	55.1' 55.1'
11	345°54.70	47.79 48.38	240 41.07 261°13.09	12.4	21 35.74 21°25.72	-10.0 -10.1'	55.0'
12	0°54.69	N18° 48.97	275° 44.61	12.6'	N21° 15.62	-10.2	55.0'
13	15°54.69	49.57	290° 16.23	12.7'	21°5.43	-10.3'	55.0'
14	30°54.68	50.16	304°47.94	12.8'	20° 55.15	-10.4'	55.0'
15 16	45°54.67 60°54.67	· · 50.75 51.34	319° 19.75 333° 51.65	12.9' 13.0'	20°44.80 20°34.36	-10.4' -10.5'	54.9' 54.9'
17	75°54.66	51.54	348° 23.65	13.1'	20° 23.84	-10.5 -10.6'	54.9'
18	90°54.65	N18° 52.52	2°55.74	13.2'	N20° 13.24	-10.7	54.9'
19	105°54.65	53.11	17°27.92	13.3'	20°2.56	-10.8'	54.9'
20	120°54.64	53.70	32°0.20	13.4'	19°51.80	-10.8'	54.8'
21 22	135°54.63 150°54.62	· · 54.29 54.88	46°32.57 61°5.03	13.5' 13.5'	19° 40.97 19° 30.07	-10.9' -11.0'	54.8' 54.8'
23	165°54.61	55.46	75°37.58	13.6'	19° 30.07 19° 19.09	-11.1	54.8'
	SD = 15.8'	d = 0.6'			D = 15.1'		

	Twi	Twilight			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°	////	////	01:00	23:04	////	////
68°	////	////	01:56	22:02	////	////
66°	////	////	02:28	21:28	////	////
64°	////	01:19	02:52	21:03	22:40	////
62°	////	01:58	03:11	20:44	21:58	////
60°	////	02:24	03:26	20:28	21:31	////
N 58°	01:11	02:44	03:39	20:15	21:10	22:48
56°	01:46	03:01	03:50	20:04	20:53	22:10
54°	02:11	03:15	04:00	19:54	20:39	21:44
52°	02:30	03:27	04:09	19:45	20:27	21:25
50°	02:46	03:37	04:16	19:37	20:16	21:09
45°	03:16	03:59	04:33	19:21	19:55	20:38
N 40°	03:38	04:16	04:46	19:07	19:38	20:15
35°	03:56	04:30	04:58	18:55	19:23	19:57
30°	04:10	04:42	05:08	18:45	19:12	19:43
20°	04:33	05:01	05:25	18:28	18:52	19:20
N 10°	04:51	05:17	05:39	18:14	18:36	19:02
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:57	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:16	17:41	18:10
35°	05:49	06:19	06:46	17:06	17:33	18:04
40°	05:55	06:28	06:57	16:55	17:24	17:57
45°	06:02	06:38	07:09	16:43	17:15	17:50
S 50°	06:10	06:49	07:25	16:28	17:03	17:42
52°	06:13	06:54	07:32	16:20	16:58	17:39
54°	06:17	07:00	07:40	16:13	16:52	17:35
56°	06:20	07:06	07:48	16:04	16:46	17:32
58°	06:24	07:13	07:58	15:54	16:39	17:27
S 60°	06:29	07:21	08:10	15:42	16:31	17:23

Lat.		Moonris	e		Moonset	t
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°			07:08			03:55
64°		05:20	07:48		03:57	03:14
62°	04:13	06:24	08:15	03:10	02:53	02:46
60°	05:22	06:58	08:36	02:01	02:18	02:24
N 58°	05:57	07:23	08:53	01:26	01:53	02:07
56°	06:22	07:43	09:08	01:00	01:33	01:52
54°	06:42	07:59	09:20	00:40	01:16	01:39
52°	06:59	08:14	09:31	00:23	01:01	01:27
50°	07:14	08:26	09:40	00:08	00:49	01:17
45°	07:43	08:51	10:01		00:22	00:56
N 40°	08:06	09:11	10:17		00:02	00:38
35°	08:25	09:28	10:31	23:44		00:24
30°	08:41	09:42	10:43	23:29		00:11
20°	09:09	10:07	11:03	23:03	23:49	
N 10°	09:32	10:28	11:20	22:41	23:30	•• ••
0°	09:54	10:48	11:37	22:20	23:12	23:59
S 10°	10:16	11:07	11:53	21:59	22:54	23:44
20°	10:39	11:28	12:10	21:37	22:34	23:29
30°	11:07	11:52	12:30	21:11	22:12	23:11
35°	11:23	12:06	12:42	20:55	21:58	23:00
40°	11:41	12:22	12:55	20:37	21:43	22:48
45°	12:04	12:42	13:10	20:15	21:25	22:34
S 50°	12:32	13:06	13:30	19:47	21:01	22:16
52°	12:46	13:17	13:38	19:33	20:50	22:07
54°	13:03	13:31	13:49	19:17	20:38	21:58
56°	13:22	13:46	14:00	18:59	20:23	21:47
58°	13:45	14:03	14:13	18:35	20:06	21:35
S 60°	14:17	14:25	14:28	18:04	19:45	21:21

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-36%	
12	03:38	03:39	11:56	16:07	03:39		
13	03:39	03:39	11:56	17:00	04:34		
14	03:39	03:39	11:56	17:48	05:24		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	233° 12.83	186° 19.21	N16°42.10	222°36.29	N03°12.92	177°54.02	N18°51.89	243°46.75	S06°29.59	
1	248° 15.29	201°18.61	43.02	237°37.00	13.67	192°55.88	52.02	258°49.05	29.53	Alpheratz
2	263° 17.76	216°18.01	43.93	252°37.71	14.42	207°57.73	52.16	273°51.35	29.47	Ankaa
3	278°20.22	231°17.40	• • 44.85	267°38.42	• • 15.17	222°59.59	• • 52.30	288°53.64	• • 29.41	Schedar
4	293°22.68	$246^{\circ}16.80$	45.76	$282^{\circ}39.13$	15.93	238° 1.45	52.43	303°55.94	29.35	Diphda
5	$308^{\circ}25.15$	261°16.19	46.67	297°39.84	16.68	253°3.31	52.57	318°58.24	29.29	Achernar Hamal
6	323°27.61	276°15.59	N16°47.58	312°40.54	N03°17.43	268°5.16	N18°52.71	334°0.54	S06°29.23	Polaris
7	338°30.08	291°14.98	48.49	327°41.25	18.18	283°7.02	52.84	349°2.84	29.17	Acamar
8	353°32.54	306°14.38	49.40	342°41.96	18.93	298° 8.88	52.98	4°5.13	29.11	Menkar
9	8°35.00	321°13.77	• • 50.31	357°42.67	• • 19.68	313°10.74	•• 53.12	19°7.43	• • 29.05	Mirfak
10	23°37.47	336°13.16	51.22	12°43.38	20.43	328°12.59	53.25	34°9.73	28.99	Aldebaran
11	38° 39.93	351°12.55	52.13	27°44.09	21.19	343°14.45	53.39	49°12.03	28.93	Rigel
12	53°42.40	6°11.95	N16°53.04	42°44.80	N03°21.94	358°16.31	N18°53.53	64°14.33	S06°28.87	Capella
13	68° 44.86	21°11.34	53.94	57° 45.51	22.69	13°18.17	53.66	79°16.63	28.81	Bellatrix
14	83°47.33	36°10.73	54.85	72°46.22	23.44	28°20.02	53.80	94°18.93	28.75	Elnath
15	98° 49.79 113° 52.25	51°10.12 66°9.51	• • 55.75	87°46.93 102°47.64	• • 24.19	43°21.88 58°23.74	• • 53.93	109°21.23 124°23.53	• • 28.69	Alnilam
16 17	113 52.25 128° 54.72	81°8.90	56.66 57.56	102 47.04 117°48.35	24.94 25.69	73°25.60	54.07 54.21	124 23.53 139°25.82	28.63 28.57	Betelgeuse
18	143° 57.18	96°8.29	N16°58.47	117 46.35 132°49.06	N03°26.44	88°27.45	N18°54.34	159 25.62 154°28.12	S06°28.51	Canopus
19	158° 59.65	111°7.68	16°59.37	147°49.76	27.19	103°29.31	54.48	169°30.42	28.45	Sirius
20	174°2.11	126°7.07	10° 39.37 17° 0.27	162°50.47	27.19	118°31.17	54.62	184°32.72	28.39	Adhara
21	189°4.57	141°6.45	. 1.17	177°51.18	28.69	133°33.03	54.75	199°35.02	. 28.33	Procyon
22	204°7.04	156°5.84	2.07	192°51.89	29.44	148°34.88	54.89	214°37.32	28.27	Pollux
23	219°9.50	171°5.23	2.97	207°52.60	30.19	163°36.74	55.02	229°39.62	28.21	Avior
										Suhail
Mer.	pass. 08:26	ν -0.6′ d0	.9′ m-3.92	$\nu 0.7' d0$.8′ m1.08	ν 1.9′ d0.	.1′ m-2.00	$\nu 2.3' \ d-0$.1′ m1.06	Miaplacidus
										Alphard
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus
0	$234^{\circ}11.97$	186°4.61	N17°3.87	222°53.31	N03°30.94	178°38.60	N18°55.16	244°41.92	S06°28.15	Dubhe Denebola
1	249° 14.43	201°4.00	4.76	237°54.02	31.69	193°40.45	55.30	259°44.22	28.09	Gienah
2	$264^{\circ}16.89$	216°3.39	5.66	252°54.73	32.44	208°42.31	55.43	274°46.53	28.03	Acrux
3	$279^{\circ}19.36$	231°2.77	• • 6.56	267°55.44	• • 33.19	223°44.17	• • 55.57	289°48.83	• • 27.97	Gacrux
4	294°21.82	246°2.16	7.45	282°56.15	33.94	238°46.03	55.70	304°51.13	27.91	Alioth
5	309°24.29	261°1.54	8.34	297°56.86	34.69	253°47.88	55.84	319°53.43	27.85	Spica
6	324°26.75	276°0.92	N17° 9.24	312°57.57	N03°35.44	268°49.74	N18°55.97	334°55.73	S06°27.79	Alkaid
7	339°29.21	291°0.31	10.13	327°58.28	36.19	283°51.60	56.11	349°58.03	27.74	Hadar
8	354°31.68	305°59.69	11.02	342°58.99	36.94	298°53.45	56.25	5°0.33	27.68	Menkent
9	9°34.14	320°59.07	• • 11.91	357°59.70	• • 37.69	313°55.31	• • 56.38	20°2.63	• • 27.62	Arcturus
10	24°36.61	335°58.45	12.81	13°0.41	38.44	328°57.17	56.52	35°4.93	27.56	Rigil Kent.
11 12	39° 39.07 54° 41.54	350°57.83 5°57.21	13.70 N17°14.58	28°1.12 43°1.82	39.18 N03°39.93	343°59.03 359°0.88	56.65 N18°56.79	50°7.24 65°9.54	27.50 \$06°27.44	Kochab
	69°44.00	20°56.59	15.47	58°2.53	40.68	14°2.74		80°11.84		Zuben'ubi
13 14	84°46.46	20 56.59 35°55.97	16.36	73°3.24	40.68	14 2.74 29°4.60	56.92 57.06	95°14.14	27.38 27.32	Alphecca
15	99° 48.93	50°55.35	10.30	88°3.95	• 42.18	44° 6.45	•• 57.19	110°16.44	27.27	Antares
16	114°51.39	65°54.73	18.13	103°4.66	42.10	59°8.31	57.33	125°18.75	27.21	Atria
17	129°53.86	80°54.11	19.02	118°5.37	43.68	74°10.17	57.47	140°21.05	27.15	Sabik
18	144°56.32	95°53.49	N17°19.90	133°6.08	N03°44.42	89°12.02	N18°57.60	155°23.35	S06°27.09	Shaula
19	159°58.78	110°52.87	20.79	148°6.79	45.17	104°13.88	57.74	170°25.65	27.03	Rasalhague
20	175°1.25	125°52.24	21.67	163°7.50	45.92	119°15.74	57.87	185°27.96	26.97	Eltanin
21	190°3.71	140°51.62	• • 22.55	178°8.21	• • 46.67	134°17.60	• • 58.01	200°30.26	• • 26.92	Kaus Aust. Vega
22	205°6.18	155°50.99	23.43	193°8.92	47.42	$149^{\circ}19.45$	58.14	215°32.56	26.86	Nunki
23	220°8.64	170°50.37	24.31	208°9.63	48.16	$164^{\circ}21.31$	58.28	230°34.87	26.80	Altair
Morr	pass. 08:22	1, 0.6' d0	.9' m-3.92	υ0 7′ d0	.7′ m1.08	11 0' d0	.1′ m-2.00	"3 3' d U	.1′ m1.05	Peacock
ivier.	Dass. 06.22	ν-0.0 α0	.9 111-3.92	νο.τ αυ	.7 1111.00	ν1.9 do.	.1 111-2.00	ν2.3 u-0	.1 1111.05	Deneb
										Enif
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir
0	235° 11.10	185°49.74		223° 10.34	N03°48.91	179°23.17	N18°58.41	245°37.17	S06°26.74	Fomalhaut
1	250° 13.57	200°49.12	26.07	238°11.05	49.66	194°25.02	58.55	260°39.47	26.68	Scheat
2	265° 16.03	215°48.49	26.95	253°11.76	50.41	209°26.88	58.68	275°41.78	26.63	Markab
3	280° 18.50	230°47.87	• • 27.83	268° 12.47	• • 51.15	224°28.74	• • 58.82	290°44.08	• • 26.57	May 15 M/- 1
4	295°20.96	245° 47.24	28.70	283°13.18	51.90	239°30.59	58.95	305°46.39	26.51	May 15 Wed
5	310°23.42	260°46.61	29.58	298° 13.89	52.65	254°32.45	59.09	320°48.69	26.45	Venus Mars
6	325°25.89 340°28.35	275°45.98		313° 14.60 328° 15.31	N03°53.40	269°34.31 284°36.16	N18°59.22 59.36	335°50.99 350°53.30	S06°26.39	Jupiter
7 8	340° 28.35 355° 30.82	290°45.36 305°44.73	31.33 32.20	328° 15.31 343° 16.02	54.14 54.89	284°36.16 299°38.02	59.36 59.49	5°55.60	26.34 26.28	Saturn
9	10°33.28	320°44.10	• • 33.07	358° 16.73	• • 55.64	314°39.88	• • 59.62	20°57.91	26.22	Suturn
10	25°35.74	335°43.47	33.95	13° 17.44	56.38	329°41.73	59.76	36°0.21	26.16	May 16 Thu
11	40°38.21	350° 42.84	34.82	28° 18.15	57.13	344°43.59	18°59.89	51°2.52	26.11	Venus
12	55°40.67	5° 42.21	N17°35.69	43° 18.86	N03°57.88	359°45.45	N19°0.03	66°4.82	S06°26.05	Mars
13	70°43.14	20°41.57	36.56	58° 19.57	58.62	14°47.30	0.16	81°7.13	25.99	Jupiter
14	85°45.60	35°40.94	37.43	73°20.28	03°59.37	29°49.16	0.30	96°9.43	25.94	Saturn
15	100°48.07	50°40.31	• • 38.29	88°20.99	04°0.12	44°51.02	• • 0.43	111°11.74	• • 25.88	May 17 Fri
16	$115^{\circ}50.53$	65°39.68	39.16	103°21.70	0.86	59°52.87	0.57	126°14.04	25.82	Venus
17	$130^{\circ}52.99$	80°39.04	40.03	118°22.41	1.61	74°54.73	0.70	141°16.35	25.76	Mars
18	145°55.46	95°38.41		133°23.12	N04°2.35	89°56.59	N19°0.83	156°18.65	S06°25.71	Jupiter
19	160°57.92	110°37.78	41.76	148°23.83	3.10	104°58.44	0.97	171°20.96	25.65	Saturn
20	176°0.39	125°37.14	42.62	163°24.54	3.85	120°0.30	1.10	186°23.27	25.59	LI!-
21	191°2.85	140°36.51	• • 43.48	178° 25.25	• • 4.59	135° 2.16	• • 1.24	201°25.57	• • 25.54	Horizon
22	206°5.31	155°35.87	44.35	193°25.96	5.34	150° 4.01	1.37	216°27.88	25.48	
23	221°7.78	170°35.24	45.21	208°26.66	6.08	165° 5.87	1.50	231°30.18	25.42	
Mer.p	pass. 08:18	ν -0.6' d0	.9′ m-3.92	$ u$ 0.7 $^{\prime}$ d0	.7′ m1.08	ν 1.9 $^{\prime}$ d0.	.1′ m-2.00	ν 2.3′ d-0	.1' m 1.05	

Stars SHA

357°35.58 353°7.96

349°32 12

348°48.09

 $335^{\circ}21.09$

 $327^{\circ}52.16$

314°48.00

315°12.61

 $314^{\circ}7.06$

308°29.58

290°40.60

281°4.72

 $280^{\circ}23.16$

278°23.79

 $278^{\circ}\,2.92$

275°38.59

270°52.98

263°53.08

258°26.99

255°6.57

244°51.61

 $243^{\circ}18.19$ 234°15.23

222°46.82

221°38.60

217°48.34

207°35.01

193°41.44

 $182^{\circ}25.35$

 $175^{\circ}43.97$

 $173^{\circ}\,0.31$

171°51.91

 $166^{\circ}13.01$

158°22.63

152°51.99

148°36.24

147°57.93

 $145^{\circ}48.10$

139°40.46

137°18.57

136°56.31

126°3.84

112°16 16

107°10.37

102°3.10

96°10.76

95°58.76

90°41.99

83°32.94

80°33.29

75°48.20

62°0.34

 $53^{\circ}6.38$

49°26.06

33°39.34

27°33.64

15°15.23

13°45.88

13°30.57

SHA

313°6.38

349°23.46

304°41.19

SHA

311°52.65

348°41.35

304°26.63

10°29.96

SHA

310°38.64

347°59.24

304°12.06

 $10^{\circ}26.07$

Venus: Mars:

Horizontal parallax

 $10^{\circ}33.92$

Dec 29°13.27

-42°10.32

56°39 99

-17°51.20

 $-57^{\circ}6.68$

23°34.52

89°21.93

40°12.42

4°11.03

49°56.77

16°33.45

-8°10.47

 $46^{\circ}1.38$

 $6^{\circ}22.26$

28°37.68

 $-1^{\circ}11.23$

7°24.67

-52°42.65

-16°45.06

-29°0.44

-59°35.48

-43°32.07

-69°49.28

-8°45.93

11°50.92

61°37.45

14°26.18

-17°40.76

-63°14.28

-57°15.20

55°49.82 -11°17.40

49°11.57 -60°29.57

-36°29.52

19°3.30

74°3.33

-16°8.67

26°37.88

-26°29.20

-69°4.20 -15°45.36

 $-37^{\circ}7.26$

12°32.40

51°28.88

-34°22.34 38°48.11

-26°15.97 8°55.80

-56°39.20

45°21.69

 $9^{\circ}59.03$

-46°50.42

-29°29.53

28°12.64

15°19.99

Mer.pass

11:35

09:09

12:07

07:44

11:36

09:08

12:04

07:40

09:07

12:01

07:36

0.1

0.1

Mer.pass 11:37

Mer.pass

-60°56.27

5°9.74 27°58.13

h	Su	n			Moon		
Ved	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.61	N18°56.05	90°10.22	13.7'	N19°8.03	-11.1'	54.8
1	195°54.60	56.64	104°42.95	13.8'	18°56.91	-11.2'	54.7
2	210°54.59	57.22	119°15.76	13.9'	18°45.71	-11.3'	54.7
3	225°54.58	• • 57.81	133°48.66	14.0'	18°34.45	-11.3'	54.7
4	240°54.57	58.39	148°21.65	14.1'	18°23.11	-11.4'	54.7
5	255°54.56	58.98	162°54.72	14.2'	$18^{\circ}11.71$	-11.5'	54.7
6	270°54.55	N18°59.56	177°27.87	14.2'	N18°0.24	-11.5'	54.7
7	285°54.54	19°0.14	192°1.11	14.3'	17°48.71	-11.6'	54.6
8	300°54.53	0.73	206°34.43	14.4'	17°37.11	-11.7'	54.0
9	315°54.52	. 1.31	221°7.83	14.5'	17°25.44	-11.7'	54.
10	330°54.51	1.89	235°41.31	14.6'	17°13.72	-11.8'	54.
11	345°54.50	2.47	250°14.87	14.6'	17°1.93	-11.8'	54.
12	0°54.49	N19°3.05	264°48.51	14.7'	N16°50.08	-11.9'	54.
13	15°54.48	3.63	279°22.22	14.7	16°38.17	-11.9	54.
13 14	30°54.46	4.21	293°56.01	14.9'	16°26.20	-12.0'	54.
1 4 15	45°54.45	. 4.79	308°29.88	14.9'	16° 20.20	-12.1'	54.
16	60°54.44	5.36	323°3.82	15.0'	16°2.10	-12.1'	54.
	75°54.43		323 3.62 337°37.83				
17		5.94		15.1'	15°49.96	-12.2'	54.
18	90°54.41	N19°6.52	352°11.92	15.2'	N15°37.76	-12.2'	54.
19	105°54.40	7.09	6°46.07	15.2'	15°25.52	-12.3'	54.
20	120°54.39	7.67	21°20.30	15.3'	15°13.21	-12.4'	54.
21	135°54.37	• • 8.24	35°54.59	15.4'	15°0.86	-12.4'	54.
22	150°54.36	8.82	50°28.95	15.4'	14°48.45	-12.5'	54.
23	165°54.35	9.39	65°3.38	15.5'	14°36.00	-12.5'	54.
	SD = 15.8'	d = 0.6'		SI	O = 14.9'		
hu	GHA	Dec	GHA	.,	Dec	d	HF
0 0	180°54.33	N19°9.96	79°37.88	u 15.6'	N14°23.49	-12.6'	54.
1	195°54.32	10.54	94°12.44	15.6'	14°10.93	-12.6'	54.
	195°54.32 210°54.30	10.54 11.11	94°12.44 108°47.06	15.7	14°10.93 13°58.33	-12.6 -12.7'	54.4
2							
3	225°54.29	• • 11.68	123°21.74	15.7'	13°45.68	-12.7'	54.
4	240°54.27	12.25	137°56.49	15.8'	13°32.98	-12.7'	54.
5	255°54.26	12.82	152°31.30	15.9'	13°20.24	-12.8'	54.
6	270°54.24	N19°13.39	$167^{\circ}6.16$	15.9'	N13°7.45	-12.8'	54.
7	285°54.23	13.96	181°41.08	16.0'	$12^{\circ}54.61$	-12.9'	54.
8	300°54.21	14.53	196°16.06	16.0'	12°41.74	-12.9'	54.3
9	315°54.20	• • 15.10	210°51.10	16.1'	12°28.82	-13.0'	54.
10	330°54.18	15.67	225°26.19	16.1'	12°15.86	-13.0'	54.
11	345°54.16	16.23	240°1.34	16.2'	12°2.86	-13.0'	54.
12	0°54.14	N19°16.80	254°36.53	16.2'	N11°49.82	-13.1'	54.:
13	15°54.13	17.37	269°11.78	16.3'	11°36.73	-13.1'	54.:
14	30°54.11	17.93	283°47.08	16.3'	11°23.61	-13.2'	54.:
15	45°54.09	· · 18.50	298°22.43	16.4'	11°10.46	-13.2'	54.:
16	60°54.07	19.06	312°57.82	16.4'	10°57.26	-13.2'	54.:
17	75°54.06	19.62	327°33.27	16.5'	10°44.03	-13.3'	54.
18	90°54.04	N19°20.19	342°8.76	16.5'	N10°30.76	-13.3'	54.:
19	105°54.02	20.75	356°44.29	16.6'	10°17.46		54.:
	120°54.00	21.31	11°19.86	16.6'	10°4.13		54.:
20 21	120 54.00 135°53.98	21.87	25°55.48	16.7	10 4.13 09°50.76	-13.4' -13.4'	54
21 22	135°53.98 150°53.96	22.43	25°55.48 40°31.14	16.7' 16.7'	09°50.76 09°37.36	-13.4' -13.4'	54.
22 23	165°53.94	22.43	40 31.14 55°6.84	16.7'	09 37.30 09°23.92	-13.4 -13.5'	54.
23	SD = 15.8'	$\frac{22.99}{d=0.6'}$	- 55 0.04		O = 14.8'	-13.3	34.
_							
Fri	GHA	Dec	GHA	ν	Dec	d	H
0	180°53.92	N19°23.55	69°42.58	16.8'	N09°10.46	-13.5'	54.:
1	195°53.90	24.11	84°18.36	16.8'	08°56.96	-13.5'	54.:
2	210°53.88	24.67	98°54.17	16.8'	08°43.44	-13.6'	54.:
	225°53.86	• • 25.23	113°30.02	16.9'	08°29.88	-13.6'	54.:
3		25.78	1000 = 01	16 0'	08°16.30	-13.6'	54.
3 4	240°53.84	25.78	128°5.91	16.9'	00 10.50	-13.6'	54.
	240°53.84 255°53.82	26.34	128°5.91 142°41.83	16.9'	08°2.69	-13.0	
4			142°41.83 157°17.77			-13.7	54.
4 5	255°53.82	26.34	142°41.83	16.9'	08°2.69		
4 5 6	255°53.82 270°53.80	26.34 N19°26.90	142°41.83 157°17.77	16.9' 17.0'	08°2.69 N07°49.05	-13.7'	54.
4 5 6 7	255°53.82 270°53.80 285°53.78	26.34 N19°26.90 27.45	142°41.83 157°17.77 171°53.75	16.9' 17.0' 17.0'	08°2.69 N07°49.05 07°35.39	-13.7' -13.7'	54. 54.
4 5 6 7 8	255° 53.82 270° 53.80 285° 53.78 300° 53.76	26.34 N19°26.90 27.45 28.01	142°41.83 157°17.77 171°53.75 186°29.76	16.9' 17.0' 17.0' 17.0'	08°2.69 N07°49.05 07°35.39 07°21.70	-13.7' -13.7' -13.7'	54. 54. 54.
4 5 6 7 8 9	255°53.82 270°53.80 285°53.78 300°53.76 315°53.73	26.34 N19°26.90 27.45 28.01	142°41.83 157°17.77 171°53.75 186°29.76 201°5.80	16.9' 17.0' 17.0' 17.0' 17.1'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98	-13.7' -13.7' -13.7' -13.7'	54. 54. 54. 54.
4 5 6 7 8 9 10	255°53.82 270°53.80 285°53.78 300°53.76 315°53.73 330°53.71 345°53.69	26.34 N19°26.90 27.45 28.01 •• 28.56 29.12 29.67	142°41.83 157°17.77 171°53.75 186°29.76 201°5.80 215°41.87 230°17.96	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48	-13.7' -13.7' -13.7' -13.7' -13.8' -13.8'	54. 54. 54. 54. 54.
4 5 6 7 8 9 10 11	255°53.82 270°53.80 285°53.78 300°53.76 315°53.73 330°53.71 345°53.69 0°53.67	26.34 N19°26.90 27.45 28.01 •• 28.56 29.12 29.67 N19°30.22	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69	-13.7' -13.7' -13.7' -13.7' -13.8' -13.8'	54 54 54 54 54
4 5 6 7 8 9 10 11 12	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64	26.34 N19°26.90 27.45 28.01 · · 28.56 29.12 29.67 N19°30.22 30.77	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69 06°12.89	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8'	54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 10 11 12 13	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62	26.34 N19°26.90 27.45 28.01 · · 28.56 29.12 29.67 N19°30.22 30.77 31.32	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39	16.9' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69 06°12.89 05°59.06	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8' -13.9'	54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 10 11 12 13 14	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 31.88	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2'	08° 2.69 N07° 49.05 07° 35.39 07° 21.70 07° 7.98 06° 54.24 06° 40.48 N06° 26.69 06° 12.89 05° 59.06 05° 45.21	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.9' -13.9'	54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 10 11 12 13 14 15 16	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57	26.34 N19°26.90 27.45 28.01 29.67 N19°30.22 30.77 31.32 31.88 32.43	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2'	08° 2.69 N07° 49.05 07° 35.39 07° 21.70 07° 7.98 06° 54.24 06° 40.48 N06° 26.69 06° 12.89 05° 59.06 05° 45.21 05° 31.34	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9'	54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 10 11 12 13 14 15 16	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57 75° 53.55	26.34 N19°26.90 27.45 28.01 29.67 N19°30.22 30.77 31.32 31.88 32.43 32.98	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.2'	08° 2.69 N07° 49.05 07° 35.39 07° 21.70 07° 7.98 06° 54.24 06° 40.48 N06° 26.69 06° 12.89 05° 59.06 05° 45.21 05° 31.34 05° 17.45	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9'	54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 10 11 11 12 13 14 15 16 17	255° 53.82 270° 53.80 285° 53.78 300° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57 75° 53.55 90° 53.53	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 31.88 32.43 32.98 N19°33.52	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01 332° 31.26	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.2' 17.3'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69 06°12.89 05°59.06 05°45.21 05°31.34 05°17.45 N05°3.54	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9' -13.9'	54. 54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 110 111 112 113 114 115 116 117	255° 53.82 270° 53.80 285° 53.78 300° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.55 75° 53.55 90° 53.53 105° 53.50	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 31.88 32.43 32.98 N19°33.52 34.07	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01 332° 31.26 347° 7.52	16.9' 17.0' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.3' 17.3'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69 06°12.89 05°59.06 05°45.21 05°31.34 N06°3.54 04°49.61	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9' -13.9' -13.9' -13.9'	54. 54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 110 111 12 13 14 115 116 117 118 119 220	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57 75° 53.55 90° 53.53 105° 53.50 120° 53.48	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 32.43 32.98 N19°33.52 34.07 34.62	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01 332° 31.26 347° 7.52 1° 43.80	16.9' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.3' 17.3' 17.3'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69 06°12.89 05°59.06 05°45.21 05°31.34 05°17.45 N05°3.54 04°49.61 04°35.67	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9' -13.9' -13.9' -14.0'	54. 54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 110 111 1213 144 115 116 117 118 120 220 221	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57 75° 53.55 90° 53.53 105° 53.50 120° 53.48 135° 53.45	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 32.43 32.98 N19°33.52 34.07 34.62 35.17	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01 332° 31.26 347° 7.52 1° 43.80 16° 20.09	16.9' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.3' 17.3' 17.3' 17.3'	08° 2.69 N07° 49.05 07° 35.39 07° 21.70 07° 7.98 06° 54.24 06° 40.48 N06° 26.69 06° 12.89 05° 59.06 05° 45.21 05° 31.34 05° 17.45 N05° 3.54 04° 49.61 04° 35.67 04° 21.71	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9' -14.0' -14.0'	54. 54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 110 111 1213 144 115 166 177 188 199 200 221	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57 75° 53.55 90° 53.53 105° 53.50 120° 53.48	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 32.43 32.98 N19°33.52 34.07 34.62	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01 332° 31.26 347° 7.52 1° 43.80	16.9' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.3' 17.3' 17.3'	08°2.69 N07°49.05 07°35.39 07°21.70 07°7.98 06°54.24 06°40.48 N06°26.69 06°12.89 05°59.06 05°45.21 05°31.34 05°17.45 N05°3.54 04°49.61 04°35.67	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9' -13.9' -13.9' -14.0'	54. 54. 54. 54. 54. 54. 54. 54. 54. 54.
4 5 6 7 8 9 110 111 112 113 114 115 116 117 118 119 220	255° 53.82 270° 53.80 285° 53.78 300° 53.76 315° 53.73 330° 53.71 345° 53.69 0° 53.67 15° 53.64 30° 53.62 45° 53.60 60° 53.57 75° 53.55 90° 53.53 105° 53.50 120° 53.48 135° 53.45	26.34 N19°26.90 27.45 28.01 28.56 29.12 29.67 N19°30.22 30.77 31.32 32.43 32.98 N19°33.52 34.07 34.62 35.17	142° 41.83 157° 17.77 171° 53.75 186° 29.76 201° 5.80 215° 41.87 230° 17.96 244° 54.08 259° 30.22 274° 6.39 288° 42.58 303° 18.78 317° 55.01 332° 31.26 347° 7.52 1° 43.80 16° 20.09	16.9' 17.0' 17.0' 17.1' 17.1' 17.1' 17.1' 17.2' 17.2' 17.2' 17.2' 17.3' 17.3' 17.3' 17.3'	08° 2.69 N07° 49.05 07° 35.39 07° 21.70 07° 7.98 06° 54.24 06° 40.48 N06° 26.69 06° 12.89 05° 59.06 05° 45.21 05° 31.34 05° 17.45 N05° 3.54 04° 49.61 04° 35.67 04° 21.71	-13.7' -13.7' -13.7' -13.8' -13.8' -13.8' -13.8' -13.9' -13.9' -13.9' -13.9' -14.0' -14.0'	54 54

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°	////	////	00:00	////	////	////
68°	////	////	01:39	22:19	////	////
66°	////	////	02:16	21:40	////	////
64°	////	00:57	02:42	21:13	23:04	////
62°	////	01:45	03:03	20:52	22:12	////
60°	////	02:14	03:19	20:35	21:41	////
N 58°	00:51	02:36	03:33	20:21	21:18	23:09
56°	01:35	02:54	03:45	20:09	21:00	22:22
54°	02:02	03:09	03:55	19:59	20:45	21:53
52°	02:23	03:22	04:04	19:50	20:32	21:32
50°	02:39	03:33	04:12	19:41	20:21	21:15
45°	03:11	03:55	04:29	19:24	19:58	20:43
N 40°	03:35	04:13	04:44	19:10	19:41	20:19
35°	03:53	04:27	04:55	18:58	19:26	20:00
30°	04:08	04:40	05:06	18:47	19:14	19:45
20°	04:32	05:00	05:23	18:30	18:53	19:21
N 10°	04:50	05:16	05:39	18:14	18:37	19:03
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:45	06:07	17:46	18:08	18:34
20°	05:32	05:58	06:22	17:31	17:54	18:21
30°	05:44	06:13	06:39	17:14	17:39	18:08
35°	05:51	06:21	06:49	17:04	17:31	18:02
40°	05:58	06:30	07:00	16:53	17:22	17:55
45°	06:05	06:41	07:13	16:40	17:12	17:47
S 50°	06:13	06:53	07:29	16:24	16:59	17:39
52°	06:17	06:58	07:36	16:16	16:54	17:35
54°	06:21	07:04	07:44	16:08	16:48	17:32
56°	06:25	07:11	07:54	15:58	16:41	17:27
58°	06:29	07:18	08:04	15:48	16:34	17:23
S 60°	06:34	07:26	08:16	15:36	16:26	17:18

Lat.		Moonris	e		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	06:52	10:13	12:22	05:50	03:58	03:14
N 70°	08:15	10:36	12:31	04:26	03:33	03:02
68°	08:53	10:53	12:39	03:46	03:14	02:52
66°	09:19	11:07	12:45	03:19	02:59	02:44
64°	09:39	11:18	12:51	02:58	02:46	02:37
62°	09:55	11:28	12:55	02:41	02:35	02:31
60°	10:09	11:36	12:59	02:26	02:26	02:25
N 58°	10:20	11:43	13:03	02:14	02:18	02:21
56°	10:30	11:49	13:06	02:03	02:11	02:16
54°	10:39	11:55	13:09	01:54	02:04	02:13
52°	10:47	12:00	13:11	01:45	01:58	02:09
50°	10:54	12:05	13:13	01:38	01:53	02:06
45°	11:09	12:14	13:18	01:21	01:42	01:59
N 40°	11:21	12:22	13:22	01:08	01:32	01:53
35°	11:31	12:29	13:26	00:56	01:24	01:48
30°	11:40	12:36	13:29	00:46	01:17	01:44
20°	11:56	12:46	13:34	00:29	01:04	01:36
N 10°	12:09	12:55	13:39	00:13	00:53	01:29
0°	12:22	13:04	13:44		00:42	01:23
S 10°	12:34	13:12	13:48		00:32	01:17
20°	12:48	13:21	13:53		00:20	01:10
30°	13:03	13:31	13:58		00:07	01:02
35°	13:12	13:37	14:01		00:00	00:57
40°	13:21	13:44	14:04	23:51		00:52
45°	13:33	13:52	14:08	23:41	•• ••	00:45
S 50°	13:47	14:01	14:13	23:28		00:38
52°	13:54	14:05	14:15	23:22		00:34
54°	14:01	14:10	14:17	23:16		00:31
56°	14:09	14:15	14:20	23:09		00:26
58°	14:18	14:21	14:23	23:00		00:22
S 60°	14:28	14:27	14:26	22:51		00:16

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	45-64%	
15	03:38	03:38	11:56	18:32	06:10		
16	03:37	03:37	11:56	19:13	06:53		
17	03:36	03:35	11:56	19:53	07:33		

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	236° 10.24	185°34.60 N17°46.07	223°27.37 N04°6.83	180°7.73 N19°1.64	246°32.49 \$06°25.37
1	251° 12.71	200°33.96 46.93	238°28.08 7.57	195°9.58 1.77	261°34.80 25.31
2	266° 15.17	215°33.32 47.79	253°28.79 8.32	210°11.44 1.91	276°37.10 25.25
3	281°17.63	230°32.69 · · 48.65	268°29.50 · · 9.06	225°13.29 · · 2.04	291°39.41 · · 25.20
4	296°20.10	245°32.05 49.50	283°30.21 9.81	240°15.15 2.17	306°41.72 25.14
5	311°22.56	260°31.41 50.36	298°30.92 10.55	255°17.01 2.31	321°44.02 25.08
6	326°25.03	275°30.77 N17°51.22	313°31.63 N04°11.30	270°18.86 N19°2.44	336°46.33
7	341°27.49	290°30.13 52.07	328°32.34 12.04	285°20.72 2.58	351°48.64 24.97
8	356° 29.95	305°29.49 52.93	343°33.05 12.79	300°22.58 2.71	6°50.95 24.91
9	11°32.42	320°28.85 · · 53.78	358°33.76 · · 13.53	315°24.43 · · 2.84	21°53.25 · · 24.86
10	26°34.88	335°28.21 54.63	13°34.47 14.28	330°26.29 2.98	36°55.56 24.80
11	41°37.35	350°27.56 55.49	28°35.18 15.02	345°28.15 3.11	51°57.87 24.75
12	56°39.81	5°26.92 N17°56.34	43°35.89 N04°15.76	0°30.00 N19°3.24	67°0.18 S06°24.69
13	$71^{\circ}42.27$	20°26.28 57.19	58°36.60 16.51	15°31.86 3.38	82°2.49 24.63
14	86°44.74	35°25.64 58.04	73°37.31 17.25	30°33.72 3.51	97°4.79 24.58
15	101°47.20	50°24.99 · · 58.89	88°38.02 · · 18.00	45°35.57 · · 3.64	$112^{\circ}7.10 \cdot \cdot 24.52$
16	116°49.67	65°24.35 17°59.73	103°38.73 18.74	60°37.43 3.78	127°9.41 24.47
17	131°52.13	80°23.70 18°0.58	118°39.44 19.48	75°39.29 3.91	142°11.72 24.41
18	146°54.59	95°23.06 N18°1.43	133°40.15 N04°20.23	90°41.14 N19°4.04	157°14.03 S 06°24.36
19	161°57.06	110°22.41 2.27	148°40.86 20.97	105°43.00 4.18	172°16.34 24.30
20	176° 59.52	125°21.77 3.12	163°41.57 21.72	120°44.86 4.31	187°18.65 24.24
21	192°1.99	140°21.12 · · 3.96	178°42.28 · · 22.46	135°46.71 · · 4.44	202°20.96 · · 24.19
22	207°4.45	155°20.47 4.80	193°42.99 23.20	150°48.57 4.58	217°23.27 24.13
23	222°6.92	170° 19.82 5.65	208° 43.70 23.94	165°50.43 4.71	232°25.57 24.08
Mer.p	pass. 08:14	ν-0.6′ d0.9′ m-3.92	ν0.7′ d0.7′ m1.08	ν1.9' d0.1' m-2.00	ν2.3' d-0.1' m1.05
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	237°9.38	185°19.18 N18°6.49	223°44.41 N04°24.69	180°52.28 N19°4.84	247°27.88 \$06°24.02
1	252°11.84	200°18.53 7.33	238°45.12 25.43	195°54.14 4.98	262°30.19 23.97
2	267° 14.31	215°17.88 8.17	253°45.83 26.17	210°56.00 5.11	277°32.50 23.91
3	282° 16.77	230°17.23 · · 9.01	268° 46.54 · · 26.92	225°57.85 · · 5.24	292°34.81 · · 23.86
4	297° 19.24	245°16.58 9.84	283°47.25 27.66	240°59.71 5.38	307°37.12 23.80
5	312°21.70	260° 15.93 10.68	298°47.96 28.40	256° 1.57 5.51	322°39.43 23.75
6	327°24.16	275°15.28 N18°11.52	313°48.67 N04°29.14	271°3.42 N19°5.64	337°41.74 S 06°23.69
7	342°26.63	290°14.62 12.35	328°49.38 29.89	286° 5.28 5.78	352°44.06 23.64
8	357°29.09	305°13.97 13.19	343°50.09 30.63	301°7.14 5.91	7°46.37 23.58
9	12°31.56	320°13.32 · · 14.02	358°50.80 · · 31.37	316°8.99 · · 6.04	22°48.68 · · 23.53
10	27°34.02	335°12.67 14.86	13°51.52 32.11	331°10.85 6.18	37°50.99 23.47
11	42°36.48	350° 12.01 15.69	28°52.23 32.85	346°12.70 6.31	52°53.30 23.42
12	57°38.95	5°11.36 N18°16.52	43°52.94 N04°33.60	1°14.56 N19°6.44	67°55.61 \$06°23.36
13	$72^{\circ}41.41$	20° 10.71 17.35	58°53.65 34.34	16°16.42 6.58	82°57.92 23.31
14	87°43.88	35°10.05 18.18	73°54.36 35.08	31°18.27 6.71	98°0.23 23.26
15	$102^{\circ}46.34$	50°9.39 · · 19.01	88°55.07 · · 35.82	46°20.13 · · 6.84	113°2.54 · · 23.20
16	$117^{\circ}48.80$	65°8.74 19.84	103°55.78 36.56	61°21.98 6.97	128°4.86 23.15
17	132°51.27	80°8.08 20.66	118° 56.49 37.30	76°23.84 7.11	143°7.17 23.09
18	147°53.73	95°7.43 N18°21.49	133°57.20 N04°38.04	91°25.70 N19°7.24	158°9.48 S06°23.04
19	162°56.20	110°6.77 22.32	148° 57.91 38.78	106°27.55 7.37	173°11.79 22.98
20	177° 58.66	125°6.11 23.14	163°58.62 39.53	121°29.41 7.50	188°14.10 22.93
21	$193^{\circ}1.12$	140°5.45 · · 23.97	178°59.33 · · 40.27	136°31.27 · · 7.64	203°16.42 · · 22.88
22	208°3.59	155°4.79 24.79	194°0.04 41.01	151°33.12 7.77	218°18.73 22.82
23	223°6.05	170°4.13 25.61	209°0.75 41.75	166°34.98 7.90	233°21.04 22.77
Mer.	pass. 08:10	ν-0.6′ d0.8′ m-3.92	ν0.7′ d0.7′ m1.08	$\nu 1.9' \ d0.1' \ \text{m-}2.00$	ν2.3' d-0.1' m1.05
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
O	238°8.52	185°3.47 N18°26.43	224°1.46 N04°42.49	181°36.83 N19°8.04	248°23.35 \$06°22.71
1	250 0.52 253° 10.98	200°2.81 27.25	239°2.17 43.23	196°38.69 8.17	263°25.67 22.66
2	268° 13.44	215°2.15 28.07	254°2.88 43.97	211°40.55 8.30	278°27.98 22.61
3	283° 15.91	230°1.49 · · 28.89	269°3.59 · · 44.71	226°42.40 · · 8.43	293°30.29 · · 22.55
4	203 15.91 298° 18.37	245°0.83 29.71	284°4.30 45.45	241°44.26 8.56	308°32.61 22.50
5	313°20.84	260°0.17 30.53	299°5.01 46.19	256°46.11 8.70	323°34.92 22.44
6	328°23.30	274°59.51 N18°31.34	314°5.72 N04°46.93	271°47.97 N19°8.83	338°37.23 S 06°22.39
7	343°25.77	289°58.84 32.16	329°6.43 47.67	286°49.82 8.96	353°39.55 22.34
8	358°28.23	304°58.18 32.97	344°7.14 48.41	301°51.68 9.09	8°41.86 22.28
9	13°30.69	319°57.51 · · 33.79	359°7.85 · · 49.15	316°53.54 · · 9.23	23°44.17 · · 22.23
10	28°33.16	334°56.85 34.60	14°8.56 49.89	331°55.39 9.36	38°46.49 22.18
11	43°35.62	349°56.18 35.41	29°9.27 50.63	346°57.25 9.49	53°48.80 22.12
12	58°38.09	4°55.52 N18°36.22	44°9.98 N04°51.37	1°59.10 N19°9.62	68°51.12 \$06°22.07
13	73°40.55	19°54.85 37.04	59° 10.69 52.10	17° 0.96 9.75	83°53.43 22.02
14	88°43.01	34°54.19 37.85	74°11.40 52.84	32°2.82 9.89	98°55.75 21.96
15	103°45.48	49°53.52 · · 38.65	89° 12.11 · · 53.58	47° 4.67 · · · 10.02	113°58.06 · · 21.91
16	118° 47.94	64°52.85 39.46	104° 12.82 54.32	62° 6.53 10.15	129°0.37 21.86
17	133°50.41	79°52.18 40.27	119° 13.53 55.06	77°8.38 10.28	144°2.69 21.81
18	148°52.87	94°51.52 N18°41.08	134°14.24 N04°55.80	92°10.24 N19°10.41	159°5.00 S06°21.75
19	163°55.33	109°50.85 41.88	149°14.95 56.54	107°12.09 10.54	174°7.32 21.70
20	178°57.80	124°50.18 42.69	164°15.66 57.28	122°13.95 10.68	189°9.64 21.65
21	194°0.26	139°49.51 · · 43.49	179°16.37 · · 58.01	137°15.81 · · 10.81	204°11.95 · · 21.59
22	209°2.73	154°48.84 44.29	194° 17.08 58.75	152°17.66 10.94	219°14.27 21.54
23	224°5.19	169°48.17 45.09	209° 17.79 59.49	167°19.52 11.07	234°16.58 21.49
1400	2255 00.06		ν0.7' d0.7' m1.07		-
ivier.	pass. 08:06	ν-0.7' d0.8' m-3.92	νυ.τ αυ.τ m1.υτ	ν1.9' d0.1' m-2.00	ν2.3' d-0.1' m1.05

Alpheratz Ankaa Schedar Diphda Achernar		
Schedar Diphda	357°35.56	29°13.27
Diphda	353°7.94	$-42^{\circ}10.31$
	349°32.09	56°39.98
Achornar	348°48.08	$-17^{\circ}51.19$
Achemai	335°21.07	-57°6.66
Hamal	327°52.15	23°34.52
Polaris	314°47.67	89°21.91
Acamar	315° 12.60	-40°12.40
Menkar	314°7.06	4°11.04
Mirfak	308°29.58	49°56.76
Aldebaran	290°40.60	16°33.45
Rigel	281°4.72	-8° 10.46
Capella	280°23.17	46°1.37
Bellatrix	278°23.79	6° 22.27
Elnath	278°2.93	28° 37.68
Alnilam	275°38.60	-1°11.23
	270°52.98	7° 24.67
Betelgeuse	263°53.09	-52°42.64
Canopus	258° 27.00	
Sirius		-16°45.06
Adhara	255°6.58	-29°0.43
Procyon	244°51.62	5°9.74
Pollux	243°18.20	27°58.13
Avior	234° 15.26	-59°35.47
Suhail	222°46.84	-43°32.07
Miaplacidus	221°38.64	-69°49.28
Alphard	217°48.36	-8°45.93
Regulus	$207^{\circ}35.02$	$11^{\circ}50.92$
Dubhe	193°41.47	61°37.45
Denebola	182°25.36	14° 26.19
Gienah	175°43.98	-17°40.76
Acrux	173°0.33	-63°14.29
Gacrux	171°51.93	-57° 15.21
Alioth	166°13.03	55° 49.83
Spica	158°22.63	-11° 17.40
Alkaid	150 22.03 152°52.00	49°11.59
Hadar	148°36.24	-60° 29.58
Menkent	146 50.24 147°57.93	-00 29.50 -36° 29.52
	147 57.93 145°48.11	-30 29.52 19°3.31
Arcturus	145 48.11 139°40.47	-60°56.28
Rigil Kent.		
Kochab	137°18.58	74°3.35
Zuben'ubi	136°56.31	-16°8.67
Alphecca	126°3.84	26° 37.89
Antares	112°16.16	-26° 29.21
Atria	107°10.35	-69°4.21
Sabik	102°3.09	-15°45.36
Shaula	96°10.75	-37°7.27
Rasalhague	95°58.75	12° 32.40
Eltanin	90°41.97	51°28.90
Kaus Aust.	83°32.93	-34°22.34
Vega	80°33.27	38°48.13
Nunki	75°48.18	$-26^{\circ}15.97$
Altair	62°0.32	8°55.80
Aitaii	53°6.34	-56°39.20
Peacock	49°26.03	
	.5 =0.00	45°21.70
Peacock	33°39.32	45°21.70 9°59.03
Peacock Deneb		
Peacock Deneb Enif	$33^{\circ}39.32$	9°59.03
Peacock Deneb Enif Al Na'ir	33°39.32 27°33.61	9°59.03 -46°50.42
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat	33°39.32 27°33.61 15°15.21 13°45.86	9°59.03 -46°50.42 -29°29.53
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	33°39.32 27°33.61 15°15.21 13°45.86 13°30.55	9° 59.03 -46° 50.42 -29° 29.53 28° 12.65 15° 19.99
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat	33°39.32 27°33.61 15°15.21 13°45.86 13°30.55	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Jupiter	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Jupiter	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94 303° 28.32	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 17:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94 303° 28.32 10° 14.84	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass 11:40
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94 303° 28.32 10° 14.84	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass 11:40 09:03 11:52 07:25
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94 303° 28.32 10° 14.84 **tal parallax Venus:	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass 11:40 09:03 11:52 07:25
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94 303° 28.32 10° 14.84	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass 11:40 09:03 11:52 07:25
Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab May 18 Sat Venus Mars Jupiter Saturn May 19 Sun Venus Mars Jupiter Saturn May 20 Mon Venus Mars Jupiter Saturn	33° 39.32 27° 33.61 15° 15.21 13° 45.86 13° 30.55 SHA 309° 24.36 347° 17.13 303° 57.48 10° 22.25 SHA 308° 9.80 346° 35.04 303° 42.90 10° 18.51 SHA 306° 54.96 345° 52.94 303° 28.32 10° 14.84 **tal parallax Venus:	9°59.03 -46°50.42 -29°29.53 28°12.65 15°19.99 Mer.pass 11:38 09:06 11:58 07:33 Mer.pass 11:39 09:05 11:55 07:29 Mer.pass 11:40 09:03 11:52 07:25

Stars SHA

Dec

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.38	N19°36.81	60°9.05	17.3'	N03°39.73	-14.0'	54.1'
1	195°53.35	37.35	74°45.40	17.4'	03°25.71	-14.0'	54.1'
2	210°53.33	37.90	89°21.75	17.4'	03° 11.67	-14.0'	54.1'
3	225°53.30	• • 38.44	103°58.11	17.4	02°57.62	-14.1'	54.1'
4 5	240°53.27 255°53.25	38.98 39.53	118°34.47 133°10.85	17.4' 17.4'	02°43.56 02°29.49	-14.1' -14.1'	54.1' 54.1'
6	255 53.25 270°53.22	39.53 N19° 40.07	133 10.85 147°47.23	17.4	N02° 15.40	-14.1	54.1
7	285°53.19	40.61	162°23.61	17.4	02°1.31	-14.1'	54.1'
8	300°53.17	41.15	176° 59.99	17.4'	01°47.21	-14.1'	54.1'
9	315°53.14	• • 41.69	191°36.37	17.4'	01°33.10	-14.1'	54.1'
10	330°53.11	42.23	206° 12.76	17.4'	01°18.98	-14.1'	54.1'
11	345°53.08	42.77	220°49.14	17.4	01°4.85	-14.1'	54.2'
12 13	0°53.06 15°53.03	N19° 43.31 43.85	235°25.52 250°1.90	17.4' 17.4'	N00°50.71 00°36.57	-14.1' -14.1'	54.2' 54.2'
14	30°53.00	44.39	264°38.28	17.4	00°30.37	-14.1	54.2'
15	45°52.97	• • 44.92	279° 14.65	17.4	N00°8.27	-14.2'	54.2'
16	60°52.94	45.46	293°51.01	17.4'	\$00°5.88	14.2'	54.2'
17	75°52.91	45.99	308°27.36	17.3'	00°20.04	14.2'	54.2'
18	90°52.88	N19°46.53	323°3.71	17.3'	S00°34.20	14.2'	54.2'
19	105°52.85	47.06	337°40.04	17.3'	00°48.37	14.2'	54.2'
20 21	120°52.82 135°52.79	47.60 •• 48.13	352°16.36 6°52.67	17.3' 17.3'	01°2.53 01°16.70	14.2' 14.2'	54.2' 54.2'
21	135 52.79 150°52.76	48.13	0 52.07 21°28.97	17.3'	01 16.70 01°30.87	14.2'	54.2'
23	165°52.73	49.20	36°5.25	17.3'	01°45.03	14.2'	54.2'
	SD = 15.8'	d = 0.5'			D = 14.8'		
	JD = 15.6	u = 0.5		اد	J — 14.0°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.70	N19°49.73	50°41.52	17.2'	S01°59.20	14.2'	54.2'
1	195°52.67 210°52.64	50.26	65° 17.77 79° 54.00	17.2'	02°13.36 02°27.52	14.2'	54.2'
2	210°52.64 225°52.61	50.79 •• 51.32	79°54.00 94°30.21	17.2' 17.2'	02°27.52 02°41.68	14.2' 14.2'	54.2' 54.3'
4	240°52.57	51.85	109°6.41	17.2'	02°55.83	14.1'	54.3'
5	255°52.54	52.38	123° 42.58	17.1'	03°9.98	14.1'	54.3'
6	270°52.51	N19°52.91	138° 18.72	17.1'	S03°24.12	14.1'	54.3'
7	285°52.48	53.43	152° 54.85	17.1'	03°38.25	14.1'	54.3'
8	300°52.44	53.96	167°30.95	17.1'	03°52.38	14.1'	54.3'
9	315°52.41	• • 54.49	182°7.02	17.0'	04°6.50	14.1'	54.3'
10 11	330°52.38 345°52.34	55.01 55.54	196° 43.07 211° 19.08	17.0' 17.0'	04°20.62 04°34.72	14.1' 14.1'	54.3' 54.3'
12	0°52.31	N19° 56.06	211 19.00 225°55.07	17.0'	S04°48.81	14.1	54.3'
13	15°52.28	56.59	240°31.03	16.9'	05°2.89	14.1'	54.3'
14	30°52.24	57.11	255°6.95	16.9'	$05^{\circ}16.96$	14.1'	54.4'
15	45°52.21	• • 57.63	269° 42.85	16.9'	05° 31.02	14.0'	54.4'
16	60°52.17	58.15	284°18.71	16.8'	05° 45.07	14.0'	54.4'
17	75°52.14 90°52.10	58.68 N19° 59.20	298°54.53 313°30.32	16.8' 16.8'	05°59.10 \$06°13.12	14.0' 14.0'	54.4' 54.4'
18 19	105°52.07	19°59.72	328° 6.07	16.7	06°27.12	14.0'	54.4'
20	120°52.03	20°0.24	342°41.78	16.7'	06°41.10	14.0'	54.4'
21	135°52.00	0.76	357° 17.45	16.6'	06° 55.07	14.0'	54.4'
22	150°51.96	1.27	$11^{\circ}53.09$	16.6'	07°9.02	13.9'	54.4'
23	165°51.93	1.79	26°28.68	16.5'	07°22.95	13.9'	54.5'
	SD = 15.8'	d = 0.5'		SI	D = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.89	N20°2.31	41°4.22	16.5'	S07°36.86	13.9'	54.5'
1	195°51.85	2.83	55°39.73	16.5'	07°50.75	13.9'	54.5'
2	210°51.82 225°51.78	3.34	70°15.18 84°50.60	16.4' 16.4'	08°4.62 08°18.47	13.8'	54.5'
3 4	225°51.78 240°51.74	· · 3.86 4.37	84°50.60 99°25.96	16.4' 16.3'	08° 18.47 08° 32.30	13.8' 13.8'	54.5' 54.5'
5	255°51.70	4.89	99 25.90 114°1.28	16.3'	08°46.10	13.8	54.5'
6	270°51.67	N20°5.40	128° 36.54	16.2'	S08° 59.88	13.8'	54.6'
7	285°51.63	5.92	143°11.76	16.2'	$09^{\circ}13.63$	13.7'	54.6'
8	300°51.59	6.43	157° 46.92	16.1'	09°27.35	13.7'	54.6'
9	315°51.55	• • 6.94	172°22.03	16.1'	09°41.05 09°54.72	13.7'	54.6'
10 11	330°51.51 345°51.47	7.45 7.96	186°57.09 201°32.09	16.0' 15.9'	09°54.72 10°8.36	13.6' 13.6'	54.6' 54.6'
12	0°51.43	N20°8.47	201 32.09 216°7.04	15.9'	\$10° 21.98	13.6'	54.6
13	15°51.39	8.98	230°41.93	15.8'	10°35.56	13.5'	54.7'
14	30°51.35	9.49	245° 16.76	15.8'	10°49.10	13.5'	54.7'
15	45°51.32	• • 10.00	259°51.53	15.7'	11°2.62	13.5'	54.7'
16	60°51.28 75°51.23	10.51	274°26.24 289°0.89	15.7'	11°16.10 11°29.55	13.4'	54.7'
17 18	75°51.23 90°51.19	11.01 N20° 11.52	289°0.89 303°35.48	15.6' 15.5'	11°29.55 \$11°42.96	13.4' 13.4'	54.7' 54.7'
19	105°51.15	12.03	318° 10.01	15.5'	11°56.34	13.4	54.7'
20	120°51.11	12.53	332° 44.47	15.4	12°9.68	13.3'	54.8'
21	135°51.07	• • 13.04	$347^{\circ}18.86$	15.3'	$12^{\circ}22.98$	13.3'	54.8'
22	150°51.03	13.54	1°53.19	15.3'	12°36.24	13.2'	54.8'
23	165°50.99	14.05	16°27.45	15.2'	12°49.46	13.2'	54.8'
	SD = 15.8'	d = 0.5'		SI	D = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:20	22:39	////	////
66°	////	////	02:04	21:52	////	////
64°	////	00:24	02:33	21:22	////	////
62°	////	01:32	02:55	21:00	22:26	////
60°	////	02:05	03:12	20:42	21:51	////
N 58°	00:21	02:29	03:27	20:27	21:26	////
56°	01:23	02:48	03:39	20:15	21:07	22:34
54°	01:53	03:03	03:50	20:04	20:51	22:02
52°	02:16	03:17	04:00	19:54	20:38	21:39
50°	02:34	03:28	04:08	19:46	20:26	21:21
45°	03:07	03:52	04:26	19:27	20:02	20:47
N 40°	03:31	04:10	04:41	19:13	19:44	20:22
35°	03:50	04:25	04:53	19:00	19:28	20:03
30°	04:06	04:38	05:04	18:49	19:16	19:48
20°	04:30	04:59	05:22	18:31	18:55	19:23
N 10°	04:50	05:16	05:38	18:15	18:37	19:04
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:45	06:08	17:45	18:08	18:33
20°	05:33	06:00	06:23	17:30	17:53	18:20
30°	05:46	06:15	06:41	17:12	17:38	18:07
35°	05:53	06:24	06:51	17:02	17:29	18:00
40°	06:00	06:33	07:02	16:50	17:20	17:53
45°	06:08	06:44	07:16	16:37	17:09	17:45
S 50°	06:16	06:56	07:33	16:20	16:56	17:36
52°	06:20	07:02	07:40	16:12	16:50	17:32
54°	06:24	07:08	07:49	16:03	16:44	17:28
56°	06:29	07:15	07:59	15:54	16:37	17:24
58°	06:34	07:23	08:10	15:42	16:29	17:19
S 60°	06:39	07:32	08:23	15:30	16:20	17:13

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	14:19	16:18	18:29	02:40	02:09	01:35
N 70°	14:20	16:09	18:06	02:36	02:12	01:46
68°	14:20	16:02	17:50	02:33	02:15	01:56
66°	14:20	15:56	17:36	02:30	02:17	02:04
64°	14:20	15:51	17:25	02:28	02:19	02:10
62°	14:21	15:46	17:16	02:26	02:21	02:16
60°	14:21	15:43	17:08	02:24	02:23	02:21
N 58°	14:21	15:39	17:01	02:22	02:24	02:26
56°	14:21	15:37	16:55	02:21	02:25	02:30
54°	14:21	15:34	16:49	02:20	02:26	02:33
52°	14:21	15:32	16:44	02:18	02:27	02:37
50°	14:21	15:30	16:40	02:17	02:28	02:40
45°	14:21	15:25	16:30	02:15	02:30	02:46
N 40°	14:22	15:21	16:22	02:13	02:32	02:52
35°	14:22	15:18	16:15	02:11	02:34	02:57
30°	14:22	15:15	16:09	02:10	02:35	03:01
20°	14:22	15:10	15:59	02:07	02:37	03:08
N 10°	14:22	15:06	15:50	02:05	02:39	03:15
0°	14:22	15:02	15:42	02:02	02:41	03:21
S 10°	14:23	14:58	15:34	02:00	02:43	03:27
20°	14:23	14:53	15:25	01:57	02:45	03:34
30°	14:23	14:49	15:15	01:55	02:47	03:41
35°	14:23	14:46	15:10	01:53	02:49	03:45
40°	14:23	14:43	15:03	01:51	02:50	03:50
45°	14:24	14:39	14:56	01:49	02:52	03:56
S 50°	14:24	14:35	14:47	01:46	02:54	04:03
52°	14:24	14:33	14:43	01:45	02:55	04:06
54°	14:24	14:31	14:39	01:44	02:56	04:10
56°	14:24	14:29	14:34	01:42	02:57	04:14
58°	14:25	14:26	14:28	01:40	02:59	04:18
S 60°	14:25	14:23	14:22	01:39	03:00	04:23

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	73-88%
18	03:34	03:32	11:56	20:32	08:12	
19	03:31	03:29	11:57	21:11	08:51	
20	03:28	03:26	11:57	21:52	09:31	

h	Aries	` Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	239°7.65	184°47.49 N18°45.89	224°18.50 N05°0.23	182°21.37 N19°11.20	249°18.90 \$06°21.44
1	254° 10.12	199°46.82 46.70	239°19.21 0.96	197°23.23 11.33	264°21.21 21.38
2	269° 12.58	214°46.15 47.49	254°19.92 1.70	212°25.08 11.46	279°23.53 21.33
3	284° 15.05	229°45.48 · · 48.29	269°20.63 · · 2.44	227°26.94 · · 11.60	294°25.85 · · 21.28
4	299° 17.51	244°44.80 49.09	284°21.34 3.18	242°28.80 11.73	309°28.16 21.23
5	314° 19.98	259°44.13 49.89	299°22.05 3.91	257°30.65 11.86	324°30.48 21.17
6	329°22.44	274°43.46 N18°50.68	314°22.76 N05°4.65	272°32.51 N19°11.99	339°32.80 S06°21.12
7	344°24.90	289°42.78 51.48	329°23.47 5.39	287°34.36 12.12	354°35.11 21.07
8	359°27.37	304°42.11 52.27	344°24.18 6.13	302°36.22 12.25	9°37.43 21.02
9	14° 29.83	319°41.43 · · 53.07	359°24.89 · · 6.86	317°38.07 · · 12.38	24°39.75 · · 20.97
10	29°32.30	334°40.75 53.86	14°25.60 7.60	332°39.93 12.51	39°42.06 20.91
11	44°34.76	349°40.08 54.65	29°26.31 8.34	347°41.78 12.65	54°44.38 20.86
12	59°37.22	4°39.40 N18°55.44	44°27.02 N05°9.07	2°43.64 N19°12.78	69°46.70 S06°20.81
13	74°39.69	19°38.72 56.23	59°27.73 9.81	17°45.50 12.91	84°49.02 20.76
14	89° 42.15	34°38.04 57.02	74°28.44 10.55	32°47.35 13.04	99°51.33 20.71
15	104° 44.62	49°37.37 · · 57.81	89°29.15 · · 11.28	47°49.21 · · 13.17	114°53.65 · · 20.66
16	119° 47.08	64°36.69 58.60	104°29.86 12.02	62°51.06 13.30	129°55.97 20.60
17	134° 49.54	79°36.01 18°59.38	119°30.57 12.75	77°52.92 13.43	144°58.29 20.55
18	149° 52.01	94°35.33 N19°0.17	134°31.28 N05°13.49	92°54.77 N19°13.56	160°0.61 S06°20.50
19	164° 54.47	109°34.65 0.95	149°31.99 14.23	107°56.63 13.69	175°2.92 20.45
20	179° 56.94	124°33.97 1.74	164°32.70 14.96	122°58.49 13.82	190°5.24 20.40
21	194° 59.40	139°33.28 · · 2.52	179°33.41 · · 15.70	138° 0.34 · · 13.95	205°7.56 · · 20.35
22	210°1.87	154°32.60 3.30	194°34.12 16.43	153° 2.20 14.08	205 7.56 · · 20.35 220°9.88 20.29
23	210 1.87 225°4.33	169° 31.92 4.08	209° 34.83 17.17	168° 4.05 14.22	235°12.20 20.24
23	223 4.33	109 31.92 4.08		100 4.05 14.22	
Mer.p	bass. 08:02	ν -0.7 $'$ d0.8 $'$ m-3.92	$ u 0.7' \ d0.7' \ m1.07$	$\nu 1.9'~d0.1'~{\rm m} ext{-}2.00$	ν2.3′ d-0.1′ m1.05
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
vvea 0	240°6.79	184°31.24 N19°4.86	224°35.54 N05°17.90	183° 5.91 N19° 14.35	250°14.52 S06°20.19
1	240°6.79 255°9.26	184°31.24 N19°4.86 199°30.55 5.64	239°36.25 18.64	183°5.91 N19°14.35 198°7.76 14.48	265°16.84 20.14
2	255 9.26 270° 11.72	199°30.55 5.64 214°29.87 6.42	254°36.96 19.37	213° 9.62 14.48	280°19.16 20.14 280°19.16 20.09
3	270 11.72 285°14.19	229°29.18 · · 7.20	269° 37.67 · · · 20.11	213 9.02 14.01 228°11.47 · · 14.74	295°21.48 · · 20.04
3 4	300° 16.65	244°28.50 7.98	284°38.38 20.84	243°13.33 14.87	310°23.80 19.99
5	315° 19.11	259° 27.81 8.75	299°39.09 21.58	258°15.18 15.00	325°26.12 19.94
	315 19.11 330°21.58	274°27.13 N19°9.53	314°39.80 N05°22.31	273°17.04 N19°15.13	340°28.44 S06°19.89
6	345° 24.04	289° 26.44 10.30	329°40.51 23.04	288°18.90 15.26	
7 8	0°26.51				
	0 20.51 15°28.97		344°41.22 23.78 359°41.93 •• 24.51	303°20.75 15.39 318°22.61 · · 15.52	
9	30°31.43				
10		334°24.38 12.62	14° 42.64 25.25	333°24.46 15.65	40°37.72 19.68
11	45°33.90 60°36.36	349°23.69 13.39 4°23.00 N19°14.16	29°43.35 25.98 44°44.06 N05°26.71	348°26.32 15.78 3°28.17 N19°15.91	55°40.04 19.63 70°42.36 \$06°19.58
12					I
13	75°38.83 90°41.29		59°44.77 27.45 74°45.48 28.18	18°30.03 16.04	85°44.68 19.53 100°47.00 19.48
14				33°31.88 16.17	
15	105° 43.76	49°20.93 · · 16.46 64°20.24 17.23		48°33.74 · · 16.30	
16	120°46.22		104°46.90 29.65 119°47.61 30.38	63°35.59 16.43 78°37.45 16.56	130°51.64 19.38 145°53.96 19.33
17	135° 48.68				
18	150°51.15	94°18.86 N19°18.76	134°48.32 N05°31.11	93°39.31 N19°16.69	160°56.28 S06°19.28
19	165°53.61	109°18.17 19.52	149°49.03 31.85	108°41.16 16.82	175°58.61 19.23
20	180°56.08	124°17.48 20.28	164°49.74 32.58	123°43.02 16.95 138°44.87 •• 17.08	191°0.93 19.18 206°3.25 · · 19.13
21 22	195°58.54 211°1.00	139°16.78 · · 21.05	179°50.45 · · 33.31 194°51.16 34.05		
		154°16.09 21.81		153°46.73 17.21 168°48.58 17.34	
23	226°3.47	169°15.39 22.57	209°51.87 34.78	168°48.58 17.34	236°7.89 19.03
Mer.p	bass. 07:58	ν -0.7 $'$ d0.8 $'$ m-3.92	$ u 0.7' \ d0.7' \ m1.07$	$\nu 1.9'~d0.1'~{\rm m} ext{-}2.00$	ν2.3′ d-0.1′ m1.04
T I.	CUA	CHV D	CHV 2	CHV D	CHA
Thu	GHA 241°5.93	GHA Dec 184°14.70 N19°23.33	GHA Dec	GHA Dec 183°50.44 N19°17.47	GHA Dec
0			224°52.58 N05°35.51		251°10.22
1	256°8.40		239°53.29 36.24	198°52.29 17.60	266°12.54 18.93
2	271°10.86	214°13.31 24.84 229°12.61 •• 25.60	254°54.00 36.97	213°54.15 17.73	281°14.86 18.88
3	286°13.33		269°54.71 · · 37.71 284°55.42 38.44	228°56.00 · · 17.85	296°17.18 · · 18.83
4	301°15.79	244°11.92 26.35		243°57.86 17.98	311°19.51 18.78
5	316° 18.25	259°11.22 27.11	299°56.13 39.17	258°59.72 18.11	326°21.83 18.73
6	331°20.72	274°10.52 N19°27.86	314°56.84 N05°39.90	274°1.57 N19°18.24	341°24.15
7	346°23.18 1°25.65	289°9.82 28.61 304°9.13 29.37	329°57.55 40.63 344°58.26 41.36	289° 3.43 18.37 304° 5.28 18.50	356°26.48 18.64 11°28.80 18.59
8 9	1°25.65 16°28.11	304°9.13 29.37 319°8.43 · · 30.12	359°58.97 · · 42.10	304°5.28 18.50 319°7.14 · · 18.63	11°28.80 18.59 26°31.12 · · 18.54
	31° 30.57		14°59.68 42.83		
10 11	46° 33.04	334°7.73 30.87 349°7.03 31.62	30°0.39 43.56	334°8.99 18.76 349°10.85 18.89	41°33.45 18.49 56°35.77 18.44
12	46 33.04 61°35.50	4°6.33 N19°32.36	45°1.10 N05°44.29	4°12.70 N19°19.02	71°38.09 S06°18.39
13	76° 37.97	19°5.63 33.11	60°1.81 45.02	19°14.56 19.15	86°40.42 18.34
13 14	76 37.97 91°40.43	34°4.93 33.86	75°2.52 45.75	34°16.41 19.28	101°42.74 18.29
	91°40.43 106°42.90	49° 4.22 · · 34.60			101°42.74 18.29 116°45.07 · · 18.24
15 16					
16	121° 45.36	64°3.52 35.35	105°3.94 47.21	64°20.12 19.53	131°47.39 18.19
17	136° 47.82	79°2.82 36.09	120°4.65 47.94	79°21.98 19.66	146°49.71 18.15
18	151°50.29	94°2.12 N19°36.83	135°5.36 N05°48.67	94°23.83 N19°19.79	161°52.04 S06°18.10
19	166°52.75	109°1.41 37.58	150°6.07 49.40	109°25.69 19.92	176°54.36 18.05
20	181°55.22	124°0.71 38.32	165°6.78 50.13	124°27.55 20.05	191°56.69 18.00
21	196° 57.68	139°0.00 · · 39.06	180°7.49 · · 50.86	139°29.40 · · 20.18	206°59.01 · · 17.95
22 23	212°0.14	153° 59.30 39.80	195°8.20 51.59	154°31.26 20.31	222°1.34 17.90
23	227°2.61	168°58.59 40.53	210°8.91 52.32	169°33.11 20.44	237°3.67 17.85
Mer.	pass. 07:54	ν -0.7 $'$ d 0.8 $'$ m-3.92	$ u 0.7' \; d0.7' \; { m m} 1.07$	$ u 1.9' \ d0.1' \ \text{m-}2.00$	$\nu 2.3' \ d$ -0.0 $' \ m1.04$

	Stars	
	SHA	Dec
Alpheratz	357°35.54	29°13.27
Ankaa	353°7.92	-42°10.29
Schedar Diphda	349°32.06 348°48.06	56°39.98 -17°51.18
Achernar	335°21.05	-57°6.65
Hamal	327°52.14	23°34.52
Polaris	314°47.08	89°21.89
Acamar Menkar	315°12.60 314°7.05	-40°12.39 4°11.04
Mirfak	308°29.57	4 11.04 49°56.75
Aldebaran	290°40.60	16°33.45
Rigel	281°4.72	-8°10.46
Capella Bellatrix	280°23.17 278°23.79	46°1.36 6°22.27
Elnath	278° 23.19	28°37.67
Alnilam	275°38.60	$-1^{\circ}11.22$
Betelgeuse	270°52.99	7°24.67
Canopus	263°53.11 258°27.01	-52°42.63 -16°45.05
Sirius Adhara	258 27.01 255°6.59	-10 45.05 -29°0.42
Procyon	244°51.63	5°9.74
Pollux	$243^{\circ}18.21$	$27^{\circ}58.13$
Avior	234°15.29	-59°35.46
Suhail Miaplacidus	222°46.86 221°38.68	-43°32.06 -69°49.28
Alphard	221 36.06 217°48.37	-8°45.93
Regulus	207°35.04	11°50.93
Dubhe	193°41.50	61°37.46
Denebola Gienah	182°25.37 175°43.99	14°26.19 -17°40.76
Acrux	173 43.99 173°0.35	-63°14.30
Gacrux	171°51.94	-57°15.22
Alioth	166°13.05	55°49.84
Spica	158°22.64 152°52.01	-11°17.40 49°11.60
Alkaid Hadar	152 52.01 148°36.25	-60°29.59
Menkent	147°57.93	-36°29.53
Arcturus	145°48.11	19°3.32
Rigil Kent.	139°40.47	-60°56.29
Kochab Zuben'ubi	137°18.61 136°56.31	74°3.37 -16°8.67
Alphecca	126° 3.84	26°37.90
Antares	$112^{\circ}16.15$	-26°29.21
Atria	107°10.33	-69°4.22
Sabik Shaula	102°3.08 96°10.73	-15°45.35 -37°7.27
Rasalhague	95°58.74	12°32.41
Eltanin	$90^{\circ}41.96$	51°28.92
Kaus Aust.	83°32.91	-34°22.34
Vega Nunki	80°33.25 75°48.16	38°48.14 -26°15.96
Altair	62°0.30	8°55.81
Peacock	$53^{\circ}6.31$	-56°39.20
Deneb	49°26.01	45°21.71
Enif Al Na'ir	33°39.30 27°33.58	9°59.04 -46°50.41
Fomalhaut	27° 33.58 15° 15.19	-46°50.41 -29°29.52
Scheat	13°45.83	28°12.65
Markab	13°30.53	15°20.00
May 21 Tue	SHA	Mer.pass
Venus	$305^{\circ}39.84$	11:41
Mars	345°10.84	09:02
Jupiter Saturn	303°13.72 10°11.24	11:49 07:22
May 22 Wed Venus	SHA 304°24.44	Mer.pass 11:42
Mars	344°28.75	09:01
Jupiter	$302^{\circ}59.11$	11:46
Saturn	10°7.72	07:18
May 23 Thu	SHA	Mer.pass
Venus	303°8.77	11:44
Mars	343°46.65	09:00
Jupiter Saturn	302°44.51 10°4.28	11:43 07:14
		71.11
Horizon	tal parallax Venus:	0.1
	Mars:	0.1
		-

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.95	N20°14.55	31°1.64	15.1'	S 13°2.63	13.1'	54.8'
1	195°50.90	15.05	45°35.76	15.1'	13°15.77	13.1'	54.8'
2 3	210°50.86 225°50.82	15.55 •• 16.05	60°9.81 74°43.79	15.0' 14.9'	13°28.86 13°41.91	13.0' 13.0'	54.9' 54.9'
4	240°50.78	16.55	89°17.70	14.8'	13°54.91	13.0'	54.9'
5	255°50.73	17.05	103°51.53	14.8'	14°7.86	12.9'	54.9'
6	270°50.69	N20°17.55	118°25.29	14.7'	S14°20.77	12.9'	54.9'
7	285°50.65 300°50.60	18.05	132°58.98 147°32.58	14.6'	14°33.63	12.8'	55.0'
8 9	300°50.60 315°50.56	18.55 •• 19.05	147°32.58 162°6.11	14.5' 14.5'	14°46.44 14°59.20	12.8' 12.7'	55.0' 55.0'
10	330°50.51	19.55	176°39.56	14.4'	15°11.90	12.7'	55.0'
11	345°50.47	20.04	191°12.93	14.3'	$15^{\circ}24.55$	12.6'	55.0'
12	0°50.43	N20°20.54	205°46.23	14.2'	\$15°37.15	12.5'	55.0'
13 14	15°50.38 30°50.34	21.03 21.53	220°19.44 234°52.57	14.1' 14.0'	15°49.69 16°2.18	12.5' 12.4'	55.1' 55.1'
14 15	45°50.29	22.02	234 52.57 249°25.61	14.0'	16° 2.18	12.4'	55.1'
16	60°50.25	22.52	263°58.57	13.9'	16°26.97	12.3'	55.1'
17	75°50.20	23.01	278°31.45	13.8'	$16^{\circ}39.28$	12.2'	55.1'
18	90°50.15	N20°23.50	293°4.24	13.7'	\$16°51.53	12.2'	55.2'
19 20	105°50.11 120°50.06	23.99 24.48	307°36.95 322°9.57	13.6' 13.5'	17°3.71 17°15.83	12.1' 12.1'	55.2' 55.2'
21	135°50.01	• • 24.97	336°42.10	13.4'	17° 13.83	12.1	55.2'
22	150°49.97	25.46	351°14.54	13.4'	17°39.88	11.9'	55.2'
23	$165^{\circ}49.92$	25.95	5°46.89	13.3'	$17^{\circ}51.80$	11.9'	55.2'
	SD = 15.8'	d = 0.5'		SE	0 = 15.0'		
						,	
Wed 0	GHA 180°49.87	Dec N20°26.44	GHA 20° 19.16	u 13.2'	Dec 518° 3.66	<i>d</i> 11.8'	HP 55.3'
1	195°49.83	26.93	34°51.33	13.1'	18° 15.44	11.7'	55.3'
2	210°49.78	27.42	49°23.41	13.0'	18°27.16	11.6'	55.3'
3	225°49.73	• • 27.90	63°55.40	12.9'	18°38.80	11.6'	55.3'
4 5	240°49.68 255°49.63	28.39 28.87	78°27.29 92°59.10	12.8' 12.7'	18°50.36 19°1.86	11.5' 11.4'	55.3' 55.4'
6	270°49.59	N20°29.36	92 59.10 107°30.80	12.6'	S19°13.27	11.4	55.4'
7	285°49.54	29.84	122°2.42	12.5'	19°24.61	11.3'	55.4'
8	300°49.49	30.33	136°33.93	12.4'	19°35.87	11.2'	55.4'
9	315°49.44	• • 30.81	151°5.35	12.3'	19°47.05	11.1'	55.4'
10 11	330°49.39 345°49.34	31.29 31.77	165°36.68 180°7.91	12.2' 12.1'	19°58.15 20°9.17	11.0' 10.9'	55.5' 55.5'
12	0°49.29	N20°32.26	194°39.04	12.0'	S20°20.10	10.8	55.5'
13	15°49.24	32.74	$209^{\circ}10.07$	11.9'	$20^{\circ}30.95$	10.8'	55.5'
14	30°49.19	33.22	223°41.00	11.8'	20°41.71	10.7'	55.6'
15 16	45°49.14 60°49.09	· · 33.70 34.17	238°11.83 252°42.57	11.7' 11.6'	20°52.39 21°2.97	10.6' 10.5'	55.6' 55.6'
17	75°49.04	34.65	267°13.20	11.5'	21°13.46	10.4	55.6'
18	90°48.98	N20°35.13	281°43.74	11.4'	S21°23.86	10.3'	55.6'
19	105°48.93	35.61	296°14.17	11.3'	21°34.17	10.2'	55.7'
20	120°48.88 135°48.83	36.08 •• 36.56	310°44.51 325°14.74	11.2' 11.1'	21°44.39 21°54.50	10.1' 10.0'	55.7' 55.7'
21 22	150°48.78	37.03	339°44.87	11.1	21 54.50 22°4.52	9.9'	55.7'
23	165°48.72	37.51	354°14.90	10.9'	22°14.45	9.8'	55.7'
	SD = 15.8'	d = 0.5'		SE	0 = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
1 nu 0	GПА 180°48.67	N20°37.98	в° 44.83	ν 10.8'	S22°24.27	a 9.7'	пР 55.8'
1	195°48.62	38.46	$23^{\circ}14.65$	10.7'	22°33.99	9.6'	55.8'
2	210°48.57	38.93	37°44.38	10.6'	22°43.60	9.5'	55.8'
3 4	225°48.51 240°48.46	· · 39.40 39.87	52°14.00 66°43.52	10.5' 10.4'	22°53.12 23°2.52	9.4' 9.3'	55.8' 55.8'
4 5	240 48.46 255°48.41	39.87 40.34	81°12.93	10.4	23 2.52 23°11.82	9.3 9.2'	55.8'
6	270°48.35	N20°40.81	95°42.25	10.2'	S23°21.01	9.1'	55.9'
7	285°48.30	41.28	110°11.46	10.1'	23°30.09	9.0'	55.9'
8	300°48.24 315°48.19	41.75	124°40.57 139°9.58	10.0'	23°39.06 23°47.92	8.9'	55.9'
9 10	315°48.19 330°48.13	· · 42.22 42.69	139°9.58 153°38.49	9.9' 9.8'	23°47.92 23°56.66	8.7' 8.6'	56.0' 56.0'
11	345°48.08	43.16	168°7.30	9.7'	24°5.29	8.5	56.0'
12	0°48.02	N20°43.62	182°36.00	9.6'	S24°13.80	8.4'	56.0'
13	15°47.97	44.09	197°4.60	9.5'	24°22.19	8.3'	56.0'
14 15	30°47.91 45°47.86	44.55 •• 45.02	211°33.11 226°1.51	9.4' 9.3'	24°30.47 24°38.62	8.2' 8.0'	56.1' 56.1'
16	60°47.80	45.48	240°29.81	9.3 9.2'	24 36.02 24°46.65	6.0 7.9'	56.1
17	75°47.74	45.94	254°58.01	9.1'	24°54.55	7.8'	56.1
18	90°47.69	N20°46.41	269°26.12	9.0'	\$25°2.34	7.7'	56.2'
19	105°47.63 120°47.57	46.87	283°54.12 298°22.03	8.9'	25°9.99 25°17.52	7.5'	56.2'
20 21	120°47.57 135°47.52	47.33 •• 47.79	298°22.03 312°49.84	8.8' 8.7'	25°17.52 25°24.91	7.4' 7.3'	56.2' 56.2'
22	150°47.46	48.25	327°17.55	8.6'	25°32.18	7.3 7.1'	56.2
23	165°47.40	48.71	341°45.17	8.5'	25°39.31	7.0'	56.3'
	SD = 15.8'	d = 0.5'	-	SE	0 = 15.2'		
			-				

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:58	23:03	////	////
66°	////	////	01:52	22:05	////	////
64°	////	////	02:24	21:32	////	////
62°	////	01:17	02:48	21:08	22:41	////
60°	////	01:55	03:06	20:49	22:01	////
N 58°	////	02:21	03:22	20:33	21:34	////
56°	01:10	02:41	03:35	20:20	21:14	22:48
54°	01:45	02:58	03:46	20:09	20:57	22:11
52°	02:09	03:12	03:56	19:58	20:43	21:46
50°	02:28	03:24	04:05	19:49	20:31	21:27
45°	03:03	03:48	04:24	19:30	20:06	20:51
N 40°	03:28	04:07	04:39	19:15	19:47	20:26
35°	03:48	04:23	04:52	19:02	19:31	20:06
30°	04:04	04:36	05:03	18:51	19:18	19:50
20°	04:29	04:58	05:22	18:32	18:56	19:24
N 10°	04:49	05:15	05:38	18:16	18:38	19:05
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:46	06:08	17:45	18:08	18:33
20°	05:34	06:01	06:24	17:29	17:53	18:20
30°	05:47	06:17	06:42	17:11	17:37	18:06
35°	05:55	06:26	06:53	17:00	17:28	17:59
40°	06:02	06:35	07:05	16:48	17:18	17:51
45°	06:10	06:47	07:19	16:34	17:06	17:43
S 50°	06:20	07:00	07:36	16:17	16:53	17:33
52°	06:24	07:06	07:45	16:08	16:47	17:29
54°	06:28	07:13	07:54	15:59	16:40	17:25
56°	06:33	07:20	08:04	15:49	16:33	17:20
58°	06:38	07:28	08:16	15:37	16:25	17:15
S 60°	06:44	07:37	08:29	15:24	16:16	17:09
	I					

Lat.		Moonris	е		Moonset	t
Ldl.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	21:56			00:50 22:55		_
N 70°	20:32			01:14	00:20	
68°	19:54			01:33	01:00	_
66°	19:27	21:45		01:48	01:27	00:48
64°	19:07	21:03	23:50	02:01	01:49	01:31
62°	18:51	20:35	22:32	02:11	02:06	02:00
60°	18:38	20:14	21:56	02:20	02:20	02:22
N 58°	18:26	19:57	21:30	02:28	02:32	02:40
56°	18:16	19:42	21:10	02:35	02:43	02:55
54°	18:08	19:29	20:53	02:42	02:53	03:08
52°	18:00	19:18	20:38	02:48	03:01	03:20
50°	17:53	19:09	20:26	02:53	03:09	03:30
45°	17:38	18:48	20:00	03:04	03:25	03:51
N 40°	17:26	18:32	19:40	03:14	03:39	04:09
35°	17:15	18:18	19:23	03:22	03:50	04:24
30°	17:06	18:06	19:08	03:29	04:00	04:37
20°	16:51	17:46	18:44	03:41	04:18	04:59
N 10°	16:38	17:28	18:23	03:52	04:33	05:18
0°	16:25	17:12	18:03	04:02	04:47	05:36
S 10°	16:13	16:56	17:43	04:13	05:02	05:54
20°	16:00	16:39	17:22	04:24	05:17	06:13
30°	15:45	16:19	16:58	04:37	05:35	06:36
35°	15:36	16:07	16:44	04:44	05:45	06:49
40°	15:27	15:54	16:28	04:52	05:57	07:04
45°	15:15	15:39	16:09	05:02	06:11	07:23
S 50°	15:02	15:20	15:45	05:14	06:29	07:46
52°	14:55	15:11	15:34	05:20	06:37	07:57
54°	14:48	15:02	15:21	05:26	06:46	08:09
56°	14:41	14:50	15:06	05:33	06:57	08:23
58°	14:32	14:38	14:48	05:41	07:09	08:40
S 60°	14:22	14:23	14:27	05:50	07:23	09:01

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-100%
21	03:24	03:22	11:57	22:36	10:14	
22	03:19	03:17	11:57	23:24	10:59	
23	03:15	03:12	11:57	-:-	11:49	

h	Aries	Venu		M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	242°5.07		V19°41.27	225°9.62	N05°53.05	184°34.97	N19°20.56	252°5.99	S06° 17.81			
1	257°7.54	198°57.18	42.01	240°10.33	53.78	199°36.82	20.69	267°8.32	17.76	Alpheratz	357°35.51	29°13.28
2	272° 10.00	213°56.47	42.74	255°11.04	54.51	214°38.68	20.82	282°10.64	17.71	Ankaa	353°7.90	-42°10.28
3	$287^{\circ}12.47$	228°55.77	• • 43.48	$270^{\circ}11.75$	• • 55.24	229°40.53	• • 20.95	297°12.97	• • 17.66	Schedar	349°32.03	56°39.98
4	$302^{\circ}14.93$	243°55.06	44.21	285°12.46	55.97	244°42.39	21.08	312°15.29	17.61	Diphda	348°48.04 335°21.03	-17°51.16 -57°6.63
5	$317^{\circ}17.39$	258° 54.35	44.94	300°13.16	56.69	259°44.24	21.21	327°17.62	17.56	Achernar Hamal	327°52.12	-37 0.03 23°34.52
6	$332^{\circ}19.86$		<mark>V</mark> 19°45.68	$315^{\circ}13.87$	N05°57.42	274°46.10	N19°21.33	342°19.95	S06°17.52	Polaris	314°46.22	89°21.88
7	347°22.32	288°52.93	46.41	330° 14.58	58.15	289°47.95	21.46	357°22.27	17.47	Acamar	315°12.58	-40°12.37
8	2°24.79	303°52.22	47.14	345° 15.29	58.88	304°49.81	21.59	12°24.60	17.42	Menkar	314°7.03	4°11.05
9	17° 27.25	318°51.51	• • 47.87	0°16.00	05°59.61	319°51.66	• • 21.72	27°26.93	• • 17.37	Mirfak	308° 29.54	49°56.74
10	32°29.72	333°50.80	48.59	15° 16.71	06°0.34	334°53.52	21.85	42°29.25	17.33	Aldebaran	290°40.59	16°33.45
11	47°32.18	348°50.09	49.32	30° 17.42	1.06	349°55.38	21.98	57°31.58	17.28	Rigel	281°4.72	-8°10.45
12	62°34.64		V19°50.05	45°18.13	N06° 1.79	4°57.23	N19°22.10	72°33.91	506° 17.23	Capella	280°23.16	46°1.35
13	77° 37.11 92° 39.57	18°48.67 33°47.95	50.77	60° 18.84 75° 19.55	2.52	19°59.09 35°0.94	22.23	87°36.23 102°38.56	17.18	Bellatrix	278°23.79	6°22.27
14 15	92 39.57 107° 42.04		51.50 •• 52.22	90°20.26	3.25 •• 3.98	50°2.80	22.36 •• 22.49	102 36.50 117°40.89	17.13 •• 17.09	Elnath	278°2.92	28°37.67
16	107 42.04 122° 44.50	63°46.53	52.24	105°20.97	4.70	65° 4.65	22.62	132°43.22	17.09	Alnilam	275°38.60	$-1^{\circ}11.22$
17	137° 46.96	78°45.81	53.66	120°21.68	5.43	80° 6.51	22.74	147°45.54	16.99	Betelgeuse	270°52.98	7°24.67
18	152° 49.43		V19°54.39	135°22.39	N06° 6.16	95°8.36	N19°22.87	162°47.87	S06° 16.95	Canopus	263°53.12	-52°42.62
19	167°51.89	108° 44.38	55.11	150°23.10	6.88	110°10.22	23.00	177°50.20	16.90	Sirius	258° 27.01	-16°45.04
20	182°54.36	123°43.67	55.82	165°23.81	7.61	125°12.07	23.13	192°52.53	16.85	Adhara	255°6.59	-29°0.41
21	197°56.82		• • 56.54	180°24.52	• • 8.34	140°13.93	23.26	207°54.86	• • 16.80	Procyon	244°51.63	5°9.74
22	212°59.29	153°42.23	57.26	195°25.23	9.06	155°15.78	23.38	222°57.19	16.76	Pollux	243°18.21	27°58.12
23	228°1.75	168°41.52	57.98	210°25.94	9.79	170°17.64	23.51	237°59.51	16.71	Avior	234° 15.31	-59°35.46
		ν-0.7' d0.7'		-				$\nu 2.3' \ d-0$		Suhail	222°46.87 221°38.72	-43°32.06 -69°49.28
ivier.	pass. 07:50	ν -0.7 d0.7	m-3.92	ν 0.7 au	.7′ m1.06	ν 1.9° a 0.	.1′ m-2.00	ν 2.3 a-0	.0' m1.04	Miaplacidus		
										Alphard Regulus	217°48.38 207°35.04	-8°45.92 11°50.93
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.52	61°37.46
0	243°4.21		<mark>V</mark> 19°58.69	225°26.65	N06°10.52	185°19.49	N19°23.64	253°1.84	S 06°16.66	Dubne	193 41.52 182°25.38	14°26.20
1	258°6.68	198°40.08	19°59.40	240°27.36	11.24	200°21.35	23.77	268°4.17	16.62	Gienah	175°43.99	-17°40.76
2	273°9.14	213°39.36	20°0.12	255°28.06	11.97	215°23.20	23.89	283°6.50	16.57	Acrux	173°0.36	-63°14.31
3	288° 11.61	228° 38.64	• • 0.83	270°28.77	• • 12.70	230°25.06	• • 24.02	298°8.83	• • 16.52	Gacrux		-57°15.23
4	303° 14.07	243°37.92	1.54	285°29.48	13.42	245°26.92	24.15	313°11.16	16.48	Alioth	166° 13.06	55°49.85
5	318° 16.54	258° 37.20	2.25	300°30.19	14.15	260°28.77	24.28	328°13.49	16.43	Spica	158°22.64	-11°17.40
6	333° 19.00		N20°2.96	315°30.90	N06°14.87	275°30.63	N19°24.40	343°15.82	S06°16.38	Alkaid	152°52.02	49°11.61
7	348°21.46	288° 35.76	3.67	330°31.61	15.60	290°32.48	24.53	358°18.15	16.34	Hadar	148°36.25	-60°29.60
8	3°23.93	303°35.04	4.38	345°32.32	16.32	305°34.34	24.66	13°20.48	16.29	Menkent	147°57.93	-36°29.53
9	18°26.39	318°34.32 333°33.60	5.08	0°33.03 15°33.74	•• 17.05	320°36.19	• • 24.79	28°22.81	16.24	Arcturus	$145^{\circ}48.11$	19° 3.33
10 11	33°28.86 48°31.32	348°32.88	5.79 6.49	30°34.45	17.77 18.50	335°38.05 350°39.90	24.91 25.04	43°25.14 58°27.47	16.20 16.15	Rigil Kent.	139°40.47	-60°56.30
12	63° 33.78		N20°7.20	45°35.16	N06°19.22	5°41.76	25.04 N19°25.17	73°29.80	506° 16.10	Kochab	137° 18.63	74°3.38
13	78° 36.25	18°31.43	7.90	60°35.87	19.95	20°43.61	25.29	88°32.13	16.06	Zuben'ubi	136°56.30	-16°8.67
14	93°38.71	33°30.71	8.60	75°36.58	20.67	35°45.47	25.42	103°34.46	16.00	Alphecca	126°3.83	26°37.92
15	108°41.18	48° 29.98	• • 9.30	90°37.29	• • 21.40	50°47.32	• • 25.55	118°36.79	. 15.97	Antares	112°16.13	-26°29.21
16	123° 43.64	63°29.26	10.00	105°37.99	22.12	65°49.18	25.68	133°39.12	15.92	Atria	107°10.30	-69°4.23
17	138°46.11	78° 28.53	10.70	120°38.70	22.84	80°51.03	25.80	148°41.45	15.87	Sabik	102°3.07	-15°45.35
18	153°48.57	93°27.80	V20°11.40	135°39.41	N06°23.57	95°52.89	N19°25.93	163°43.78	S06° 15.83	Shaula	96° 10.71 95° 58.73	-37°7.27 12°32.43
19	$168^{\circ}51.03$	108°27.08	12.10	150°40.12	24.29	110°54.74	26.06	178°46.12	15.78	Rasalhague Eltanin	90°41.94	51°28.93
20	183°53.50	123°26.35	12.80	165°40.83	25.02	125°56.60	26.18	193°48.45	15.74	Kaus Aust.	83°32.88	-34°22.34
21	$198^{\circ}55.96$		• • 13.49	180°41.54	• • 25.74	140°58.46	• • 26.31	208°50.78	•• 15.69	Vega	80°33.23	38°48.16
22	213°58.43	153°24.90	14.18	195°42.25	26.46	156° 0.31	26.44	223°53.11	15.65	Nunki	75°48.14	-26°15.96
23	229°0.89	168°24.17	14.88	210°42.96	27.19	171°2.17	26.56	238°55.44	15.60	Altair	62°0.28	8°55.83
Mer	pass. 07:46	ν -0.7' d0.7'	′ m-3 92	$\nu 0.7' d0$.7′ m1.06	$\nu 1.9' d0$.1′ m-2.00	$\nu 2.3' d-0$.0′ m1.04	Peacock	53°6.27	-56°39.20
										Deneb	49°25.98	45°21.73
_			_		_		_		_	Enif	33°39.28	9°59.05
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}33.55$	-46°50.40
0	244°3.36		N20°15.57	225°43.67	N06°27.91	186° 4.02	N19°26.69	253°57.77		Fomalhaut	15° 15.16	-29°29.50
1	259°5.82	198°22.71	16.26	240°44.38	28.63	201°5.88	26.82	269°0.11	15.51 15.46	Scheat	13°45.81	28°12.66
2	274°8.28 289°10.75	213°21.98 228°21.25	16.95 •• 17.64	255° 45.09 270° 45.79	29.36 •• 30.08	216°7.73 231°9.59	26.94 •• 27.07	284°2.44 299°4.77	15.46 •• 15.42	Markab	13°30.51	15°20.01
3 4	304° 13.21	243° 20.52	18.33	270 45.79 285°46.50	30.80	231 9.59 246°11.44	27.20	299 4.77 314°7.10	15.42	May 24 Fri	SHA	Mer.pass
5	319° 15.68	258° 19.79	19.02	300° 47.21	31.52	261°13.30	27.32	329° 9.44	15.37	Venus		11:45
6	334° 18.14		V20°19.71	315° 47.92	N06°32.25	276° 15.15	N19°27.45	344°11.77	506° 15.28	Mars	343°4.54	08:59
7	349° 20.61	288° 18.32	20.39	330°48.63	32.97	291°17.01	27.58	359°14.10	15.24	Jupiter		11:40
8	4°23.07	303° 17.59	21.08	345°49.34	33.69	306°18.86	27.70	14°16.44	15.19	Saturn	10°0.92	07:10
9	19° 25.53	318° 16.86	• • 21.76	0°50.05	• • 34.41	321°20.72	• • 27.83	29°18.77	• 15.15			
10	34°28.00	333°16.13	22.44	15°50.76	35.13	336°22.57	27.96	44°21.10	15.10	May 25 Sat	SHA	Mer.pass
11	49°30.46	348°15.39	23.13	$30^{\circ}51.47$	35.86	351°24.43	28.08	59°23.44	15.06		300°36.58	11:46
12	64°32.93		V20°23.81	45°52.17	N06°36.58	6°26.28	N19°28.21	74°25.77	S06°15.01		342°22.43 302°15.28	08:58 11:37
13	79° 35.39	18° 13.92	24.49	60°52.88	37.30	21°28.14	28.33	89°28.10	14.97	Saturn	9°57.63	07:07
14	94° 37.85	33°13.19	25.17	75°53.59	38.02	36°30.00	28.46	104°30.44	14.92	Jatuill	2 21.03	01.01
15	109°40.32	48° 12.45	• • 25.84	90°54.30	• • 38.74	51°31.85	• • 28.59	119°32.77	• • 14.88	May 26 Sun	SHA	Mer.pass
16	124° 42.78	63°11.71	26.52	105°55.01	39.46	66°33.71	28.71	134°35.11	14.83	Venus		11:47
17	139° 45.25	78° 10.98	27.20	120°55.72	40.18	81°35.56	28.84	149°37.44	14.79	1	341°40.31	08:57
18	154° 47.71		N20°27.87	135°56.43	N06°40.90	96°37.42	N19°28.96	164°39.78	\$06° 14.75	Jupiter	302°0.67	11:34
19	169°50.18	108°9.50	28.55	150°57.14	41.62	111°39.27	29.09	179°42.11	14.70	Saturn	9°54.42	07:03
20	184° 52.64 199° 55.10	123°8.77 138°8.03	29.22	165° 57.85 180° 58.55	42.35 •• 43.07	126°41.13 141°42.98	29.22 •• 29.34	194°44.44 209°46.78	14.66	Horizor	ıtal parallax	
21 22	199 55.10 214° 57.57	158 8.03 153°7.29	30.56	180 58.55 195°59.26	43.07	141 42.98 156°44.84	29.47	209 46.78 224°49.11	· · 14.61 14.57		Venus:	0.1
23	230°0.03	168°6.55	31.23	210° 59.97	44.51	171°46.69	29.47	239°51.45	14.57		Mars:	0.1
Mer.	pass. 07:43	ν -0.7' d 0.7'	′ m-3.92	$ u$ 0.7 $^{\prime}$ d0	.7′ m1.06	ν 1.9′ d0.	.1′ m-2.00	ν 2.3′ d-0	.0′ m1.03			

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.34	N20°49.17	$356^{\circ}12.69$	8.4'	\$25°46.32	6.9'	56.3'
1	195°47.28	49.63	10°40.11	8.3'	25°53.18	6.7'	56.3'
2	210°47.23 225°47.17	50.09 •• 50.54	25°7.45 39°34.68	8.2' 8.1'	25°59.91 26°6.51	6.6' 6.5'	56.3' 56.3'
4	240°47.11	51.00	54°1.83	8.1'	26° 12.96	6.3	56.4'
5	255°47.05	51.46	68°28.89	8.0'	26° 19.28	6.2	56.4'
6	270°46.99	N20°51.91	82°55.85	7.9'	\$26°25.45	6.0'	56.4'
7	285°46.93	52.37	97°22.73	7.8'	26°31.49	5.9'	56.4'
8 9	300°46.87 315°46.81	52.82 •• 53.27	111°49.51 126°16.21	7.7' 7.6'	26°37.38 26°43.12	5.7' 5.6'	56.5' 56.5'
10	330°46.75	53.73	140°42.83	7.5	26°48.72	5.5'	56.5
11	345°46.69	54.18	155°9.36	7.4'	$26^{\circ}54.17$	5.3'	56.5'
12	0°46.63	N20°54.63	169°35.80	7.4'	\$26°59.47	5.2'	56.5'
13 14	15°46.57 30°46.51	55.08 55.53	184°2.16 198°28.45	7.3' 7.2'	27°4.63 27°9.63	5.0' 4.9'	56.6' 56.6'
15	45°46.45	55.98	212°54.65	7.1'	27 9.03 27°14.48	4.9 4.7'	56.6'
16	60°46.39	56.43	227°20.77	7.0'	27° 19.18	4.5'	56.6'
17	75°46.33	56.88	241°46.82	7.0'	$27^{\circ}23.73$	4.4'	56.6'
18	90°46.26	N20°57.33	256°12.79	6.9'	\$27°28.12	4.2'	56.7'
19	105°46.20 120°46.14	57.78	270°38.69 285°4.51	6.8'	27°32.35 27°36.43	4.1'	56.7'
20 21	120°46.14 135°46.08	58.22 •• 58.67	285°4.51 299°30.26	6.8' 6.7'	27° 36.43 27° 40.34	3.9' 3.8'	56.7' 56.7'
22	150°46.01	59.11	313°55.95	6.6'	27°44.10	3.6'	56.8'
23	165°45.95	59.56	328°21.56	6.6'	27°47.70	3.4'	56.8'
	SD = 15.8'	d = 0.5'		SI	D = 15.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	180°45.89	N21°0.00	342°47.12	6.5'	\$27°51.14	3.3'	56.8'
1	195°45.82 210°45.76	0.45	357°12.60 11°38.03	6.4'	27°54.42 27°57.53	3.1'	56.8'
2	210°45.76 225°45.70	0.89 •• 1.33	26°3.39	6.4' 6.3'	27°57.53 28°0.48	2.9' 2.8'	56.8' 56.9'
4	240°45.63	1.77	40°28.69	6.2'	28°3.26	2.6'	56.9'
5	255°45.57	2.21	54°53.94	6.2'	28°5.88	2.5'	56.9'
6	270°45.51	N21°2.65	69°19.13	6.1'	\$28°8.34	2.3'	56.9'
7	285°45.44 300°45.38	3.09	83°44.27 98°9.36	6.1'	28° 10.62 28° 12.74	2.1'	56.9'
8 9	300°45.38 315°45.31	3.53 · · 3.97	98°9.36 112°34.39	6.0' 6.0'	28° 12.74 28° 14.69	2.0' 1.8'	57.0' 57.0'
10	330°45.25	4.41	126°59.38	5.9'	28° 16.47	1.6'	57.0'
11	345°45.18	4.85	141°24.33	5.9'	28° 18.08	1.4'	57.0'
12	0°45.11	N21°5.28	155°49.23	5.9'	\$28° 19.52	1.3'	57.1'
13 14	15°45.05 30°44.98	5.72 6.15	170°14.09 184°38.91	5.8' 5.8'	28°20.79 28°21.89	1.1'	57.1' 57.1'
15	45°44.92	. 6.59	199°3.69	5.0 5.7'	26 21.69 28°22.82	0.9' 0.8'	57.1'
16	60°44.85	7.02	213°28.44	5.7'	28° 23.57	0.6'	57.1'
17	75°44.78	7.46	$227^{\circ}53.16$	5.7'	$28^{\circ}24.15$	0.4'	57.2'
18	90°44.72 105°44.65	N21°7.89	242°17.84	5.7'	\$28° 24.56 28° 24.79	0.2'	57.2'
19 20	105 44.65 120°44.58	8.32 8.75	256°42.50 271°7.13	5.6' 5.6'	28°24.79	0.1' -0.1'	57.2' 57.2'
21	135°44.51	• • 9.18	285°31.73	5.6'	28° 24.73	-0.1	57.2'
22	150°44.45	9.61	299°56.32	5.6'	28° 24.44	-0.5'	57.3'
23	165°44.38	10.04	314°20.88	5.5'	28°23.98	-0.6'	57.3'
	SD = 15.8'	d = 0.4'		SI	O = 15.5'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°44.31 195°44.24	N21°10.47 10.90	328°45.42 343°9.95	5.5' 5.5'	\$28°23.33 28°22.51	-0.8' -1.0'	57.3' 57.3'
2	195 44.24 210° 44.17	10.90	343°9.95 357°34.47	5.5'	28° 22.51 28° 21.52	-1.0 -1.2'	57.3'
3	225°44.10	11.76	11°58.97	5.5'	28°20.35	-1.3	57.4
4	240°44.03	12.18	26°23.47	5.5'	28° 19.00	-1.5'	57.4'
5	255°43.97 270°43.90	12.61	40°47.96	5.5'	28° 17.48	-1.7'	57.4'
6 7	270°43.90 285°43.83	N21°13.03 13.46	55°12.44 69°36.93	5.5' 5.5'	\$28° 15.78 28° 13.91	-1.9' -2.1'	57.4' 57.4'
8	300°43.76	13.40	84°1.41	5.5'	28° 11.85	-2.1	57.5'
9	315°43.69	• • 14.30	98°25.89	5.5'	28°9.63	-2.4'	57.5'
10	330°43.62	14.73	112°50.38	5.5'	28°7.22	-2.6'	57.5'
11 12	345°43.55 0°43.47	15.15 N21°15.57	127°14.87 141°39.37	5.5' 5.5'	28°4.64 \$28°1.88	-2.8' -2.9'	57.5' 57.5'
13	15°43.40	15.99	141 39.37 156°3.89	5.5'	27°58.95	-2.9 -3.1'	57.6'
14	30°43.33	16.41	170°28.41	5.5'	27°55.84	-3.3'	57.6'
15	45°43.26	• • 16.83	184°52.95	5.6'	27°52.56	-3.5'	57.6'
16	60°43.19 75°43.12	17.25 17.67	199°17.51 213°42.08	5.6' 5.6'	27°49.10 27°45.47	-3.6'	57.6'
17 18	75°43.12 90°43.05	17.67 N21°18.09	213°42.08 228°6.68	5.6'	\$27°45.47 \$27°41.66	-3.8' -4.0'	57.6' 57.7'
19	105°42.97	18.50	242°31.30	5.6'	27°37.67	-4.0 -4.2'	57.7'
20	120°42.90	18.92	256°55.94	5.7'	27°33.52	-4.3'	57.7'
21	135°42.83	• • 19.33	271°20.61	5.7'	27°29.19	-4.5'	57.7'
22 23	150°42.76 165°42.68	19.75 20.16	285°45.31 300°10.04	5.7' 5.8'	27°24.69 27°20.01	-4.7' -4.8'	57.7' 57.8'
23	SD = 15.8'	d = 0.4'			D = 15.6'	-7.0	31.0
	3D = 13.0	u = 0.4		ા	J — 13.0		

			2024 [May 24	to May	y. 26 l
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Tw i	i light Naut.
N 72°	INAUL.	CIVII			CIVII	Naut.
N 70°						
68°		////	00.26		////	////
66°	'////	////	00:26 01:40	22:18	////	////
64°	11111	////	02:15	21:41	////	////
62°	17777	01:01	02:41	21:15	22:58	7777
60°	////	01:46	03:00	20:55	22:11	////
N 58°	////	02:14	03:16	20:39	21:42	////
56°	00:56	02:36	03:30	20:25	21:20	23:03
54°	01:36	02:53	03:42	20:13	21:02	22:20
52°	02:03	03:08	03:52	20:02	20:48	21:53
50°	02:23	03:20	04:02	19:53	20:35	21:33
45°	02:59	03:45	04:21	19:34	20:09	20:55
N 40°	03:26	04:05	04:37	19:18	19:49	20:29
35° 30°	03:46	04:21	04:50	19:04	19:33	20:09
30° 20°	04:02 04:28	04:35 04:57	05:01 05:21	18:53 18:33	19:20 18:57	19:52 19:26
N 10°	04:28	04:57	05:21	18:16	18:39	19:20
0°	05:05	05:31	05:53	18:01	18:23	18:49
S 10°	05:21	05:46	06:09	17:45	18:07	18:33
20°	05:35	06:02	06:25	17:29	17:52	18:19
30°	05:49	06:18	06:44	17:10	17:35	18:05
35°	05:56	06:27	06:55	16:59	17:26	17:57
40°	06:04	06:38	07:07	16:46	17:16	17:49
45°	06:13	06:49	07:22	16:32	17:04	17:41
S 50°	06:23	07:03	07:40	16:14	16:51	17:31
52°	06:27	07:09	07:48	16:05	16:44	17:27
54° 56°	06:32	07:16	07:58	15:56	16:37	17:22
50°	06:37 06:42	07:24 07:32	08:09 08:21	15:45 15:33	16:30 16:21	17:17 17:11
S 60°	06:48	07:42	08:35	15:19	16:11	17:05
		Moonris	se		Moonse	t
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°		_				
68°						
66°						
64°				00:32		
62°				01:51		
60°	23:35		00:47	02:27	02:44	03:34
N 58°	22:59		00:07	02:53	03:21	04:15
56° 54°	22:32	23:39		03:14	03:47	04:43
54° 52°	22:12 21:54	23:17 22:59	23:48	03:31 03:46	04:08 04:26	05:04 05:22
50°	21:40	22:44	23:34	03:59	04:20	05:22
45°	21:10	22:13	23:05	04:26	05:11	06:08
N 40°	20:47	21:49	22:42	04:47	05:34	06:32
35°	20:28	21:29	22:24	05:04	05:54	06:52
30°	20:11	21:12	22:08	05:20	06:10	07:09
20°	19:44	20:43	21:40	05:46	06:39	07:37
N 10°	19:20	20:19	21:17	06:08	07:03	08:02
0°	18:58	19:56	20:55	06:29	07:25	08:24
S 10°	18:36	19:33	20:33	06:50	07:48	08:47
20°	18:13	19:09	20:10	07:12	08:12	09:11
30°	17:45	18:40	19:42	07:38	08:41	09:39
35° 40°	17:29 17:11	18:23 18:04	19:26 19:07	07:54 08:12	08:57 09:17	09:56 10:15
40 45°	16:49	18:04 17:40	19:07	08:12	09:17	10:15
73	10.49	11.40	10.44	00.54	09.40	10.50

70	11.11	10.04	19.01	00.12	05.11	10.13
45°	16:49	17:40	18:44	08:34	09:40	10:38
S 50°	16:20	17:09	18:15	09:01	10:11	11:08
52°	16:06	16:54	18:00	09:15	10:26	11:23
54°	15:50	16:37	17:43	09:31	10:44	11:40
56°	15:32	16:15	17:23	09:49	11:05	12:00
58°	15:08	15:48	16:58	10:12	11:32	12:26
S 60°	14:38	15:10	16:23	10:42	12:10	13:01
	l	Sun		1	Moon	
		Sun			Moon	
Dav	Eqn.of	Sun Time	Mer.	Mer.		Age
Day	Eqn.of 00 ^h		Mer. Pass	Mer. Upper		Age 16-18
Day		Time			Pass.	
Day 24	oo ^h	Time 12 ^h	Pass	Upper	Pass. Lower	16-18
	00 ^h mm:ss	Time 12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Pass. Lower hh:mm	16-18
24	00 ^h mm:ss 03:09	Time 12 ^h mm:ss	Pass hh:mm 11:57	Upper hh:mm 00:16	Pass. Lower hh:mm	16-18

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	245°2.50	183°5.81 N20°31.90	226°0.68 N06°45.23	186°48.55 N19°29.72	254°53.79 \$06°14.48
1	260°4.96	198°5.07 32.57	241°1.39 45.95	201°50.40 29.85	269°56.12 14.44
2	275°7.43	213°4.33 33.24	256°2.10 46.67	216°52.26 29.97	284°58.46 14.39
3	290°9.89	228°3.59 · · 33.91	271°2.81 · · 47.38	231°54.11 · · 30.10	300°0.79 · · 14.35
4	$305^{\circ}12.35$	243°2.84 34.57	286°3.51 48.10	246°55.97 30.22	315°3.13 14.31
5	320° 14.82	258°2.10 35.24	301°4.22 48.82	261°57.83 30.35	330°5.46 14.26
6	335° 17.28	273°1.36 N20°35.90	316°4.93 N06°49.54	276°59.68 N19°30.47	345°7.80 S 06°14.22
7	350° 19.75	288°0.62 36.56	331°5.64 50.26	292°1.54 30.60	0°10.14 14.17
8	5°22.21	302°59.87 37.22	346°6.35 50.98	307°3.39 30.72	15°12.47 14.13
9	20°24.67	317°59.13 · · 37.88	1°7.06 · · 51.70	322°5.25 · · 30.85	30°14.81 · · 14.09
10	35°27.14	332°58.38 38.54	16°7.77 52.42	337°7.10 30.98	45°17.15 14.04
11	50°29.60	347°57.64 39.20	31°8.47 53.14	352°8.96 31.10	60°19.48 14.00
12	65°32.07	2°56.89 N20°39.86	46°9.18 N06°53.85	7°10.81 N19°31.23	75°21.82 S06°13.96
13	80°34.53 95°37.00	17°56.15 40.52	61°9.89 54.57	22°12.67 31.35 37°14.52 31.48	90°24.16 13.91
14 15	95 37.00 110°39.46	32°55.40 41.17 47°54.65 •• 41.83	76°10.60 55.29 91°11.31 · · 56.01	37°14.52 31.48 52°16.38 · · 31.60	105°26.50 13.87 120°28.83 · · 13.83
16	125° 41.92	62°53.91 42.48	106°12.02 56.73	67°18.23 31.73	135°31.17 13.78
17	140° 44.39	77°53.16 43.13	121°12.72 57.44	82°20.09 31.85	150°33.51 13.74
18	155° 46.85	92°52.41 N20°43.79	136°13.43 N06°58.16	97°21.95 N19°31.98	165°35.85 S06°13.70
19	170° 49.32	107°51.66 44.44	151°14.14 58.88	112°23.80 32.10	180°38.18 13.66
20	185°51.78	122°50.91 45.09	166°14.85 06°59.60	127°25.66 32.23	195°40.52 13.61
21	200° 54.25	137°50.16 · · 45.74	181°15.56 07°0.31	142°27.51 · · 32.35	210°42.86 · · 13.57
22	215°56.71	152°49.41 46.38	196° 16.27 1.03	157°29.37 32.48	225°45.20 13.53
23	230°59.17	167°48.66 47.03	211°16.97 1.75	172°31.22 32.60	240°47.54 13.49
Mer.p	pass. 07:39	ν-0.7' d0.7' m-3.92	ν0.7' d0.7' m1.06	ν1.9' d0.1' m-2.00	ν2.3' d-0.0' m1.03
	-1				
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	246°1.64	182°47.91 N20°47.68	226°17.68 N07°2.46	187°33.08 N19°32.73	255°49.88 \$06°13.44
1	261°4.10	197°47.16 48.32	241°18.39 3.18	202°34.93 32.85	270°52.22 13.40
2	276°6.57	212°46.41 48.96	256° 19.10 3.89	217°36.79 32.97	285°54.55 13.36
3	291°9.03	227° 45.66 · · 49.61	271° 19.81 · · 4.61	232°38.64 · · 33.10	300°56.89 · · 13.32
4	306°11.49	242°44.90 50.25	286°20.52 5.33	247°40.50 33.22	315°59.23 13.27
5	321°13.96	257°44.15 50.89	301°21.22 6.04	262°42.36 33.35	331°1.57 13.23
6	336° 16.42	272°43.40 N20°51.53	316°21.93 N07°6.76	277°44.21 N19°33.47	346°3.91 S06°13.19
7	351°18.89	287° 42.64 52.17	331°22.64 7.47	292°46.07 33.60	1°6.25 13.15
8	6°21.35 21°23.82	302°41.89 52.81 317°41.13 · · 53.44	346°23.35 8.19 1°24.06 • 8.90	307°47.92 33.72 322°49.78 · · 33.85	16°8.59 13.10 31°10.93 · · 13.06
9 10	36° 26.28	317°41.13 · · 53.44 332°40.38 54.08	1°24.06 · · 8.90 16°24.76 9.62	322°49.78 · · 33.85 337°51.63	31°10.93 · · 13.06 46°13.27 13.02
11	51°28.74	347°39.62 54.72	31°25.47 10.33	352°53.49 34.10	61°15.61 12.98
12	66°31.21	2°38.86 N20°55.35	46°26.18 N07°11.05	7°55.34 N19°34.22	76°17.95 S06°12.94
13	81°33.67	17°38.11 55.98	61°26.89 11.76	22°57.20 34.34	91°20.29 12.90
14	96°36.14	32°37.35 56.61	76°27.60 12.48	37°59.05 34.47	106°22.63 12.85
15	111°38.60	47°36.59 · · 57.25	91°28.30 · · 13.19	53°0.91 · · 34.59	121°24.97 · · 12.81
16	126°41.06	62°35.83 57.88	106° 29.01 13.91	68° 2.77 34.72	136°27.31 12.77
17	141°43.53	77°35.08 58.50	121°29.72 14.62	83°4.62 34.84	151°29.66 12.73
18	156° 45.99	92°34.32 N20°59.13	136°30.43 N07°15.34	98°6.48 N19°34.96	166°32.00 S06°12.69
19	171°48.46	107°33.56 20°59.76	151°31.13 16.05	113°8.33 35.09	181°34.34 12.65
20	186°50.92	122°32.80 21°0.38	166°31.84 16.76	128°10.19 35.21	196°36.68 12.60
21	201°53.39	137°32.04 · · 1.01	181°32.55 · · 17.48	143°12.04 · · 35.34	211°39.02 · · 12.56
22	216°55.85	152°31.28 1.63	196°33.26 18.19	158°13.90 35.46	226°41.36 12.52
23	231°58.31	167°30.51 2.26	211°33.97 18.90	173°15.75 35.58	241°43.71 12.48
Mer.p	bass. 07:35	ν -0.8′ d 0.6′ m -3.92	$ u 0.7' \ d0.7' \ m1.05$	$\nu 1.9' \ d0.1' \ \text{m-}2.00$	$\nu 2.3' \ d\text{-}0.0' \ \text{m}1.03$
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	247°0.78 262°3.24	182°29.75 N21°2.88	226°34.67 N07°19.62 241°35.38 20.33	188°17.61 N19°35.71 203°19.47 35.83	256°46.05
1 2	262° 3.24 277° 5.71	197°28.99 3.50 212°28.23 4.12	241°35.38 20.33 256°36.09 21.04	203°19.47 35.83 218°21.32 35.95	271°48.39 12.40 286°50.73 12.36
3	277 5.71 292°8.17	212 28.23 4.12 227°27.46 •• 4.74	271°36.80 · · 21.75	218 21.32 35.95 233°23.18 · · 36.08	301°53.07 · · 12.32
4	307° 10.63	242°26.70 5.36	286° 37.50 22.47	248°25.03 36.20	316°55.42 12.28
5	322° 13.10	257°25.94 5.97	301°38.21 23.18	263°26.89 36.33	331°57.76 12.24
6	337° 15.56	272°25.17 N21°6.59	316°38.92 N07°23.89	278°28.74 N19°36.45	347°0.10 S06°12.20
7	352°18.03	287°24.41 7.20	331°39.63 24.60	293°30.60 36.57	2°2.45 12.15
8	7° 20.49	302°23.64 7.82	346°40.33 25.31	308°32.46 36.70	17°4.79 12.11
9	22°22.96	317°22.88 · · 8.43	1°41.04 · · 26.03	323°34.31 · · 36.82	32°7.13 · · 12.07
10	$37^{\circ}25.42$	332°22.11 9.04	16°41.75 26.74	338°36.17 36.94	47°9.48 12.03
11	52° 27.88	347°21.34 9.65	31°42.46 27.45	353°38.02 37.07	62°11.82 11.99
12	67°30.35	2°20.58 N21°10.26	46°43.16 N07°28.16	8°39.88 N19°37.19	77°14.16 S06°11.95
13	82°32.81	17°19.81 10.87	61°43.87 28.87	23°41.73 37.31	92°16.51 11.91
14	97°35.28	32°19.04 11.48	76°44.58 29.58	38°43.59 37.44	107°18.85 11.87
15	112°37.74	47°18.27 · · 12.09	91°45.29 · · 30.29	53°45.44 · · 37.56	122°21.20 · · 11.83
16	127° 40.20	62°17.50 12.69 77°16.73 13.30	106° 45.99 31.00 121° 46.70 31.71	68°47.30 37.68	137°23.54 11.79 152°25.89 11.75
17 18	142° 42.67 157° 45.13	77°16.73 13.30 92°15.96 N21°13.90	121°46.70 31.71 136°47.41 N07°32.42	83°49.16 37.80 98°51.01 N19°37.93	152°25.89 11.75 167°28.23 \$06°11.71
19	157 45.13 172° 47.60	107°15.19 14.50	151°48.12 33.13	98 51.01 N19 37.93 113°52.87 38.05	182°30.57 11.67
20	187° 50.06	122°14.42 15.11	166° 48.82 33.84	128°54.72 38.17	197°32.92 11.63
21	202°52.52	137°13.65 · · 15.71	181°49.53 · · 34.55	143°56.58 · · 38.30	212°35.26 · · 11.59
22	217°54.99	152°12.88 16.31	196° 50.24 35.26	158°58.43 38.42	227°37.61 11.55
23	232°57.45	167°12.11 16.90	211°50.94 35.97	174°0.29 38.54	242°39.96 11.51
		ν-0.8' d0.6' m-3.92	ν0.7' d0.7' m1.05	ν1.9' d0.1' m-2.00	ν2.3' d-0.0' m1.03
ivier.p	pass. 07:31	ν-υ.υ αυ.υ III-3.92		ν1.9 αυ.1 III-2.UU	ν2.3 u-0.0 III1.03

	Stars	
	SHA	Dec
Alpheratz	357°35.48	29° 13.29
Ankaa	353°7.87	-42° 10.26 56° 39.98
Schedar Diphda	349°31.99 348°48.01	-17°51.15
Achernar	335°21.00	-57°6.61
Hamal	327°52.09	23°34.52
Polaris	$314^{\circ}45.40$	$89^{\circ}21.87$
Acamar	315°12.57	-40° 12.35
Menkar Mirfak	314°7.01 308°29.52	4° 11.06 49° 56.74
Aldebaran	290°40.58	16°33.45
Rigel	281°4.71	-8° 10.44
Capella	280°23.15	46°1.35
Bellatrix Elnath	278°23.78 278°2.91	6°22.28 28°37.67
Alnilam	276 2.91 275°38.59	-1°11.21
Betelgeuse	270°52.98	7°24.68
Canopus	$263^{\circ}53.12$	-52°42.60
Sirius	258°27.01	-16°45.03
Adhara Procyon	255°6.60 244°51.63	-29°0.40 5°9.75
Pollux	244 51.03 243°18.21	27°58.12
Avior	234° 15.33	-59°35.45
Suhail	222°46.89	-43°32.06
Miaplacidus	221°38.76	-69°49.27
Alphard	217°48.38	-8°45.92
Regulus Dubhe	207°35.05 193°41.54	11°50.93 61°37.46
Denebola	182°25.38	14°26.20
Gienah	175°43.99	-17°40.76
Acrux	173°0.38	-63°14.32
Gacrux	171°51.96 166°13.07	-57° 15.24 55° 49.85
Alioth Spica	158° 22.63	-11° 17.40
Alkaid	152°52.03	49° 11.62
Hadar	$148^{\circ}36.25$	$-60^{\circ}29.61$
Menkent	147°57.92	-36°29.54
Arcturus Rigil Kent.	145°48.10 139°40.46	19°3.33 -60°56.32
Kochab	139 40.40 137°18.65	74°3.39
Zuben'ubi	136°56.30	-16°8.67
Alphecca	$126^{\circ}3.83$	$26^{\circ}37.93$
Antares	112°16.12	-26°29.21
Atria Sabik	107°10.26 102°3.05	-69°4.25 -15°45.35
Shaula	96° 10.68	-37°7.27
Rasalhague	$95^{\circ}58.71$	$12^{\circ}32.43$
Eltanin	90°41.92	51°28.95
Kaus Aust.	83°32.86 80°33.21	-34°22.34
Vega Nunki	75°48.11	38° 48.17 -26° 15.96
Altair	62°0.25	8° 55.84
Peacock	53°6.23	-56° 39.20
Deneb	49°25.95	45°21.74
Enif Al Na'ir	33°39.25 27°33.51	9°59.06 -46°50.39
Fomalhaut	27 33.51 15° 15.13	-46 50.39 -29°29.49
Scheat	13°45.78	28° 12.67
Markab	13°30.48	$15^{\circ}20.02$
May 27 Mon	SHA	Mer.pass
Venus	298°3.31	11:48
Mars	340°58.18	08:56
Jupiter Saturn	301°46.05 9°51.29	11:31 06:59
May 28 Tue	SHA 296° 46.27	Mer.pass
Venus Mars	296°46.27 340°16.04	11:49 08:54
Jupiter	301°31.44	11:28
Saturn	9°48.24	06:56
May 29 Wed	SHA	Mer.pass
Venus	$295^{\circ}28.97$	11:51
Mars	339°33.90	08:53
Jupiter Saturn	301°16.83 9°45.27	11:25 06:52
		00.52
Horizor	ital parallax	0.1
	Venus: Mars:	0.1

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.61	N21°20.58	$314^{\circ}34.80$	5.8'	\$27° 15.17	-5.0'	57.8'
1	195°42.54	20.99	328° 59.59	5.8'	27°10.15	-5.2'	57.8'
2	210°42.46 225°42.39	21.40 •• 21.82	343°24.42 357°49.29	5.9' 5.9'	27°4.96 26°59.60	-5.4' -5.5'	57.8' 57.8'
4	240°42.31	22.23	12° 14.20	5.9'	26°54.07	-5.7'	57.8'
5	255°42.24	22.64	26° 39.15	6.0'	26°48.38	-5.9'	57.9'
6	270°42.17	N21°23.05	$41^{\circ}4.14$	6.0'	S26°42.51	-6.0'	57.9'
7	285°42.09	23.46	55° 29.17	6.1'	26°36.48	-6.2'	57.9'
8 9	300°42.02 315°41.94	23.86 •• 24.27	69°54.26 84°19.38	6.1' 6.2'	26°30.28 26°23.92	-6.4' -6.5'	57.9' 57.9'
10	330°41.87	24.68	98° 44.56	6.2'	26° 17.39	-6.7'	57.9 58.0'
11	345°41.79	25.09	113°9.79	6.3'	26° 10.69	-6.9'	58.0'
12	0°41.71	N21°25.49	127°35.07	6.3'	\$26°3.83	-7.0'	58.0'
13	15°41.64	25.90	142°0.40	6.4'	25°56.81	-7.2'	58.0'
14 15	30°41.56 45°41.49	26.30 •• 26.71	156°25.79 170°51.24	6.4' 6.5'	25°49.63 25°42.29	-7.3' -7.5'	58.0' 58.0'
16	60°41.41	27.11	170 51.24 185° 16.74	6.6'	25° 34.79	-7.5' -7.7'	58.1'
17	75°41.33	27.51	199° 42.30	6.6'	25°27.13	-7.8'	58.1'
18	90°41.26	N21°27.92	214°7.92	6.7'	S25°19.31	-8.0'	58.1'
19	105°41.18	28.32	228° 33.60	6.7'	25°11.33	-8.1'	58.1'
20 21	120°41.10 135°41.02	28.72 •• 29.12	242°59.34 257°25.14	6.8' 6.9'	25°3.20 24°54.92	-8.3' -8.4'	58.1' 58.1'
22	150°40.95	29.52	271°51.01	6.9	24° 46.48	-8.6'	58.2
23	165°40.87	29.92	286° 16.94	7.0'	24° 37.88	-8.7'	58.2'
	SD = 15.8'	d = 0.4'		SI	D = 15.8'		
					20.0		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°40.79 195°40.71	N21°30.32 30.71	300°42.94 315°9.00	7.1' 7.1'	\$24°29.14 24°20.25	-8.9' -9.0'	58.2' 58.2'
2	195°40.71 210°40.63	30.71	315°9.00 329°35.13	7.1	24° 20.25 24° 11.20	-9.0° -9.2°	58.2' 58.2'
3	225°40.55	31.51	344°1.33	7.3'	24°2.01	-9.3	58.3'
4	240°40.47	31.90	$358^{\circ}27.60$	7.3'	$23^{\circ}52.67$	-9.5'	58.3'
5	255°40.39	32.30	12°53.94	7.4'	23°43.19	-9.6'	58.3'
6 7	270°40.32 285°40.24	N21°32.69 33.09	27°20.34 41°46.82	7.5' 7.5'	\$23°33.56 23°23.79	-9.8' -9.9'	58.3' 58.3'
8	300°40.16	33.48	56° 13.37	7.6'	23° 13.87	-9.9 -10.1'	58.3'
9	315°40.08	• • 33.87	70°39.99	7.7'	23°3.82	-10.2	58.4'
10	330°40.00	34.26	85°6.69	7.8'	$22^{\circ}53.62$	-10.3'	58.4'
11	345°39.92	34.66	99°33.45	7.8'	22°43.29	-10.5'	58.4'
12 13	0°39.83 15°39.75	N21°35.05 35.44	114°0.29 128°27.20	7.9' 8.0'	\$22°32.82 22°22.21	-10.6' -10.7'	58.4' 58.4'
14	30°39.67	35.83	142° 54.19	8.1	22° 22.21	-10.7	58.4
15	45°39.59	36.21	157°21.25	8.1'	22°0.60	-11.0'	58.4'
16	60°39.51	36.60	$171^{\circ}48.38$	8.2'	$21^{\circ}49.59$	-11.1'	58.5'
17	75°39.43	36.99 N21°37.38	186° 15.59	8.3'	21°38.46	-11.3'	58.5'
18 19	90°39.35 105°39.26	N21°37.38 37.76	200° 42.87 215° 10.22	8.4' 8.4'	\$21°27.19 21°15.80	-11.4' -11.5'	58.5' 58.5'
20	120°39.18	38.15	219° 37.65	8.5'	21°4.28	-11.6'	
21	135°39.10	• • 38.53	244°5.16	8.6'	20°52.63	-11.8'	58.5'
22	150°39.02	38.92	258°32.74	8.7'	$20^{\circ}40.87$	-11.9'	58.6'
23	165°38.93	39.30	273°0.39	8.7'	20°28.97	-12.0'	58.6'
	SD = 15.8'	d = 0.4'		SI	O = 15.9'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.85	N21°39.68	287° 28.12	8.8'	\$20° 16.96	-12.1'	58.6'
1	195°38.77	40.06	$301^{\circ}55.92$	8.9'	20°4.83	-12.2'	58.6'
2	210°38.68	40.45	316° 23.79	8.9'	19°52.58	-12.4'	58.6'
3 4	225°38.60 240°38.52	· · 40.83 41.21	330°51.74 345°19.77	9.0' 9.1'	19°40.21 19°27.73	-12.5' -12.6'	58.6' 58.6'
4 5	240 38.52 255°38.43	41.21	345 19.77 359°47.86	9.1 9.2'	19 27.73 19°15.14	-12.0 -12.7'	58.7'
6	270°38.35	N21°41.97	14° 16.03	9.2'	\$19°2.43	-12.8'	58.7'
7	285°38.26	42.34	28° 44.27	9.3'	18°49.61	-12.9'	58.7'
8	300°38.18	42.72	43° 12.58	9.4'	18° 36.68	-13.0'	58.7'
9 10	315°38.10 330°38.01	· · 43.10 43.47	57°40.97 72°9.42	9.5' 9.5'	18°23.64 18°10.50	-13.1' -13.3'	58.7' 58.7'
11	345°37.92	43.47 43.85	72 9.42 86° 37.95	9.5 9.6'	18 10.50 17°57.25	-13.3 -13.4'	58.7'
12	0°37.84	N21°44.23	101°6.54	9.7'	\$17°43.89	-13.5	58.8'
13	15°37.75	44.60	115° 35.21	9.7'	17° 30.43	-13.6'	58.8'
14	30°37.67	44.97	130°3.94	9.8'	17°16.88	-13.7'	58.8'
15 16	45°37.58 60°37.50	•• 45.35 45.72	144°32.75 159°1.62	9.9' 9.9'	17°3.22 16°49.46	-13.8' -13.9'	58.8' 58.8'
17	75°37.41	46.09	173° 30.55	10.0'	16° 49.40 16° 35.61	-13.9'	58.8'
18	90°37.32	N21°46.46	187°59.56	10.1'	S16°21.66	-14.0'	58.8'
19	105°37.24	46.83	202°28.63	10.1'	16°7.62	-14.1'	58.9'
20	120°37.15	47.20	216° 57.76	10.2'	15°53.49	-14.2'	58.9'
21 22	135°37.06 150°36.97	•• 47.57 47.94	231°26.96 245°56.22	10.3' 10.3'	15°39.26 15°24.95	-14.3' -14.4'	58.9' 58.9'
23	165°36.89	48.31	260° 25.55	10.4	15° 24.95	-14.5'	58.9'
	SD = 15.8'	d = 0.4'		SI	O = 16.0'		
		<u> 0.7</u>		J.	10.0		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:27	22:31	////	////
64°	////	////	02:07	21:50	////	////
62°	////	00:43	02:34	21:22	23:19	////
60°	////	01:37	02:55	21:01	22:21	////
$N 58^{\circ}$	////	02:07	03:12	20:44	21:49	////
56°	00:39	02:30	03:26	20:30	21:26	23:23
54°	01:28	02:48	03:38	20:17	21:07	22:29
52°	01:57	03:04	03:49	20:06	20:52	22:00
50°	02:18	03:17	03:59	19:57	20:39	21:38
45°	02:56	03:43	04:19	19:36	20:12	20:59
N 40°	03:23	04:03	04:35	19:20	19:52	20:32
35°	03:44	04:20	04:49	19:06	19:35	20:11
30°	04:01	04:34	05:00	18:55	19:21	19:54
20°	04:28	04:56	05:20	18:34	18:59	19:27
N 10°	04:48	05:15	05:38	18:17	18:40	19:06
0°	05:06	05:32	05:54	18:01	18:23	18:49
S 10°	05:21	05:47	06:10	17:45	18:08	18:34
20°	05:36	06:03	06:27	17:28	17:52	18:19
30°	05:50	06:20	06:46	17:09	17:35	18:04
35°	05:58	06:29	06:57	16:57	17:25	17:56
40°	06:06	06:40	07:10	16:45	17:15	17:48
45°	06:15	06:52	07:25	16:29	17:02	17:39
S 50°	06:26	07:06	07:43	16:11	16:48	17:29
52°	06:30	07:13	07:52	16:02	16:42	17:24
54°	06:35	07:20	08:02	15:52	16:34	17:19
56°	06:40	07:28	08:13	15:41	16:26	17:14
58°	06:46	07:37	08:26	15:29	16:18	17:08
S 60°	06:52	07:47	08:40	15:14	16:07	17:02
Lat		Moonris	e		Moonset	i i

Lat.		Moonris	e		Moonset	<u> </u>
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°			04:10			06:14
68°			03:09			07:13
66°		04:06	02:33		04:21	07:47
64°		02:33	02:08		05:53	08:12
62°	02:07	01:55	01:48	04:18	06:30	08:31
60°	01:18	01:28	01:31	05:07	06:57	08:46
N 58°	00:47	01:07	01:17	05:38	07:17	08:59
56°	00:23	00:49	01:05	06:01	07:34	09:11
54°	00:04	00:34	00:54	06:20	07:48	09:20
52°		00:21	00:45	06:36	08:01	09:29
50°		00:10	00:36	06:50	08:12	09:37
45°	23:46		00:18	07:18	08:34	09:53
N 40°	23:27		00:03	07:40	08:52	10:07
35°	23:11	23:51		07:58	09:08	10:18
30°	22:57	23:40		08:13	09:21	10:28
20°	22:33	23:21		08:40	09:43	10:45
N 10°	22:12	23:04	23:51	09:02	10:02	11:00
0°	21:53	22:48	23:40	09:23	10:20	11:13
S 10°	21:33	22:32	23:29	09:44	10:37	11:27
20°	21:13	22:16	23:17	10:06	10:56	11:41
30°	20:48	21:56	23:03	10:32	11:18	11:57
35°	20:34	21:45	22:55	10:47	11:30	12:07
40°	20:17	21:31	22:46	11:04	11:44	12:17
45°	19:57	21:16	22:35	11:25	12:01	12:30
S 50°	19:32	20:56	22:22	11:51	12:22	12:45
52°	19:20	20:47	22:16	12:04	12:32	12:52
54°	19:06	20:37	22:09	12:18	12:43	12:59
56°	18:50	20:25	22:01	12:35	12:55	13:08
58°	18:30	20:11	21:52	12:55	13:10	13:18
S 60°	18:06	19:55	21:42	13:20	13:26	13:29

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	87-69%	
27	02:50	02:47	11:57	03:09	15:38		
28	02:43	02:39	11:57	04:06	16:34		
29	02:35	02:31	11:57	05:01	17:27		

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn		Stars
Thu	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	247°59.92		°17.50	226°51.65	N07°36.68	189° 2.15	N19°38.66	257°42.30	S06°11.47		
1	263°2.38	197° 10.56	18.10	241°52.36	37.39	204° 4.00	38.79	272°44.65	11.43	Alpheratz	357°35.46
2	278°4.85	212°9.79	18.69	256°53.07	38.10	219° 5.86	38.91	287°46.99	11.40	Ankaa	353°7.84 349°31.96
3	293°7.31		19.29	271°53.77	• • 38.81	234°7.71	• • 39.03	302°49.34	• • 11.36	Schedar Diphda	349° 31.90 348° 47.99
4	308°9.77	242°8.24	19.88	286° 54.48	39.52	249° 9.57	39.16	317°51.68	11.32	Achernar	335°20.98
5	323°12.24	257°7.47	20.47	301°55.19	40.23	264°11.43	39.28	332°54.03	11.28	Hamal	
6 7	338° 14.70 353° 17.17	272°6.69 N21 287°5.92	°21.07 21.66	316°55.89 331°56.60	N07°40.94	279°13.28 294°15.14	N19°39.40 39.52	347°56.38 2°58.72	S06°11.24 11.20	Polaris	314°44.80
8	8° 19.63	302°5.14	22.25	346° 57.31	41.64 42.35	309°16.99	39.52	2 56.72 18°1.07	11.20	Acamar	$315^{\circ}12.55$
9	23°22.09		22.83	1°58.01	• • 43.06	324°18.85	39.77	33°3.42	•• 11.12	Menkar	314°7.00
10	38°24.56	332°3.59	23.42	16°58.72	43.77	339°20.70	39.89	48°5.76	11.08	Mirfak	308°29.51
11	53°27.02	347°2.81	24.01	31°59.43	44.48	354°22.56	40.01	63°8.11	11.04	Aldebaran Rigel	290°40.57 281°4.71
12	68°29.49		°24.59	47°0.14	N07°45.18	9°24.42	N19°40.13	78°10.46	S06°11.00	Capella	280°23.15
13	83°31.95	17°1.26	25.18	62°0.84	45.89	24°26.27	40.26	93°12.81	10.97	Bellatrix	278° 23.77
14	98°34.41	32°0.48	25.76	77°1.55	46.60	39°28.13	40.38	108°15.15	10.93	Elnath	278°2.91
15 16	113° 36.88 128° 39.34	46°59.70 · · · 61°58.92	26.34 26.92	92°2.26 107°2.96	· · 47.31 48.01	54°29.98 69°31.84	· · 40.50 40.62	123°17.50 138°19.85	· · 10.89 10.85	Alnilam	275°38.59
17	143°41.81	76°58.14	27.50	122°3.67	48.72	84°33.70	40.74	153°22.20	10.81	Betelgeuse	270°52.98
18	158° 44.27		°28.08	137°4.38	N07°49.43	99°35.55	N19°40.87	168°24.54	S06° 10.77	Canopus	263°53.13
19	173°46.74	106°56.58	28.66	152°5.08	50.13	114°37.41	40.99	183°26.89	10.73	Sirius	258°27.01 255°6.60
20	$188^{\circ}49.20$	121°55.80	29.24	167°5.79	50.84	129°39.26	41.11	198°29.24	10.70	Adhara Procyon	255 0.00 244°51.63
21	203°51.66		29.81	182°6.50	• • 51.54	144°41.12	• • 41.23	213°31.59	• • 10.66	Pollux	
22	218°54.13	151°54.23	30.39	197°7.20	52.25	159°42.98	41.35	228°33.94	10.62	Avior	234°15.36
23	233°56.59	166°53.45	30.96	212°7.91	52.96	174°44.83	41.48	243°36.29	10.58	Suhail	222°46.90
Mer.۱	pass. 07:27	u-0.8 $'$ d 0.6 $'$ m	1-3.92	ν 0.7' d0.	.7′ m1.05	$\nu 1.9' \ d0.$.1' m-2.00	$\nu 2.3' \ d-0$	0.0′ m1.02	Miaplacidus	221°38.81
										Alphard	217°48.39
Fri	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°35.05
0	248°59.06		°31.54	227°8.62	N07°53.66	189°46.69	N19°41.60	258°38.64	S06° 10.54	Dubhe	193°41.56 182°25.39
1	$264^{\circ}1.52$	196°51.89	32.11	242°9.32	54.37	204°48.54	41.72	273°40.99	10.51	Denebola Gienah	182 25.39 175°44.00
2	279°3.98	211°51.10	32.68	257° 10.03	55.07	219°50.40	41.84	288°43.33	10.47	Acrux	173 44.00 173°0.41
3	294°6.45		33.25	272°10.74	• • 55.78	234°52.26	• • 41.96	303°45.68	• • 10.43		171°51.98
4	309°8.91	241°49.53	33.82	287°11.44	56.48	249°54.11	42.08	318°48.03	10.39		166° 13.09
5	324°11.38	256° 48.75	34.38	302°12.15	57.19	264°55.97	42.21 N19°42.33	333°50.38	10.35	Spica	$158^{\circ}22.64$
6 7	339° 13.84 354° 16.30	271°47.96 N21 286°47.18	°34.95 35.52	317° 12.86 332° 13.56	N07°57.89 58.60	279°57.82 294°59.68	N19 42.33 42.45	348°52.73 3°55.08	\$06° 10.32 10.28		152° 52.03
8	9° 18.77	301°46.39	36.08	347° 14.27	07°59.30	310° 1.54	42.45	18°57.43	10.28	Hadar	148°36.26
9	24°21.23		36.64	2°14.97	08° 0.01	325°3.39	• • 42.69	33°59.78	. 10.20	l l	147°57.93
10	39°23.70	331°44.82	37.21	17° 15.68	0.71	340° 5.25	42.81	49°2.13	10.17	Arcturus Rigil Kent.	145°48.11 139°40.47
11	54°26.16	346°44.03	37.77	$32^{\circ}16.39$	1.41	355°7.10	42.93	64°4.48	10.13	Kochab	137° 18.67
12	69°28.62		°38.33	47° 17.09	N08°2.12	10°8.96	N19°43.05	79°6.83	S06°10.09	Zuben'ubi	136°56.29
13	84°31.09	16° 42.46	38.89	62°17.80	2.82	25°10.82	43.18	94°9.19	10.06	Alphecca	126°3.82
14	99° 33.55	31°41.67	39.44	77° 18.51	3.52	40°12.67	43.30	109°11.54	10.02	Antares	$112^{\circ}16.11$
15 16	114° 36.02 129° 38.48	46°40.88 · · · 61°40.09	40.00 40.56	92° 19.21 107° 19.92	· · 4.23 4.93	55°14.53 70°16.39	· · 43.42 43.54	124°13.89 139°16.24	• • 9.98 9.94	Atria	107° 10.25
17	144°40.94	76°39.30	41.11	122° 20.62	5.63	85°18.24	43.66	154°18.59	9.94	Sabik	102°3.04
18	159°43.41	91°38.51 N21		137°21.33	N08° 6.34	100°20.10	N19°43.78	169°20.94	S06°9.87	Shaula	96°10.67
19	174°45.87	106°37.72	42.22	152°22.04	7.04	115°21.95	43.90	184°23.29	9.83	Rasalhague Eltanin	95°58.70 90°41.91
20	189°48.34	121°36.93	42.77	167°22.74	7.74	130°23.81	44.02	199°25.65	9.80	Kaus Aust.	83°32.84
21	204°50.80		43.32	182°23.45	• • 8.44	145°25.67	• • 44.14	214°28.00	• • 9.76	Vega	80°33.20
22	219°53.27	151°35.34	43.87	197°24.16	9.15	160°27.52	44.26	229°30.35	9.72	Nunki	75°48.09
23	234°55.73	166°34.55	44.42	212°24.86	9.85	175°29.38	44.38	244°32.70	9.69	Altair	$62^{\circ}0.23$
Mer.ı	pass. 07:23	u-0.8 $'$ d 0.6 $'$ m	ı-3.92	$\nu 0.7' \ d0.$.7' m1.05	$\nu 1.9' \ d0.$.1' m-2.00	$\nu 2.3' \ d-0$	0.0′ m1.02	Peacock	53°6.19
										Deneb	49°25.93
Sat	GHA	GHA I	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.22
0	249°58.19		°44.97	227° 25.57	N08° 10.55	190°31.24	N19°44.50	259°35.05	S06°9.65	Al Na'ir Fomalhaut	27°33.48 15°15.10
1	265°0.66	196°32.96	45.51	242°26.27	11.25	205°33.09	44.63	274°37.41	9.61	Scheat	13°45.75
2	280°3.12	211° 32.17	46.06	257° 26.98	11.95	220°34.95	44.75	289°39.76	9.58	Markab	13°30.45
3	295°5.59		46.60	272°27.69	• • 12.65	235°36.80	• • 44.87	304°42.11	• • 9.54		
4	310°8.05	241°30.58	47.15 47.60	287°28.39	13.36	250°38.66	44.99 45.11	319°44.47	9.50	May 30 Thu	SHA 294°11.42
5 6	325° 10.51 340° 12.98	256°29.79 271°28.99 N21	47.69 °48.23	302°29.10 317°29.80	14.06 N08°14.76	265°40.52 280°42.37	45.11 N19°45.23	334°46.82 349°49.17	9.47 \$06° 9.43		338°51.73
7	355° 15.44	286°28.20	48.77	332° 30.51	15.46	295°44.23	45.35	4°51.53	9.40	Jupiter	301°2.23
8	10° 17.91	301°27.40	49.31	347°31.21	16.16	310°46.09	45.47	19°53.88	9.36	Saturn	9°42.38
9	25°20.37		49.85	2°31.92	• • 16.86	325°47.94	• • 45.59	34°56.23	• • 9.32	N4 21 F *	CIIA
10	40°22.83	331°25.81	50.39	17°32.63	17.56	340°49.80	45.71	49°58.59	9.29	May 31 Fri	SHA 292°53.61
11	55°25.30	346°25.01	50.92	32°33.33	18.26	355°51.66	45.83	65°0.94	9.25	Mars	338° 9.56
12	70°27.76	1°24.21 N21		47°34.04	N08°18.96	10°53.51	N19°45.95	80°3.29	\$06°9.22		300° 47.63
13 14	85° 30.23 100° 32.69	16°23.41 31°22.61	51.99 52.52	62°34.74 77°35.45	19.66 20.36	25°55.37 40°57.22	46.07 46.19	95°5.65 110°8.00	9.18 9.15	Saturn	9°39.58
14 15	100 32.09 115°35.15		52.52	92°36.15	. 21.06	55°59.08	46.19 •• 46.31	110 8.00 125°10.36	9.15	Jun 01 Sat	SHA
16	130°37.62	61°21.02	53.59	107° 36.86	21.76	71° 0.94	46.43	140°12.71	9.11		291°35.56
17	145°40.08	76° 20.22	54.12	122° 37.57	22.46	86°2.79	46.55	155°15.07	9.04		337° 27.37
18	160°42.55	91°19.42 N 21	°54.64	137°38.27	N08°23.15	101°4.65	N19°46.67	170°17.42	S06°9.00		300°33.04
19	175° 45.01	106° 18.62	55.17	152° 38.98	23.85	116° 6.51	46.79	185°19.78	8.97	Saturn	9°36.86
20	190° 47.47	121°17.82	55.70	167°39.68	24.55	131°8.36	46.91	200°22.13	8.93	Havisa	ntal parallax
21	205°49.94		56.22 56.75	182°40.39	25.25	146°10.22	· · 47.03	215°24.49	· · 8.90	HORIZON	Venus:
22 23	220° 52.40 235° 54.87	151°16.21 166°15.41	56.75 57.27	197°41.09 212°41.80	25.95 26.65	161°12.08 176°13.93	47.15 47.27	230°26.84 245°29.20	8.86 8.83		Mars:
Mer.	pass. 07:19	ν-0.8′ d0.5′ m	1-3.92	ν 0.7′ d0.	./' m1.04	ν 1.9′ d0.	.1′ m-2.00	ν 2.4′ d-0	0.0′ m1.02		

29°13.29 -42°10.25

56°39.98 -17°51.14

 $\text{-}57^{\circ}6.59$

 $23^{\circ}34.53$

 $89^{\circ}21.86$

-40°12.33

4°11.07

49°56.74 16°33.46

-8°10.43

46°1.34

6°22.29

28°37.67 -1°11.20

7°24.69 -52°42.59

-16°45.02

-29°0.39

5°9.75 27°58.12

-59°35.44

-43°32.05 -69°49.27

-8°45.92

11°50.93

61°37.46 14°26.20

-17°40.76

 $-63^{\circ} 14.33$ $-57^{\circ} 15.24$

55°49.86 -11°17.40

49°11.63

-60°29.63

-36°29.55

19°3.34

74°3.40 -16°8.67

26°37.93 -26°29.22

-69°4.26

-15°45.35 -37°7.28

 $12^{\circ}32.44$

51°28.96

-34°22.34 38°48.18

-26°15.96 8°55.84

-56°39.20

45°21.75 9°59.07

-46°50.39 -29°29.48

28°12.68

15°20.03

Mer.pass

11:52

08:52

11:22 06:48 **Mer.pass**

11:53

08:51

11:19

06:44 Mer.pass

11:54

08:50

11:17

06:41

0.1

0.1

-60°56.33

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.80	N21°48.67	274°54.94	10.4'	S 14°56.06	-14.6'	58.9'
1	195°36.71	49.04	289°24.38	10.5'	14°41.48	-14.7'	58.9'
2	210°36.62 225°36.54	49.41 •• 49.77	303°53.89 318°23.46	10.6' 10.6'	14° 26.82 14° 12.08	-14.7' -14.8'	58.9' 59.0'
4	240°36.45	50.14	332°53.08	10.7	13°57.26	-14.9'	59.0'
5	255°36.36	50.50	347°22.77	10.7'	13°42.36	-15.0'	59.0'
6	270°36.27	N21°50.86	1°52.51	10.8'	S13°27.38	-15.1'	59.0'
7	285°36.18 300°36.09	51.23	16°22.30	10.8'	13° 12.33	-15.1'	59.0'
8 9	300°36.09 315°36.00	51.59 •• 51.95	30°52.15 45°22.05	10.9' 11.0'	12°57.20 12°42.00	-15.2' -15.3'	59.0' 59.0'
10	330°35.91	52.31	59°52.00	11.0'	12° 26.72	-15.3'	59.0'
11	345°35.82	52.67	74°22.01	11.1'	$12^{\circ}11.37$	-15.4'	59.1'
12	0°35.73	N21°53.03	88°52.07	11.1'	S11°55.96	-15.5'	59.1'
13 14	15°35.64 30°35.55	53.39 53.75	103°22.17 117°52.32	11.2' 11.2'	11°40.48 11°24.93	-15.5' -15.6'	59.1' 59.1'
14 15	45°35.46	54.10	132° 22.52	11.2'	11 24.93 11°9.32	-15.0 -15.7'	59.1'
16	60°35.37	54.46	146°52.77	11.3'	10°53.64	-15.7'	59.1'
17	75°35.28	54.81	161°23.06	11.3'	$10^{\circ}37.90$	-15.8'	59.1'
18	90°35.19	N21°55.17	175°53.39	11.4'	\$10°22.10	-15.9'	59.1'
19 20	105°35.10 120°35.00	55.52 55.88	190°23.77 204°54.19	11.4' 11.5'	10°6.24 09°50.33	-15.9' -16.0'	59.1' 59.2'
21	135°34.91	56.23	219°24.64	11.5'	09°34.36	-16.0'	59.2'
22	150°34.82	56.58	233°55.14	11.5'	09°18.33	-16.1'	59.2'
23	165°34.73	56.94	248°25.67	11.6'	$09^{\circ}2.26$	-16.1'	59.2'
	SD = 15.8'	d = 0.4'		SI	D = 16.1'		
						,	
Fri 0	GHA 180°34.64	Dec N21° 57.29	GHA 262° 56.25	u 11.6'	Dec \$08° 46.13	d -16.2'	HP 59.2'
1	195°34.54	57.64	277°26.85	11.6'	08° 29.94	-16.2	59.2'
2	210°34.45	57.99	291°57.49	11.7'	08°13.72	-16.3'	59.2'
3	225°34.36	• • 58.34	306°28.16	11.7'	07°57.44	-16.3'	59.2'
4 5	240°34.27 255°34.17	58.69 59.03	320°58.87 335°29.60	11.7' 11.8'	07°41.12 07°24.75	-16.4' -16.4'	59.2' 59.2'
6	270°34.08	N21°59.38	350°0.36	11.8'	S07°8.34	-16.5	59.2
7	285°33.98	21°59.73	4°31.15	11.8'	06°51.89	-16.5'	59.3'
8	300°33.89	22°0.07	19°1.97	11.8'	06°35.40	-16.5'	59.3'
9	315°33.80	• • 0.42	33°32.81	11.9'	06°18.88	-16.6'	59.3'
10 11	330°33.70 345°33.61	0.76 1.11	48°3.67 62°34.56	11.9' 11.9'	06°2.31 05°45.71	-16.6' -16.6'	59.3' 59.3'
12	0°33.51	N22°1.45	77°5.47	11.9'	S05°29.07	-16.7'	59.3'
13	15°33.42	1.79	91°36.40	11.9'	05°12.41	-16.7'	59.3'
14	30°33.32	2.14	106°7.34	12.0'	04°55.71	-16.7'	59.3'
15 16	45°33.23 60°33.13	· · 2.48 2.82	120°38.31 135°9.28	12.0' 12.0'	04°38.98 04°22.22	-16.8' -16.8'	59.3' 59.3'
17	75°33.04	3.16	135 9.28 149°40.28	12.0'	04 22.22 04°5.44	-16.8'	59.3'
18	90°32.94	N22°3.50	164°11.28	12.0'	S03°48.63	-16.8'	59.4'
19	105°32.85	3.84	178° 42.30	12.0'	03°31.80	-16.9'	59.4'
20	120°32.75	4.17	193°13.33 207°44.37		03°14.95		
21 22	135°32.66 150°32.56	· · 4.51 4.85	207° 44.37 222° 15.41	12.0' 12.1'	02°58.07 02°41.18	-16.9' -16.9'	59.4' 59.4'
23	165°32.46	5.18	236°46.46	12.1'	02°24.27	-16.9	59.4'
	SD = 15.8'	d = 0.4'		SI	D = 16.1'		
_							
Sat 0	GHA 180°32.37	Dec N22°5.52	GHA 251°17.52	u 12.1'	Dec 502°7.34	d -16.9'	HP 59.4'
1	195°32.27	5.85	265°48.58	12.1'	01°50.40	-10.9 -17.0'	59.4'
2	210°32.17	6.19	$280^{\circ}19.64$	12.1'	01°33.44	-17.0'	59.4'
3	225°32.07	• • 6.52	294°50.70	12.1'	01°16.47	-17.0'	59.4'
4 5	240°31.98 255°31.88	6.85 7.19	309°21.76 323°52.82	12.1' 12.1'	00°59.49 00°42.51	-17.0' -17.0'	59.4' 59.4'
6	270°31.78	N22°7.52	338° 23.88	12.1'	500°25.51	-17.0'	59.4
7	285°31.68	7.85	352°54.93	12.0'	S00°8.51	-17.0'	59.4'
8	300°31.59	8.18	7°25.98	12.0'	N00°8.49	17.0'	59.4'
9 10	315°31.49 330°31.39	· · 8.51 8.84	21°57.01 36°28.04	12.0' 12.0'	00°25.50 00°42.51	17.0' 17.0'	59.4' 59.4'
10	330 31.39 345°31.29	8.84 9.16	36 28.04 50°59.06	12.0'	00 42.51 00°59.52	17.0° 17.0°	59.4 59.5'
12	0°31.19	N22°9.49	65°30.07	12.0'	N01° 16.52	17.0'	59.5'
13	15°31.09	9.82	80°1.06	12.0'	01°33.53	17.0'	59.5'
14	30°30.99	10.14	94°32.04	12.0'	01°50.53	17.0'	59.5'
15 16	45°30.89 60°30.79	· · 10.47 10.79	109°3.01 123°33.95	11.9' 11.9'	02°7.52 02°24.50	17.0' 17.0'	59.5' 59.5'
17	75°30.69	10.79	123 33.95 138°4.88	11.9'	02°24.50	17.0'	59.5'
18	90°30.59	N22°11.44	152°35.79	11.9'	N02°58.44	17.0'	59.5'
19	105°30.49	11.76	167°6.68	11.9'	03°15.39	16.9'	59.5'
20 21	120°30.39 135°30.29	12.09 •• 12.41	181°37.54 196°8.39	11.8' 11.8'	03°32.33 03°49.25	16.9'	59.5' 59.5'
21 22	135°30.29 150°30.19	· · 12.41 12.73	196°8.39 210°39.20	11.8' 11.8'	03°49.25 04°6.15	16.9' 16.9'	59.5' 59.5'
23	165°30.09	13.05	225°9.99	11.8'	04°23.04	16.9	59.5'
	SD = 15.8'	d = 0.3'		SI	D = 16.2'		
			-				

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:15	22:45	////	////
64°	////	////	01:59	21:58	////	////
62°	////	00:12	02:28	21:29	////	////
60°	////	01:28	02:50	21:07	22:30	////
N 58°	////	02:01	03:08	20:49	21:56	////
56°	00:10	02:25	03:23	20:34	21:31	////
54°	01:20	02:44	03:35	20:21	21:12	22:38
52°	01:51	03:00	03:46	20:10	20:56	22:06
50°	02:14	03:14	03:56	20:00	20:43	21:43
45°	02:53	03:41	04:17	19:39	20:15	21:03
N 40°	03:21	04:01	04:34	19:22	19:54	20:35
35°	03:43	04:18	04:47	19:08	19:38	20:13
30°	04:00	04:33	05:00	18:56	19:23	19:56
20°	04:27	04:56	05:20	18:36	19:00	19:29
N 10°	04:48	05:15	05:38	18:18	18:41	19:07
0°	05:06	05:32	05:54	18:01	18:24	18:50
S 10°	05:22	05:48	06:10	17:45	18:08	18:34
20°	05:37	06:04	06:28	17:28	17:51	18:19
30°	05:52	06:21	06:47	17:08	17:34	18:04
35°	06:00	06:31	06:59	16:56	17:24	17:56
40°	06:08	06:42	07:12	16:43	17:13	17:47
45°	06:18	06:54	07:28	16:28	17:01	17:38
S 50°	06:28	07:09	07:47	16:09	16:46	17:27
52°	06:33	07:16	07:56	16:00	16:39	17:22
54°	06:38	07:23	08:06	15:50	16:32	17:17
56°	06:43	07:31	08:17	15:38	16:24	17:12
58°	06:49	07:41	08:30	15:25	16:15	17:06
S 60°	06:56	07:51	08:46	15:10	16:04	16:59

Lat.		Moonris	е		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	03:13	02:19	01:40	09:00	11:39	14:03
N 70°	02:46	02:08	01:38	09:26	11:48	14:00
68°	02:24	01:58	01:36	09:45	11:55	13:58
66°	02:08	01:50	01:34	10:00	12:00	13:57
64°	01:54	01:43	01:33	10:12	12:05	13:55
62°	01:42	01:37	01:32	10:23	12:09	13:54
60°	01:32	01:31	01:31	10:31	12:13	13:53
N 58°	01:23	01:27	01:30	10:39	12:16	13:52
56°	01:15	01:23	01:29	10:46	12:19	13:51
54°	01:08	01:19	01:28	10:52	12:21	13:50
52°	01:02	01:15	01:27	10:57	12:24	13:50
50°	00:56	01:12	01:27	11:02	12:26	13:49
45°	00:44	01:06	01:25	11:12	12:30	13:48
N 40°	00:34	01:00	01:24	11:21	12:34	13:47
35°	00:25	00:55	01:23	11:28	12:37	13:46
30°	00:17	00:51	01:22	11:35	12:40	13:45
20°	00:03	00:43	01:21	11:46	12:45	13:43
N 10°		00:36	01:19	11:55	12:49	13:42
0°		00:30	01:18	12:04	12:53	13:41
S 10°		00:23	01:17	12:13	12:57	13:39
20°		00:17	01:15	12:22	13:01	13:38
30°		00:09	01:14	12:33	13:05	13:36
35°		00:04	01:13	12:39	13:08	13:35
40°	23:59		01:12	12:45	13:10	13:34
45°	23:53		01:11	12:53	13:14	13:33
S 50°	23:46		01:09	13:03	13:18	13:32
52°	23:43		01:09	13:07	13:20	13:31
54°	23:39		01:08	13:12	13:21	13:30
56°	23:35		01:07	13:17	13:24	13:30
58°	23:30		01:07	13:23	13:26	13:29
S 60°	23:25		01:06	13:29	13:29	13:28
		_				

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-36%
30	02:27	02:23	11:58	05:52	18:17	
31	02:19	02:14	11:58	06:41	19:05	
01	02:09	02:05	11:58	07:29	19:53	

h	Aries	Ve	nus	M	ars	Jալ	oiter	Sat	urn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	250° 57.33	181°14.61	N21°57.79	227° 42.50	N08°27.34	191°15.79	N19°47.39	260°31.56	S06°8.79			
1	265°59.80	196°13.80	58.31	242°43.21	28.04	206°17.65	47.51	275°33.91	8.76	Alpheratz	357°35.44	29° 13.30
2	281°2.26	211°13.00	58.83	257°43.91	28.74	221°19.50	47.63	290°36.27	8.72	Ankaa	353°7.82	-42° 10.24
3	296°4.72	$226^{\circ}12.20$	• • 59.35	272°44.62	• • 29.44	$236^{\circ}21.36$	• • 47.75	305°38.62	• • 8.69	Schedar Diphda	349°31.93 348°47.97	56° 39.98 -17° 51.13
4	311°7.19	241°11.39	$21^{\circ}59.87$	287°45.33	30.13	251°23.22	47.87	320°40.98	8.65	Achernar	335°20.95	-17 51.13 -57°6.58
5	$326^{\circ}9.65$	256° 10.59	22°0.39	302°46.03	30.83	266°25.07	47.98	335°43.34	8.62	Hamal	327°52.06	23°34.53
6	341°12.12	271°9.78	N22°0.90	317°46.74	N08°31.53	281°26.93	N19°48.10	350°45.69	S06°8.58	Polaris	314°44.05	89°21.84
7	356° 14.58	286°8.98	1.42	332°47.44	32.22	296°28.79	48.22	5°48.05	8.55	Acamar	315°12.54	-40° 12.32
8	11° 17.04	301°8.17	1.93	347° 48.15	32.92	311°30.64	48.34	20°50.41	8.52	Menkar	314°6.99	4°11.07
9	26° 19.51	316°7.37	• • 2.44	2°48.85	• • 33.62	326°32.50	• • 48.46	35°52.77	• • 8.48	Mirfak	308°29.49	49°56.73
10	41°21.97	331°6.56	2.95	17°49.56	34.31	341°34.36	48.58	50°55.12	8.45	Aldebaran	290°40.57	16°33.46
11	56°24.44	346°5.75	3.46	32°50.26	35.01	356°36.21	48.70	65°57.48	8.41	Rigel	281°4.71	-8° 10.42
12 13	71°26.90 86°29.36	1°4.95 16°4.14	N22°3.97	47°50.97 62°51.67	N08°35.70 36.40	11°38.07 26°39.93	N19°48.82 48.94	80°59.84 96°2.20	\$06°8.38	Capella	280°23.14	46°1.34
14	101°31.83	31°3.33	4.48 4.99	77°52.38	37.10	20 39.93 41°41.78	49.06	90 2.20 111°4.55	8.34 8.31	Bellatrix	278°23.77	6°22.29
15	116° 34.29	46°2.52	• • 5.49	92°53.08	• • 37.79	56°43.64	• • 49.18	126°6.91	• • 8.28	Elnath	278°2.91	28° 37.67
16	131°36.76	61°1.71	6.00	107°53.79	38.49	71°45.50	49.29	141°9.27	8.24	Alnilam	275°38.59	-1°11.20
17	146°39.22	76°0.90	6.50	122°54.49	39.18	86°47.36	49.41	156°11.63	8.21	Betelgeuse	270°52.98	7°24.69
18	161°41.68	91°0.09	N22°7.00	137°55.20	N08°39.88	101°49.21	N19°49.53	171°13.99	S06°8.17	Canopus	263°53.14	-52° 42.57
19	176°44.15	105°59.28	7.51	152°55.90	40.57	116°51.07	49.65	186°16.35	8.14	Sirius	258°27.02	-16°45.01 -29°0.38
20	191°46.61	120°58.47	8.01	167°56.61	41.26	131°52.93	49.77	201°18.71	8.11	Adhara	255°6.61 244°51.64	-29°0.38 5°9.76
21	206°49.08	135°57.66	• • 8.51	182°57.31	• • 41.96	146°54.78	• • 49.89	216°21.06	• • 8.07	Procyon Pollux	244 51.04 243°18.23	27°58.12
22	221°51.54	150°56.85	9.00	197°58.02	42.65	161°56.64	50.01	231°23.42	8.04	Avior	234° 15.38	-59°35.43
23	236°54.01	165°56.04	9.50	212°58.72	43.35	176°58.50	50.13	246°25.78	8.01	Suhail	222°46.92	-43°32.04
Merr	pass. 07:15	v-0.8' d0	.5′ m-3.92	ν0 7' d0	.7′ m1.04	v1 9' d0	.1′ m-2.00	$\nu 2.4' \ d-0.$	0′ m1 02	Miaplacidus	221°38.85	-69°49.26
- IVICI.	7833. 07.13	- V 0.0 U0	.5 111 5.52			V1.5 UO	.1 111 2.00	ν Z.Ψ U U.		Alphard	217°48.40	-8°45.91
										Regulus	207°35.07	11°50.94
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.59	61°37.47
0	251°56.47	180°55.23	N22°10.00	227°59.43	N08°44.04	192°0.35	N19°50.24	261°28.14	S06°7.97	Denebola	182°25.40	14°26.21
1	266° 58.93	195°54.42	10.49	243°0.13	44.73	207°2.21	50.36	276°30.50	7.94	Gienah	$175^{\circ}44.01$	$-17^{\circ}40.76$
2	282°1.40	210°53.60	10.99	258°0.83	45.43	222°4.07	50.48	291°32.86	7.91	Acrux	173°0.43	-63° 14.33
3 4	297°3.86 312°6.33	225°52.79 240°51.98	· · 11.48 11.97	273°1.54 288°2.24	· · 46.12 46.81	237° 5.93 252° 7.78	• • 50.60 50.72	306°35.22 321°37.58	· · 7.87 7.84	Gacrux	171°52.00	-57° 15.25
5	312 0.33 327°8.79	255°51.16	12.46	303°2.95	47.51	267° 9.64	50.72	336°39.94	7.84	Alioth	166°13.11	55° 49.87
6	342° 11.25	270°50.35	N22°12.95	318° 3.65	N08°48.20	282°11.50	N19°50.95	351°42.30	S06°7.77	Spica	158°22.65	-11° 17.40
7	357° 13.72	285°49.54	13.44	333°4.36	48.89	297°13.35	51.07	6°44.66	7.74	Alkaid	152°52.05	49°11.64
8	12° 16.18	300°48.72	13.93	348°5.06	49.58	312°15.21	51.19	21°47.02	7.71	Hadar	148°36.27	-60°29.64
9	27° 18.65	315°47.90	• • 14.41	3°5.77	• • 50.28	327°17.07	51.31	36°49.38	• • 7.67	Menkent	147°57.94	-36°29.55
10	42°21.11	330°47.09	14.90	18°6.47	50.97	342°18.93	51.43	51°51.75	7.64	Arcturus Rigil Kent.	145°48.11 139°40.48	19°3.35 -60°56.34
11	57°23.57	345°46.27	15.38	33°7.18	51.66	357°20.78	51.55	66°54.11	7.61	Kochab	139 40.46 137°18.70	74°3.42
12	72°26.04	0°45.46	N22°15.86	48°7.88	N08°52.35	12°22.64	N19°51.66	81°56.47	S06°7.58	Zuben'ubi	136°56.30	-16°8.67
13	87°28.50	15°44.64	16.35	63°8.58	53.04	27°24.50	51.78	96°58.83	7.54	Alphecca	126°3.83	26° 37.95
14	102°30.97	30°43.82	16.83	78°9.29	53.73	42°26.35	51.90	112°1.19	7.51	Antares	112°16.10	-26°29.22
15	117°33.43	45°43.01	• • 17.31	93°9.99	• • 54.43	57°28.21	• • 52.02	127°3.55	• • 7.48	Atria	107°10.24	-69°4.28
16	132° 35.89	60°42.19	17.78	108° 10.70	55.12	72°30.07	52.13	142°5.91	7.45	Sabik	102°3.03	$-15^{\circ}45.35$
17	147°38.36	75°41.37	18.26	123°11.40	55.81	87°31.93	52.25	157°8.28	7.41	Shaula	$96^{\circ}10.66$	-37°7.28
18 19	162° 40.82 177° 43.29	90°40.55 105°39.73	N22°18.74	138° 12.11 153° 12.81	N08°56.50	102°33.78 117°35.64	N19°52.37	172°10.64 187°13.00		Rasalhague	95°58.69	12°32.45
20	177 45.29 192°45.75	105 39.73 120°38.91	19.21 19.69	168° 13.51	57.19 57.88	132°37.50	52.49 52.61	202°15.36	7.35 7.32	Eltanin	90°41.90	51°28.98
21	207° 48.22	135°38.09	. 20.16	183° 14.22	• • 58.57	147°39.36	52.72	202 15.30 217°17.73	• • 7.29	Kaus Aust.	83°32.82	-34°22.34
22	222°50.68	150°37.27	20.63	198° 14.92	59.26	162°41.21	52.84	232°20.09	7.25	Vega	80°33.18	38°48.20
23	237°53.14	165°36.45	21.10	213° 15.63	59.95	177°43.07	52.96	247°22.45	7.22	Nunki	75°48.08	-26° 15.96
										Altair	62°0.22	8°55.85
Mer.	pass. 07:11	ν -0.8' d0	.5′ m-3.92	$\nu 0.7' d0$.7′ m1.04	ν 1.9' d0	.1′ m-2.00	ν 2.4′ d-0.	0′ m1.01	Peacock	53°6.16 49°25.90	-56°39.20 45°21.76
										Deneb Enif	33°39.20	9°59.08
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.45	-46° 50.38
0	$252^{\circ}55.61$		N22°21.57	$228^{\circ}16.33$	$N09^{\circ}0.64$	192°44.93		262°24.81		Fomalhaut	15°15.08	-40° 30.30° -29° 29.47
1	267°58.07	195°34.81	22.04	243° 17.04	1.33	207°46.79	53.19	277°27.18	7.16	Scheat	13°45.73	28° 12.68
2	283°0.54	210°33.99	22.50	258° 17.74	2.02	222°48.64	53.31	292°29.54	7.13	Markab	13°30.43	15°20.03
3	298°3.00	225°33.17	• • 22.97	273°18.44	• • 2.71	237°50.50	• • 53.43	307°31.90	7.09	I 02 C	CIIA	
4	313°5.46	240°32.35	23.43	288° 19.15	3.39	252°52.36	53.55 53.66	322°34.27	7.06	Jun 02 Sun Venus	SHA 290°17.28	Mer.pass 11:56
5 6	328°7.93 343°10.39	255°31.53 270°30.70	23.90 N22°24.36	303° 19.85 318° 20.56	4.08 N09°4.77	267°54.22 282°56.07	53.66 N19°53.78	337°36.63 352°39.00	7.03		290 17.28 336°45.17	08:49
7	343° 10.39 358° 12.86	270° 30.70 285° 29.88	N22 24.36 24.82	318° 20.56 333° 21.26	N09 4.77 5.46	282°56.07 297°57.93	N19 53.78 53.90	7°41.36	\$06°7.00 6.97	Jupiter		11:14
8	13° 15.32	300°29.06	25.28	348° 21.20	6.15	312°59.79	53.90 54.01	7 41.30 22°43.72	6.94	Saturn	9°34.23	06:37
9	28° 17.79	315°28.24	. 25.28	3°22.67	• • 6.84	328° 1.65	54.13	37°46.09	• • 6.90			
10	43°20.25	330°27.41	26.19	18°23.37	7.52	343°3.50	54.25	52°48.45	6.87	Jun 03 Mon	SHA	Mer.pass
11	58°22.71	345°26.58	26.64	33°24.07	8.21	358° 5.36	54.36	67°50.82	6.84	Venus	288°58.76	11:57
12	73°25.18	0°25.76	N22°27.09	48°24.78	N09°8.90	13°7.22	N19°54.48	82°53.18	S 06°6.81	Mars	336°2.96	08:48
13	88°27.64	15°24.93	27.54	63°25.48	9.59	$28^{\circ}9.08$	54.60	97°55.55	6.78	Jupiter	300°3.89	11:11
14	103°30.11	30°24.09	27.99	$78^{\circ}26.19$	10.27	43°10.94	54.72	$112^{\circ}57.91$	6.75	Saturn	9°31.67	06:33
15	118° 32.57	45°23.26	• • 28.44	93°26.89	• 10.96	58°12.79	• • 54.83	128°0.28	• • 6.72	Jun 04 Tue	SHA	Mer.pass
16	133° 35.03	60°22.42	28.89	108° 27.59	11.65	73°14.65	54.95	143°2.64	6.69	Venus		11:58
17	148°37.50	75°21.58	29.35	123°28.30	12.33	88°16.51	55.07	158°5.01	6.66		$335^{\circ}20.72$	08:46
18	163°39.96	90°20.75	N22°29.80	138°29.00	N09°13.02	103°18.37	N19°55.18	173°7.37	506° 6.63	Jupiter		11:08
19	178° 42.43	105°19.91	30.26	153°29.70	13.71	118°20.22	55.30	188°9.74	6.59	Saturn	9°29.21	06:29
20	193°44.89	120°19.08	30.72	168°30.41	14.39	133°22.08	55.42	203°12.11	6.56	Horizor	ntal parallax	
21 22	208° 47.36 223° 49.82	135°18.26 150°17.43	· · 31.17 31.62	183°31.11 198°31.82	· · 15.08 15.76	148°23.94 163°25.80	• • 55.53 55.65	218°14.47 233°16.84	· · 6.53	11011201	Venus:	0.1
23	223 49.82 238° 52.28	165° 16.60	32.07	213° 32.52	16.45	163 25.80 178°27.66	55.77	233 16.84 248°19.20	6.50 6.47		Mars:	0.1
Mer.	oass. 07:07	ν -0.8′ d0	.5′ m-3.92	$ u$ 0.7 $^{\prime}$ d0	.7′ m1.04	u 1.9' d0	.1′ m-2.00	ν 2.4′ d-0.	0′ m1.01			

h	Su	n			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°29.99	N22°13.37	239°40.75	11.7'	N04°39.90	16.8'	59.5'	
1	195°29.89	13.68	254°11.49	11.7'	04°56.75	16.8'	59.5'	
2	210°29.79	14.00	268°42.19	11.7'	05°13.57	16.8'	59.5'	
3	225°29.69	• • 14.32	283°12.86	11.6'	05°30.36	16.8'	59.5'	
4	240°29.59	14.64	297°43.50	11.6'	05°47.13	16.7'	59.5'	
5 6	255°29.48 270°29.38	14.95 N22°15.27	312°14.10 326°44.67	11.6' 11.5'	06°3.87 N06°20.58	16.7' 16.7'	59.5' 59.5'	
7	270 29.36 285°29.28	15.58	341°15.20	11.5'	06°37.26	16.6'	59.5'	
8	300°29.18	15.90	355°45.69	11.5'	06°53.90	16.6'	59.5'	
9	315°29.08	. 16.21	10°16.14	11.4'	07°10.51	16.6'	59.5'	
10	330°28.97	16.52	24°46.55	11.4'	07°27.08	16.5'	59.5'	
11	345°28.87	16.83	$39^{\circ}16.92$	11.3'	07°43.62	16.5'	59.5'	
12	0°28.77	N22°17.14	53°47.25	11.3'	N08°0.12	16.5'	59.5'	
13	15°28.66	17.45	68°17.53	11.2'	08°16.57	16.4'	59.5'	
14 15	30°28.56 45°28.46	17.76 •• 18.07	82°47.77 97°17.96	11.2' 11.1'	08°32.99 08°49.35	16.4' 16.3'	59.5' 59.5'	
16	60°28.35	18.38	97 17.90 111°48.10	11.1	06 49.33 09°5.68	16.3	59.5'	
17	75°28.25	18.69	126°18.19	11.0'	09°21.95	16.2	59.5'	
18	90°28.15	N22°19.00	140°48.24	11.0'	N09°38.18	16.2'	59.5'	
19	105°28.04	19.30	155°18.23	10.9'	09°54.35	16.1'	59.5'	
20	120°27.94	19.61	169°48.16	10.9'	$10^{\circ}10.47$	16.1'	59.5'	
21	135°27.83	• • 19.91	$184^{\circ}18.05$	10.8'	$10^{\circ}26.54$	16.0'	59.5'	
22	150°27.73	20.22	198°47.88	10.8'	10°42.55	16.0'	59.5'	
23	165°27.62	20.52	213°17.65	10.7'	10°58.50	15.9'	59.5'	
	SD = 15.8′	d = 0.3'		SE	0 = 16.2'			
Mon	GHA	Dec	GHA	ν	Dec	d	НР	
0	180°27.52	N22°20.82	227°47.37	10.7'	N11°14.40	15.8'	59.5'	
1	195°27.41	21.13	242°17.03	10.6'	11°30.23	15.8'	59.5'	
2	210°27.31	21.43	256°46.63	10.5'	11°46.00	15.7'	59.5'	
3	225°27.20	• • 21.73	271°16.17	10.5'	12°1.70	15.6'	59.5'	
4	240°27.10	22.03	285°45.64	10.4'	12°17.34	15.6'	59.4'	
5	255°26.99	22.33	300°15.06	10.4'	12°32.92	15.5'	59.4	
6	270°26.89 285°26.78	N22°22.63 22.93	314°44.41 329°13.70	10.3' 10.2'	N12°48.42 13°3.85	15.4' 15.4'	59.4'	
7 8	285 26.78 300°26.67	22.93	343°42.93	10.2'	13 3.85 13°19.21	15.4	59.4' 59.4'	
9	315°26.57	23.52	358°12.08	10.2	13°34.49	15.2'	59.4'	
10	330°26.46	23.82	12°41.18	10.0'	13°49.70	15.1'	59.4'	
11	345°26.35	24.11	27°10.20	10.0'	14°4.83	15.1'	59.4'	
12	0°26.25	N22°24.41	41°39.16	9.9'	N14°19.88	15.0'	59.4'	
13	15°26.14	24.70	56°8.04	9.8'	14°34.85	14.9'	59.4'	
14	30°26.03	25.00	70°36.86	9.7'	14°49.73	14.8'	59.4'	
15	45°25.92	• • 25.29	85°5.60	9.7'	15°4.53	14.7'	59.4	
16	60°25.82	25.58 25.87	99°34.28 114°2.88	9.6'	15°19.25	14.6'	59.4'	
17 18	75°25.71 90°25.60	25.87 N22°26.16	114°2.88 128°31.41	9.5' 9.5'	15°33.87 N15°48.41	14.5' 14.4'	59.4' 59.3'	
19	90 25.00 105°25.49	26.45	128 31.41 142°59.87	9.5 9.4'	16°2.86	14.4' 14.4'	59.3'	
20	120°25.39	26.74	157°28.25	9.4	16° 17.21	14.3	59.3'	
21	135°25.28	27.03	171°56.56	9.2'	16°31.46	14.2'	59.3'	
22	150°25.17	27.32	186°24.79	9.2'	16°45.62	14.1'	59.3'	
23	165°25.06	27.61	200°52.94	9.1'	16°59.68	14.0'	59.3'	
	SD = 15.8′	d = 0.3'		SE	0 = 16.2'			
Tue	GHA	Dec	GHA	ν	Dec	d	НР	
0	180°24.95	N22°27.89	$215^{\circ}21.02$	9.0'	N17°13.65	13.9'	59.3'	
1	195°24.84	28.18	229°49.03	8.9'	17°27.51	13.8'	59.3'	
2	210°24.73	28.46	244°16.95	8.8'	17°41.26	13.7'	59.3'	
3	225°24.62 240°24.51	•• 28.75	258°44.80 273°12.57	8.8' 8.7'	17°54.91 18°8.46	13.5'	59.3'	
4 5	240°24.51 255°24.41	29.03 29.32	273°12.57 287°40.27	8.7° 8.6'	18°8.46 18°21.89	13.4' 13.3'	59.2' 59.2'	
6	255 24.41 270°24.30	29.32 N22°29.60	302°7.88	8.5'	N18°35.22	13.3	59.2'	
7	285°24.19	29.88	316°35.42	8.5'	18°48.43	13.1'	59.2'	
8	300°24.08	30.16	331°2.87	8.4'	19°1.53	13.0'	59.2'	
9	315°23.97	• • 30.44	345°30.25	8.3'	$19^{\circ}14.52$	12.9'	59.2'	
10	330°23.86	30.72	359°57.55	8.2'	19°27.38	12.7'	59.2'	
11	345°23.75	31.00	14°24.77	8.1'	19°40.13	12.6'	59.2'	
12	0°23.63	N22°31.28	28°51.91	8.1'	N19°52.76	12.5'	59.1'	
13 14	15°23.52 30°23.41	31.56	43°18.97 57°45.95	8.0' 7.9'	20°5.27	12.4'	59.1'	
14 15	30°23.41 45°23.30	31.83 · · 32.11	57°45.95 72°12.86	7.9° 7.8'	20°17.65 20°29.91	12.3' 12.1'	59.1' 59.1'	
16	60°23.19	32.39	72 12.60 86°39.68	7.0 7.7'	20°29.91	12.1	59.1'	
17	75°23.08	32.66	101°6.42	7.7'	20°54.05	11.9'	59.1'	
18	90°22.97	N22°32.94	115°33.09	7.6'	N21°5.93	11.7'	59.1'	
19	105°22.86	33.21	129°59.68	7.5'	21°17.67	11.6'	59.0'	
20	120°22.74	33.48	$144^{\circ}26.19$	7.4'	21°29.28	11.5'	59.0'	
21	135°22.63	• • 33.75	158°52.62	7.4'	21°40.76	11.3'	59.0'	
22	150°22.52	34.03	173°18.97	7.3'	21°52.10	11.2'	59.0'	
23	165°22.41	34.30	187°45.25	7.2'	22°3.30	11.1'	59.0'	
	SD = 15.8'	d = 0.3'		SE	0 = 16.2'			

Lat.	Twi	light	Sunrise	Sunset	Twilight	
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:01	22:59	////	////
64°	////	////	01:52	22:06	////	////
62°	////	////	02:23	21:35	////	////
60°	////	01:19	02:46	21:12	22:40	////
N 58°	////	01:56	03:04	20:53	22:02	////
56°	////	02:21	03:20	20:38	21:37	////
54°	01:12	02:41	03:33	20:24	21:17	22:47
52°	01:46	02:57	03:44	20:13	21:00	22:12
50°	02:10	03:11	03:54	20:03	20:46	21:48
45°	02:51	03:39	04:15	19:42	20:18	21:06
N 40°	03:19	04:00	04:32	19:24	19:57	20:38
35°	03:41	04:17	04:47	19:10	19:39	20:16
30°	03:59	04:32	04:59	18:58	19:25	19:58
20°	04:27	04:56	05:20	18:37	19:01	19:30
N 10°	04:48	05:15	05:38	18:19	18:42	19:08
0°	05:06	05:32	05:55	18:02	18:24	18:50
S 10°	05:22	05:49	06:11	17:45	18:08	18:34
20°	05:38	06:05	06:29	17:28	17:51	18:19
30°	05:53	06:23	06:49	17:07	17:34	18:03
35°	06:01	06:33	07:01	16:56	17:24	17:55
40°	06:10	06:44	07:14	16:42	17:12	17:46
45°	06:20	06:57	07:30	16:26	17:00	17:37
S 50°	06:31	07:12	07:49	16:07	16:45	17:26
52°	06:35	07:19	07:59	15:58	16:38	17:21
54°	06:41	07:26	08:09	15:47	16:30	17:16
56°	06:46	07:35	08:21	15:35	16:22	17:10
58°	06:53	07:44	08:34	15:22	16:12	17:04
S 60°	06:59	07:55	08:50	15:06	16:01	16:57
				ı		

Lat.		Moonris	е	Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	01:03	00:20 23:01		16:32	19:39	
N 70°	01:10	00:38 23:49		16:17	18:53	
68°	01:15	00:52	00:20 22:53	16:05	18:24	21:45
66°	01:20	01:04	00:43	15:55	18:02	20:31
64°	01:24	01:14	01:02	15:47	17:45	19:55
62°	01:27	01:22	01:17	15:40	17:31	19:29
60°	01:30	01:30	01:30	15:34	17:19	19:09
N 58°	01:33	01:36	01:41	15:29	17:09	18:52
56°	01:35	01:42	01:51	15:24	17:00	18:38
54°	01:37	01:47	02:00	15:20	16:52	18:26
52°	01:39	01:52	02:08	15:17	16:45	18:16
50°	01:41	01:56	02:15	15:13	16:39	18:07
45°	01:45	02:06	02:30	15:06	16:26	17:47
N 40°	01:48	02:14	02:43	15:00	16:15	17:31
35°	01:51	02:21	02:53	14:55	16:05	17:18
30°	01:54	02:27	03:03	14:50	15:57	17:06
20°	01:58	02:37	03:19	14:42	15:43	16:46
N 10°	02:02	02:47	03:34	14:36	15:31	16:29
0°	02:06	02:55	03:47	14:29	15:20	16:13
S 10°	02:10	03:04	04:01	14:23	15:08	15:57
20°	02:14	03:14	04:16	14:16	14:56	15:40
30°	02:19	03:25	04:33	14:08	14:43	15:21
35°	02:22	03:31	04:43	14:04	14:35	15:10
40°	02:25	03:39	04:55	13:59	14:26	14:57
45°	02:29	03:48	05:08	13:53	14:15	14:42
S 50°	02:33	03:58	05:25	13:46	14:03	14:24
52°	02:35	04:03	05:33	13:43	13:57	14:15
54°	02:37	04:08	05:42	13:40	13:51	14:05
56°	02:40	04:14	05:52	13:36	13:44	13:55
58°	02:43	04:21	06:03	13:32	13:36	13:42
S 60°	02:46	04:29	06:17	13:27	13:27	13:28

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-8%
02	02:00	01:55	11:58	08:18	20:42	
03	01:50	01:45	11:58	09:07	21:33	
04	01:40	01:35	11:58	10:00	22:28	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	253°54.75	180°15.77 N22°32.51	228°33.22 N09°17.13	193°29.51 N19°55.88	263°21.57 \$06°6.44	
1	268° 57.21	195°14.95 32.96	243°33.93 17.82	208°31.37 56.00	278°23.94 6.41	Alpheratz 357°35.41 29°13.30
2	$283^{\circ}59.68$	210°14.12 33.40	258°34.63 18.50	223°33.23 56.11	293°26.30 6.38	Ankaa 353°7.79 -42°10.23 Schedar 349°31.89 56°39.98
3	299°2.14	225°13.29 · · 33.84	273°35.33 ·· 19.19	238°35.09 · · 56.23	308°28.67 · · 6.35	Diphda 348°47.95 -17°51.12
4	314°4.60	240°12.46 34.28	288°36.04 19.87	253°36.95 56.35	323°31.04 6.32	Achernar 335°20.93 -57°6.56
5 6	329°7.07 344°9.53	255°11.63 34.72 270°10.80 N22°35.16	303°36.74 20.56 318°37.44 N09°21.24	268°38.80 56.46 283°40.66 N19°56.58	338°33.41 6.29 353°35.77 \$06°6.26	Hamal 327°52.04 23°34.53
7	359° 12.00	285°9.97 35.59	333°38.15 21.93	298°42.52 56.70	8°38.14 6.23	Polaris 314°42.91 89°21.83
8	14°14.46	300°9.14 36.03	348°38.85 22.61	313°44.38 56.81	23°40.51 6.20	Acamar 315°12.53 -40°12.30
9	29° 16.93	315°8.31 · · 36.46	3°39.55 · · 23.29	328°46.24 · · 56.93	38°42.88 · · 6.17	Menkar 314° 6.97 4° 11.08
10	$44^{\circ}19.39$	330°7.47 36.89	18° 40.26 23.98	343°48.10 57.04	53°45.25 6.14	Mirfak 308°29.47 49°56.72 Aldebaran 290°40.56 16°33.46
11	59°21.85	345°6.64 37.32	33°40.96 24.66	358°49.95 57.16	68°47.61 6.11	Rigel 281°4.70 -8°10.42
12	74°24.32	0°5.81 N22°37.75	48°41.66 N09°25.34	13°51.81 N19°57.27	83°49.98	Capella 280°23.13 46°1.33
13 14	89°26.78 104°29.25	15°4.97 38.18 30°4.14 38.61	63° 42.36 26.02 78° 43.07 26.71	28°53.67 57.39 43°55.53 57.51	98°52.35 6.05 113°54.72 6.02	Bellatrix 278°23.77 6°22.29
15	119°31.71	45°3.31 · · 39.04	93°43.77 · · 27.39	58°57.39 · · 57.62	128°57.09 · · 5.99	Elnath 278°2.90 28°37.66
16	134°34.18	60°2.47 39.46	108° 44.47 28.07	73°59.25 57.74	143°59.46 5.97	Alnilam 275°38.58 -1°11.19
17	149°36.64	75°1.64 39.89	123°45.18 28.75	89° 1.10 57.85	159°1.83 5.94	Betelgeuse 270°52.97 7°24.69 Canopus 263°53.15 -52°42.56
18	164°39.10	90°0.80 N22°40.31	138°45.88 N09°29.44	104°2.96 N19°57.97	174°4.20 \$06°5.91	Sirius 258°27.01 -16°45.01
19	179°41.57	104°59.96 40.73	153° 46.58 30.12	119° 4.82 58.08	189°6.56 5.88	Adhara 255°6.61 -29°0.37
20	194° 44.03	119°59.13 41.15	168° 47.29 30.80	134° 6.68 58.20	204°8.93 5.85	Procyon 244°51.64 5°9.76
21 22	209° 46.50 224° 48.96	134°58.29 · · 41.57 149°57.45 41.99	183°47.99 · · 31.48 198°48.69 32.16	149°8.54 · · 58.32 164°10.40 58.43	219°11.30 · · 5.82 234°13.67 5.79	Pollux 243°18.23 27°58.12
23	239°51.42	164°56.62 42.41	213°49.39 32.84	179°12.26 58.55	249°16.04 5.76	Avior 234°15.40 -59°35.43
						Suhail 222°46.93 -43°32.04
Mer.	pass. 07:03	ν-0.8' d0.4' m-3.92	ν 0.7′ d 0.7′ m 1.04	ν1.9' d0.1' m-2.00	ν2.4' d-0.0' m1.01	Miaplacidus 221°38.88 -69°49.26 Alphard 217°48.40 -8°45.91
						Alphard 217°48.40 -8°45.91 Regulus 207°35.07 11°50.94
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.62 61°37.47
0	254°53.89	179°55.78 N22°42.82	228°50.10 N09°33.52	194°14.11 N19°58.66	264°18.41 S06°5.73	Denebola 182°25.41 14°26.21
1	269° 56.35	194°54.94 43.24	243°50.80 34.20	209°15.97 58.78	279°20.78 5.70	Gienah 175°44.01 -17°40.76
2	284°58.82 300°1.28	209°54.10 43.65 224°53.27 •• 44.07	258° 51.50 34.88 273° 52.21 · · · 35.57	224°17.83 58.89 239°19.69 •• 59.01	294°23.16 5.68 309°25.53 · · 5.65	Acrux 173°0.45 -63°14.34
4	315°3.75	239°52.43 44.48	288° 52.91 36.25	254°21.55 59.12	324°27.90 5.62	Gacrux 171°52.02 -57°15.25
5	330°6.21	254°51.59 44.89	303°53.61 36.93	269°23.41 59.24	339°30.27 5.59	Alioth 166°13.13 55°49.88
6	345°8.67	269°50.75 N22°45.30	318°54.31 N09°37.60	284°25.27 N19°59.35	354°32.64 \$06°5.56	Spica 158°22.65 -11°17.40 Alkaid 152°52.06 49°11.65
7	$0^{\circ}11.14$	284°49.91 45.71	333°55.02 38.28	299°27.12 59.47	9°35.01 5.53	Hadar 148°36.27 -60°29.64
8	15° 13.60	299°49.07 46.11	348°55.72 38.96	314°28.98 59.58	24°37.38 5.50	Menkent 147°57.94 -36°29.55
9	30°16.07	314°48.23 · · 46.52	3°56.42 · · 39.64	329°30.84 · · 59.70	39°39.75 · · 5.48	Arcturus 145°48.12 19°3.36
10 11	45° 18.53 60° 21.00	329°47.39 46.93 344°46.54 47.33	18° 57.12 40.32 33° 57.83 41.00	344°32.70 59.81 359°34.56 19°59.93	54°42.12 5.45 69°44.50 5.42	Rigil Kent. 139°40.48 -60°56.35
12	75°23.46	359°45.70 N22°47.73	48°58.53 N09°41.68	14°36.42 N20°0.04	84°46.87 S06°5.39	Kochab 137°18.74 74°3.43
13	90°25.92	14°44.86 48.13	63°59.23 42.36	29°38.28 0.16	99°49.24 5.36	Zuben'ubi 136°56.30 -16°8.67 Alphecca 126°3.82 26°37.96
14	$105^{\circ}28.39$	29°44.02 48.53	78°59.93 43.04	44°40.14 0.27	114°51.61 5.34	Antares 112° 16.09 -26° 29.22
15	120°30.85	44°43.18 · · 48.93	94°0.64 · · 43.71	59°42.00 · · 0.39	129°53.99 · · 5.31	Atria 107°10.21 -69°4.29
16	135°33.32	59°42.33 49.33	109°1.34 44.39	74°43.85 0.50	144°56.36 5.28	Sabik 102°3.02 -15°45.34
17 18	150° 35.78 165° 38.24	74°41.49 49.73 89°40.65 N22°50.12	124°2.04 45.07 139°2.74 N09°45.75	89°45.71 0.62 104°47.57 N20°0.73	159°58.73 5.25 175°1.10 \$06°5.23	Shaula 96°10.64 -37°7.29
19	180° 40.71	104°39.80 50.52	154°3.45 46.42	119°49.43 0.84	190°3.48 5.20	Rasalhague 95°58.68 12°32.46
20	195°43.17	119°38.96 50.91	169°4.15 47.10	134°51.29 0.96	205°5.85 5.17	Eltanin 90°41.89 51°29.00 Kaus Aust. 83°32.80 -34°22.34
21	210°45.64	134°38.11 · · 51.31	184°4.85 · · 47.78	149°53.15 · · 1.07	220°8.22 · · 5.14	Vega 80°33.17 38°48.21
22	225°48.10	149°37.27 51.70	199°5.55 48.45	164°55.01 1.19	235°10.60 5.12	Nunki 75°48.06 -26°15.95
23	240°50.57	164°36.42 52.09	214°6.25 49.13	179°56.87 1.30	250°12.97 5.09	Altair 62°0.20 8°55.87
Mer.p	pass. 06:59	ν -0.8 $'$ d0.4 $'$ m-3.92	$ u 0.7' \ d0.7' \ m1.03$	$ u 1.9' \ d0.1' \ { m m-}2.00$	ν 2.4′ <i>d</i> -0.0′ m1.00	Peacock 53°6.12 -56°39.20
						Deneb 49°25.87 45°21.77
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.18 9°59.09 Al Na'ir 27°33.42 -46°50.37
0	255°53.03	179°35.58 N22°52.48	229°6.96 N09°49.81	194°58.73 N20°1.42	265°15.34 S 06°5.06	Fomalhaut 15°15.06 -29°29.46
1	270°55.49	194°34.73 52.86	244°7.66 50.48	210°0.59 1.53	280°17.72 5.03	Scheat 13°45.70 28°12.69
2	285° 57.96	209°33.89 53.25	259°8.36 51.16	225° 2.45 1.64	295°20.09 5.01	Markab 13°30.41 15°20.05
3	301°0.42 316°2.89	224°33.04 · · 53.64 239°32.19 54.02	274°9.06 · · 51.83	240°4.31 · · 1.76	310°22.47 · · 4.98	Jun 05 Wed SHA Mer.pass
4 5	331° 5.35	239°32.19 54.02 254°31.34 54.40	289° 9.77 52.51 304° 10.47 53.19	255° 6.17 1.87 270° 8.02 1.99	325°24.84 4.95 340°27.22 4.93	Venus 286°21.03 12:00
6	346°7.82	269°30.50 N22°54.79	319°11.17 N09°53.86	285°9.88 N20°2.10	355°29.59 S06°4.90	Mars 334°38.47 08:45
7	1°10.28	284°29.65 55.17	334°11.87 54.54	300°11.74 2.22	10°31.97 4.87	Jupiter 299°34.77 11:05
8	$16^{\circ}12.74$	299°28.80 55.55	349°12.57 55.21	315°13.60 2.33	25°34.34 4.85	Saturn 9°26.82 06:26
9	31° 15.21	314°27.95 · · 55.93	4°13.28 · · 55.88	330°15.46 · · 2.44	40°36.72 · · 4.82	Jun 06 Thu SHA Mer.pass
10	46° 17.67	329°27.10 56.30	19°13.98 56.56	345°17.32 2.56	55°39.09 4.79	Venus 285°1.89 12:01
11	61°20.14 76°22.60	344°26.26 56.68 359°25.41 N22°57.05	34°14.68 57.23 49°15.38 N09°57.91	0°19.18 2.67 15°21.04 N20°2.78	70°41.47 4.77 85°43.84 \$06°4.74	Mars 333°56.21 08:44
12 13	91°25.07	14°24.56 57.43	64°16.08 58.58	30°22.90 2.90	100°46.22 4.71	Jupiter 299°20.22 11:02
14	106°27.53	29°23.71 57.80	79°16.78 59.25	45°24.76 3.01	115°48.59 4.69	Saturn 9°24.53 06:22
15	121°29.99	44°22.86 · · 58.17	94°17.49 09°59.93	60°26.62 · · 3.12	130°50.97 · · 4.66	Jun 07 Fri SHA Mer.pass
16	$136^{\circ}32.46$	59°22.01 58.54	$109^{\circ}18.19$ $10^{\circ}0.60$	75°28.48 3.24	145°53.35 4.63	Venus 283°42.55 12:02
17	151°34.92	74°21.16 58.91	124°18.89 1.27	90°30.34 3.35	160°55.72 4.61	Mars 333°13.93 08:43
18	166° 37.39	89°20.31 N22°59.28	139°19.59 N10°1.95	105°32.20 N20°3.47	175°58.10 \$06°4.58	Jupiter 299° 5.70 10:59
19 20	181°39.85 196°42.32	104°19.45 22°59.65 119°18.60 23°0.02	154°20.29 2.62 169°20.99 3.29	120°34.06 3.58 135°35.92 3.69	191°0.48 4.56 206°2.85 4.53	Saturn 9°22.31 06:18
20	196 42.32 211°44.78	134°17.75 · · 0.38	184°21.70 · · 3.96	150°37.78 · · 3.81	200 2.85 4.53 221°5.23 · · 4.50	Horizontal parallax
22	226° 47.24	149°16.90 0.74	199°22.40 4.64	165°39.64 3.92	236°7.61 4.48	Venus: 0.1
23	241°49.71	164°16.05 1.11	214°23.10 5.31	180°41.50 4.03	251°9.98 4.45	Mars: 0.1
Mer.	pass. 06:55	ν-0.8' d0.4' m-3.92	ν0.7' d0.7' m1.03	ν1.9' d0.1' m-2.00	ν2.4' d-0.0' m1.00	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°22.30	N22°34.57	202°11.45	7.1'	$N22^{\circ}14.36$	10.9'	59.0'
1	195°22.18	34.84	216°37.57	7.0'	22°25.29	10.8'	58.9'
2 3	210°22.07 225°21.96	35.11 •• 35.37	231°3.62 245°29.59	7.0' 6.9'	22°36.07 22°46.71	10.6' 10.5'	58.9' 58.9'
4	240°21.85	35.64	259°55.49	6.8'	22°57.20	10.3	58.9'
5	255°21.73	35.91	274°21.32	6.8'	$23^{\circ}7.55$	10.2'	58.9'
6	270°21.62 285°21.51	N22°36.17	288°47.07	6.7'	N23°17.75	10.1'	58.9'
7 8	300°21.39	36.44 36.70	303°12.75 317°38.37	6.6' 6.5'	23°27.80 23°37.70	9.9' 9.7'	58.8' 58.8'
9	315°21.28	• • 36.97	332°3.91	6.5	23°47.45	9.6'	58.8'
10	330°21.17	37.23	346°29.38	6.4'	23°57.04	9.4'	58.8'
11	345°21.05 0°20.94	37.49	0°54.78 15°20.12	6.3'	24°6.49	9.3'	58.8'
12 13	15°20.94	N22°37.76 38.02	15°20.12 29°45.39	6.3' 6.2'	N24°15.77 24°24.90	9.1' 9.0'	58.7' 58.7'
14	30°20.71	38.28	44°10.59	6.1	24°33.87	8.8'	58.7'
15	45°20.60	• • 38.54	58°35.73	6.1'	24°42.69	8.7'	58.7'
16	60°20.48 75°20.37	38.80	73°0.81 87°25.83	6.0' 6.0'	24°51.34 24°59.83	8.5' 8.3'	58.7'
17 18	90°20.25	39.06 N22°39.31	87 25.83 101°50.79	5.9'	N25°8.16	8.2'	58.6' 58.6'
19	105°20.14	39.57	116° 15.69	5.8'	25° 16.32	8.0'	58.6'
20	120°20.02	39.83	130°40.53	5.8'	25°24.32	7.8'	58.6'
21	135°19.91 150°19.79	• • 40.08	145°5.32	5.7'	25°32.15	7.7'	58.6'
22 23	150°19.79 165°19.67	40.34 40.59	159°30.05 173°54.73	5.7' 5.6'	25°39.82 25°47.32	7.5' 7.3'	58.5' 58.5'
	SD = 15.8'	d = 0.3'			D = 16.1'		20.0
	JD — 13.0°	u — 0.5		3	U — 10.1		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°19.56	N22°40.85	188°19.37	5.6'	N25°54.65	7.2'	58.5'
1 2	195°19.44 210°19.33	41.10 41.35	202°43.95 217°8.48	5.5' 5.5'	26°1.81 26°8.80	7.0' 6.8'	58.5' 58.4'
3	225°19.21	41.60	231°32.97	5.4'	26° 15.62	6.6'	58.4
4	240°19.10	41.85	245°57.41	5.4'	$26^{\circ}22.26$	6.5'	58.4'
5	255°18.98	42.10	260°21.81	5.4'	26°28.73	6.3'	58.4'
6 7	270°18.86 285°18.75	N22°42.35 42.60	274°46.18 289°10.50	5.3' 5.3'	N26°35.03 26°41.16	6.1' 5.9'	58.3' 58.3'
8	300°18.63	42.85	303°34.79	5.3'	26°47.11	5.8'	58.3'
9	315°18.51	• • 43.10	317°59.04	5.2'	$26^{\circ}52.88$	5.6'	58.3'
10	330°18.40 345°18.28	43.34	332°23.26	5.2' 5.2'	26°58.48 27°3.90	5.4'	58.3'
11 12	0°18.16	43.59 N22°43.84	346°47.45 1°11.61	5.2 5.1'	N27°9.14	5.2' 5.1'	58.2' 58.2'
13	15°18.04	44.08	15°35.74	5.1'	27°14.20	4.9'	58.2'
14	30°17.93	44.32	29°59.86	5.1'	$27^{\circ}19.09$	4.7'	58.2'
15 16	45°17.81 60°17.69	· · 44.57 44.81	44°23.94 58°48.01	5.1' 5.1'	27°23.79 27°28.32	4.5' 4.3'	58.1' 58.1'
17	75°17.57	44.01	73°12.06	5.0'	27°32.67	4.3 4.2'	58.1
18	90°17.46	N22°45.29	87°36.10	5.0'	N27°36.83	4.0'	58.1'
19	105°17.34	45.53	102°0.12	5.0'	27°40.82	3.8'	58.0'
20 21	120°17.22 135°17.10	45.77 •• 46.01	116°24.13 130°48.14	5.0' 5.0'	27° 44.62 27° 48.25	3.6' 3.4'	58.0' 58.0'
22	150°16.98	46.25	145°12.13	5.0'	27°51.69	3.3'	57.9'
23	$165^{\circ}16.86$	46.49	159°36.12	5.0'	27°54.95	3.1'	57.9'
	SD = 15.8'	d = 0.3'		S	D = 16.0'		
Fri 0	GHA 180° 16.75	Dec N22°46.73	GHA 174°0.11	ν 5.0'	Dec N27° 58.03	d 2.9'	HP 57.9'
1	180 16.75 195°16.63	46.96	174 0.11 188°24.11	5.0'	28° 0.93	2.9 2.7'	57.9'
2	210°16.51	47.20	202°48.10	5.0'	$28^{\circ}3.65$	2.5'	57.8'
3	225°16.39	• • 47.43	217°12.10 231°36.11	5.0'	28°6.18	2.4'	57.8'
4 5	240°16.27 255°16.15	47.67 47.90	231°36.11 246°0.12	5.0' 5.0'	28°8.54 28°10.71	2.2' 2.0'	57.8' 57.8'
6	270°16.03	N22°48.13	260°24.15	5.0'	N28° 12.70	1.8'	57.7'
7	285°15.91	48.37	274°48.20	5.1'	28° 14.51	1.6'	57.7'
8 9	300°15.79 315°15.67	48.60 •• 48.83	289°12.26 303°36.34	5.1' 5.1'	28°16.14 28°17.58	1.4' 1.3'	57.7' 57.6'
9 10	315°15.67 330°15.55	49.06	303°36.34 318°0.44	5.1'	28° 17.58 28° 18.85	1.3	57.6'
11	345°15.43	49.29	332°24.57	5.2'	28°19.94	0.9'	57.6'
12	0°15.31	N22°49.52	346°48.72	5.2'	N28° 20.85	0.7'	57.6'
13 14	15°15.19 30°15.07	49.74 49.97	1°12.90 15°37.11	5.2' 5.2'	28°21.57 28°22.12	0.5' 0.4'	57.5' 57.5'
14 15	45°14.95	49.97 •• 50.20	30°1.36	5.2	28° 22.12 28° 22.49	0.4	57.5'
16	60°14.83	50.42	44°25.64	5.3'	28°22.68	0.0'	57.4'
17	75°14.71	50.65	58°49.96	5.4'	28°22.70	-0.2'	57.4'
18 19	90°14.59 105°14.47	N22°50.87 51.10	73°14.32 87°38.72	5.4' 5.4'	N28°22.54 28°22.20	-0.3' -0.5'	57.4' 57.4'
20	105 14.47 120° 14.35	51.10 51.32	102°3.17	5.4	28° 22.20 28° 21.68	-0.5° -0.7'	57.4° 57.3'
21	135°14.23	• • 51.54	116°27.66	5.5'	28°20.99	-0.9'	57.3'
22	150°14.11	51.76	130°52.21	5.6'	28°20.12	-1.0'	57.3'
23	165°13.98	51.99	145°16.80	5.6'	28°19.09	-1.2'	57.2'
	SD = 15.8'	d = 0.2'		S	D = 15.8'		

Lat.	Twi	light	Sunrise	Sunset	Twilight	
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:47	23:15	////	////
64°	////	////	01:46	22:14	////	////
62°	////	////	02:18	21:40	////	////
60°	////	01:11	02:42	21:16	22:49	////
N 58°	////	01:51	03:01	20:57	22:08	////
56°	////	02:17	03:17	20:41	21:41	////
54°	01:05	02:38	03:31	20:28	21:20	22:55
52°	01:42	02:55	03:42	20:16	21:03	22:17
50°	02:06	03:09	03:53	20:05	20:49	21:52
45°	02:49	03:37	04:14	19:44	20:21	21:09
N 40°	03:18	03:59	04:31	19:26	19:59	20:40
35°	03:40	04:17	04:46	19:12	19:41	20:18
30°	03:58	04:31	04:59	18:59	19:26	20:00
20°	04:26	04:55	05:20	18:38	19:02	19:31
N 10°	04:48	05:15	05:38	18:19	18:42	19:09
0°	05:07	05:33	05:55	18:02	18:25	18:51
S 10°	05:23	05:49	06:12	17:46	18:08	18:34
20°	05:39	06:06	06:30	17:28	17:51	18:19
30°	05:54	06:24	06:50	17:07	17:33	18:03
35°	06:03	06:34	07:02	16:55	17:23	17:55
40°	06:12	06:46	07:16	16:41	17:12	17:46
45°	06:22	06:59	07:32	16:25	16:59	17:36
S 50°	06:33	07:14	07:52	16:05	16:43	17:25
52°	06:38	07:21	08:01	15:56	16:36	17:20
54°	06:43	07:29	08:12	15:45	16:28	17:14
56°	06:49	07:38	08:24	15:33	16:20	17:08
58°	06:55	07:47	08:38	15:19	16:10	17:02
S 60°	07:02	07:58	08:54	15:03	15:59	16:55

Lat.		Moonris	e	Moonset		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°	00:08					
64°	00:45 23:59	00:00		22:41		
62°	01:12	01:06	00:50	21:35	23:57	
60°	01:33	01:41	02:02	21:01	22:44	23:53
N 58°	01:50	02:06	02:38	20:36	22:09	23:16
56°	02:05	02:27	03:04	20:16	21:43	22:49
54°	02:18	02:44	03:24	19:59	21:23	22:28
52°	02:29	02:58	03:41	19:45	21:06	22:10
50°	02:39	03:11	03:56	19:33	20:51	21:55
45°	03:00	03:38	04:26	19:07	20:21	21:25
N 40°	03:17	03:59	04:50	18:47	19:58	21:01
35°	03:31	04:16	05:09	18:30	19:39	20:41
30°	03:44	04:31	05:26	18:15	19:23	20:25
20°	04:06	04:57	05:54	17:51	18:55	19:56
N 10°	04:25	05:20	06:18	17:30	18:31	19:32
0°	04:43	05:41	06:41	17:10	18:09	19:09
S 10°	05:01	06:02	07:03	16:50	17:47	18:46
20°	05:20	06:25	07:28	16:29	17:24	18:22
30°	05:42	06:51	07:56	16:05	16:56	17:53
35°	05:56	07:07	08:13	15:51	16:40	17:36
40°	06:11	07:25	08:33	15:35	16:21	17:17
45°	06:29	07:47	08:57	15:15	15:58	16:53
S 50°	06:52	08:16	09:28	14:51	15:29	16:22
52°	07:04	08:30	09:43	14:40	15:15	16:06
54°	07:16	08:46	10:01	14:26	14:59	15:48
56°	07:31	09:05	10:23	14:11	14:39	15:26
58°	07:48	09:29	10:51	13:53	14:15	14:58
S 60°	08:09	10:00	11:31	13:32	13:43	14:18

	Sun				Moon	
Day	Day Eqn.of Time		Mer. Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper Lower		28-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-0%
05	01:29	01:24	11:59	10:56	23:25	
06	01:18	01:13	11:59	11:55	-:-	
07	01:07	01:01	11:59	12:55	00:25	

h	Aries	Ver	านร	M	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	256° 52.17	179°15.19	N23°1.47	229°23.80	N10°5.98	195°43.36	N20°4.15	266°12.36	S06°4.43	A l1		29°13.31
1	271°54.64	194°14.34	1.83	244°24.50	6.65	210°45.22	4.26	281°14.74	4.40	Alpheratz Ankaa	357°35.38 353°7.76	-42° 10.21
2	286° 57.10	209°13.49	2.19	259°25.20	7.32	225°47.08	4.37	296°17.12	4.38	Schedar	349°31.85	56° 39.98
3	301°59.56	224°12.63	• • 2.55	274°25.90	• • 7.99	240°48.94	• • 4.48	311°19.50	• • 4.35	Diphda	348°47.92	-17°51.10
4 5	317°2.03 332°4.49	239°11.78 254°10.92	2.90	289°26.61 304°27.31	8.66 9.33	255°50.80 270°52.66	4.60	326°21.87 341°24.25	4.33	Achernar	$335^{\circ}20.90$	-57°6.55
6	347°6.96	269° 10.92	3.26 N23°3.61	319° 28.01	9.55 N10°10.00	285° 54.52	4.71 N20°4.82	356°26.63	4.30 \$06°4.27	Hamal	$327^{\circ}52.01$	23°34.54
7	2°9.42	284°9.21	3.97	334°28.71	10.67	300°56.38	4.94	11°29.01	4.25	Polaris	314°41.74	89°21.82
8	17° 11.89	299°8.36	4.32	349°29.41	11.34	315°58.24	5.05	26°31.39	4.22	Acamar	315°12.51	-40°12.29
9	$32^{\circ}14.35$	$314^{\circ}7.50$	• • 4.67	4°30.11	· · 12.01	331°0.10	• • 5.16	41°33.77	• • 4.20	Menkar Mirfak	314°6.95 308°29.44	4°11.09 49°56.72
10	47° 16.81	329°6.65	5.02	19°30.81	12.68	346° 1.96	5.27	56°36.15	4.17	Aldebaran	290°40.54	16° 33.46
11	62° 19.28	344°5.79	5.37	34°31.51	13.35	1°3.82	5.39	71°38.52	4.15	Rigel	281°4.69	-8° 10.41
12	77°21.74	359°4.94	N23°5.72	49°32.22	N10°14.02	16° 5.68	N20°5.50	86°40.90	S06°4.12	Capella	280°23.11	46°1.32
13 14	92°24.21 107°26.67	14°4.08 29°3.22	6.06 6.41	64°32.92 79°33.62	14.69 15.36	31°7.54 46°9.40	5.61 5.72	101°43.28 116°45.66	4.10 4.07	Bellatrix	278°23.75	6°22.30
15	122°29.14	44°2.37	6.75	94°34.32	16.03	61°11.26	5.84	131°48.04	• • 4.05	Elnath	278°2.88	28° 37.66
16	137°31.60	59°1.51	7.09	109°35.02	16.70	$76^{\circ}13.12$	5.95	146°50.42	4.03	Alnilam	275°38.57 270°52.96	-1°11.19
17	$152^{\circ}34.06$	74°0.65	7.44	124°35.72	17.37	$91^{\circ}14.98$	6.06	161°52.80	4.00	Betelgeuse Canopus	270 52.96 263°53.15	7°24.69 -52°42.55
18	167°36.53	88°59.79	N23°7.78	139°36.42	N10°18.03	106°16.84	N20°6.17	176°55.18	S06°3.98	Sirius	258°27.01	-16° 45.00
19	182°38.99	103°58.93	8.12	154° 37.12	18.70	121°18.70	6.29	191°57.56	3.95	Adhara	255°6.61	-29°0.36
20 21	197° 41.46 212° 43.92	118°58.08 133°57.22	8.45 •• 8.79	169° 37.82 184° 38.52	19.37 •• 20.04	136°20.56 151°22.43	6.40 •• 6.51	206°59.94 222°2.32	3.93 · · 3.90	Procyon	244°51.64	5°9.76
22	212 45.92 227°46.38	148° 56.36	9.13	199° 39.23	20.70	166°24.29	6.62	237°4.71	3.88	Pollux	243°18.22	27°58.12
23	242°48.85	163°55.50	9.46	214°39.93	21.37	181°26.15	6.74	252°7.09	3.86	Avior	234°15.42	-59°35.42
							_			Suhail	222°46.94	-43°32.03
Mer.	pass. 06:51	ν -0.9° d0.	4′ m-3.92	ν 0.7 d0	.7′ m1.03	$\nu 1.9' d0.$	1′ m-2.00	ν 2.4′ d-0.	0′ m1.00	Miaplacidus Alphard	221°38.92 217°48.41	-69°49.25 -8°45.91
										Regulus	207°35.07	11°50.94
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°41.64	61°37.46
0	257°51.31	178°54.64	N23°9.80	229° 40.63	N10°22.04	196°28.01	N20°6.85	267°9.47	S06°3.83	Denebola	$182^{\circ}25.41$	14°26.21
1 2	272° 53.78 287° 56.24	193°53.78 208°52.92	10.13	244°41.33	22.70	211°29.87 226°31.73	6.96	282°11.85 297°14.23	3.81	Gienah	$175^{\circ}44.02$	-17°40.76
3	302°58.71	208 52.92 223°52.06	10.46 •• 10.79	259°42.03 274°42.73	23.37	241°33.59	7.07 •• 7.18	312°16.61	3.78 · · 3.76	Acrux	173°0.46	-63°14.34
4	318°1.17	238°51.20	11.12	289°43.43	24.70	256°35.45	7.30	327°18.99	3.74	1	171°52.03	-57° 15.26
5	333°3.63	253°50.34	11.45	304°44.13	25.37	271°37.31	7.41	342°21.38	3.71	Alioth	166°13.14 158°22.65	55°49.88 -11°17.40
6	348°6.10	268°49.48	N23°11.77	319°44.83	N10°26.04	286°39.17	N20°7.52	357°23.76	S06°3.69	Spica Alkaid	150 22.05 152°52.07	49° 11.66
7	3°8.56	283°48.62	12.10	334° 45.53	26.70	301°41.03	7.63	12°26.14	3.67	Hadar	148°36.28	-60° 29.66
8	18° 11.03	298°47.75	12.42	349°46.23	27.37	316°42.89	7.74	27°28.52	3.64	Menkent	147°57.93	-36° 29.56
9	33° 13.49	313°46.89	• • 12.75	4°46.93	• • 28.03	331°44.76	· · 7.85	42°30.90	• • 3.62	Arcturus	$145^{\circ}48.12$	19°3.36
10 11	48° 15.96 63° 18.42	328°46.03 343°45.17	13.07 13.39	19°47.63 34°48.33	28.70 29.36	346°46.62 1°48.48	7.97 8.08	57°33.29 72°35.67	3.59 3.57	Rigil Kent.	139°40.48	-60°56.36
12	78° 20.88	358°44.30	N23°13.71	49°49.03	N10°30.02	16°50.34	N20°8.19	87°38.05	506° 3.55	Kochab	137°18.77	74°3.44
13	93°23.35	13°43.44	14.03	64°49.73	30.69	31°52.20	8.30	102°40.44	3.53	Zuben'ubi Alphecca	136°56.29 126°3.82	-16°8.67 26°37.97
14	$108^{\circ}25.81$	28°42.58	14.34	79°50.44	31.35	46°54.06	8.41	117°42.82	3.50	Antares	120 3.82 112° 16.08	-26° 29.22
15	123°28.28	43°41.71	• • 14.66	94°51.14	• • 32.02	61°55.92	• • 8.52	132°45.20	• • 3.48	Atria	107°10.19	-69°4.30
16	138° 30.74	58°40.85	14.98	109°51.84	32.68	76°57.78	8.63	147°47.59	3.46	Sabik	102°3.00	-15°45.34
17 18	153° 33.20 168° 35.67	73°39.99 88°39.12	15.29 N23°15.60	124°52.54 139°53.24	33.34 N10°34.01	91°59.65 107°1.51	8.75 N20°8.86	162°49.97 177°52.35	3.43 \$06°3.41	Shaula	$96^{\circ}10.62$	-37°7.29
19	183°38.13	103°38.26	15.91	159 55.24 154°53.94	34.67	107 1.51 122° 3.37	8.97	177 52.55 192°54.74	3.39	Rasalhague	95°58.66	12° 32.47
20	198° 40.60	118°37.39	16.22	169°54.64	35.33	137° 5.23	9.08	207°57.12	3.36	Eltanin	90°41.88	51°29.01
21	213°43.06	133°36.53	• • 16.53	184°55.34	• • 36.00	152°7.09	• • 9.19	222°59.51	• • 3.34	Kaus Aust. Vega	83°32.78 80°33.15	-34°22.35 38°48.23
22	228°45.53	$148^{\circ}35.66$	16.84	199°56.04	36.66	167°8.95	9.30	238°1.89	3.32	Nunki	75°48.03	-26° 15.95
23	243°47.99	163°34.80	17.15	214°56.74	37.32	182°10.81	9.41	253°4.28	3.30	Altair	62°0.17	8°55.88
Mer.ı	pass. 06:47	ν -0.9' d0.	3′ m-3.92	$\nu 0.7' d0$.7′ m1.03	$\nu 1.9' d0.$	1′ m-2.00	$\nu 2.4' \ d-0.$	0′ m1.00	Peacock	53°6.08	-56° 39.20
										Deneb	49°25.85	45°21.79
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.15	9°59.11
0	258° 50.45	178°33.93	N23°17.45	229° 57.44	N10°37.98	197°12.68	N20°9.52	268° 6.66	S06° 3.27	Al Na'ir	27°33.38	-46°50.37 -29°29.45
1	273°52.92	193°33.07	17.76	244°58.14	38.64	212°14.54	9.63	283°9.05	3.25	Fomalhaut Scheat	15°15.02 13°45.67	-29 29.45 28°12.71
2	288°55.38	$208^{\circ}32.20$	18.06	259°58.84	39.31	$227^{\circ}16.40$	9.75	298°11.43	3.23	Markab	13°30.38	15° 20.06
3	303°57.85	223°31.33	• • 18.36	274°59.54	• • 39.97	242°18.26	• • 9.86	313°13.82	• • 3.21			
4	319°0.31	238° 30.47	18.66	290°0.24	40.63	257°20.12	9.97	328°16.20	3.19	Jun 08 Sat	SHA 282°23.02	Mer.pass
5 6	334°2.77 349°5.24	253°29.60 268°28.73	18.96 N23°19.26	305°0.94 320°1.64	41.29 N10°41.95	272°21.98 287°23.85	10.08 N20°10.19	343°18.59 358°20.97	3.16 \$06°3.14	Venus		12:04 08:42
7	349 5.24 4°7.70	208 28.73 283°27.86	19.56	320 1.04 335°2.34	42.61	302°25.71	10.30	13°23.36	3.12	Jupiter	298°51.19	10:56
8	19° 10.17	298°27.00	19.86	350°3.04	43.27	317°27.57	10.30	28°25.74	3.12	Saturn	9°20.19	06:14
9	34° 12.63	313°26.13	• • 20.15	5°3.74	• • 43.93	332°29.43	• 10.52	43°28.13	• • 3.08			
10	49° 15.10	328° 25.26	20.44	20°4.44	44.59	347°31.29	10.63	58°30.52	3.05	Jun 09 Sun Venus	SHA 281°3.33	Mer.pass 12:05
11	64° 17.56	343°24.39	20.74	35°5.14	45.25	2°33.16	10.74	73°32.90	3.03	Mars	331°49.31	08:41
12	79°20.02	358° 23.52	N23°21.03	50°5.84	N10°45.91	17°35.02	N20°10.85	88°35.29	S06° 3.01	Jupiter	298°36.69	10:53
13 14	94° 22.49 109° 24.95	13°22.65 28°21.78	21.32 21.61	65°6.54 80°7.24	46.57 47.23	32°36.88 47°38.74	10.96 11.07	103°37.68 118°40.06	2.99 2.97	Saturn	9°18.15	06:10
15	109° 24.95 124° 27.42	43°20.91	• • 21.90	95°7.93	• • 47.89	62°40.60	•• 11.18	133°42.45	• • 2.95	Jun 10 Mon	SHA	Mer.pass
16	139° 29.88	58°20.05	22.18	110°8.63	48.55	77°42.47	11.10	148°44.84	2.92	Venus		12:06
17	154° 32.34	73°19.18	22.47	125°9.33	49.20	92°44.33	11.40	163°47.23	2.90	Mars	331°6.98	08:40
18	169° 34.81	88° 18.31	N23°22.75	140° 10.03	N10°49.86	107°46.19	N20°11.51	178°49.61	S06°2.88	Jupiter		10:50
19	184° 37.27	103°17.43	23.04	155° 10.73	50.52	122°48.05	11.62	193°52.00	2.86	Saturn	9°16.21	06:07
20	199°39.74	118° 16.56	23.32	170°11.43	51.18	137°49.91	11.73	208°54.39	2.84	Horizor	ıtal parallax	
21 22	214° 42.20 229° 44.67	133° 15.69 148° 14.82	· · 23.60 23.88	185°12.13 200°12.83	•• 51.84 52.49	152°51.78 167°53.64	· · 11.84 11.95	223°56.78 238°59.17	· · 2.82 2.80	11011201	Venus:	0.1
23	244°47.13	163° 13.95	24.16	215° 13.53	53.15	182°55.50	12.06	254°1.55	2.78		Mars:	0.1
ivier.	pass. 06:44	ν -0.9' d0.	J III-3.92	νυ.τ΄ αυ	.7′ m1.02	$\nu 1.9' d0.$	ı III-∠.UU	ν 2.4′ d-0.	0 1110.99			

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 13.86	N22°52.21	$159^{\circ}41.45$	5.7'	$N28^{\circ}17.87$	-1.4'	57.2'
1	195°13.74	52.43	174°6.15	5.8'	28°16.49	-1.6'	57.2'
2	210°13.62 225°13.50	52.64 •• 52.86	188°30.91 202°55.73	5.8' 5.9'	28°14.93 28°13.20	-1.7' -1.9'	57.2' 57.1'
4	240°13.38	53.08	202 33.73 217°20.61	5.9'	28°11.31	-2.1'	57.1'
5	255° 13.25	53.30	231°45.56	6.0'	28° 9.24	-2.2'	57.1'
6	270° 13.13	N22°53.51	246°10.57	6.1'	N28°7.01	-2.4'	57.0'
7	285°13.01 300°12.89	53.73	260°35.65 275°0.79	6.1'	28° 4.61 28° 2.04	-2.6'	57.0'
8 9	300° 12.89 315° 12.77	53.94 •• 54.16	275°0.79 289°26.01	6.2' 6.3'	28° 2.04 27° 59.31	-2.7' -2.9'	57.0' 57.0'
10	330°12.64	54.37	303°51.30	6.4	27°56.41	-3.1'	56.9'
11	$345^{\circ}12.52$	54.58	$318^{\circ}16.67$	6.4'	$27^{\circ}53.35$	-3.2'	56.9'
12	0°12.40	N22°54.80	332°42.11	6.5'	N27°50.13	-3.4'	56.9'
13 14	15°12.28 30°12.15	55.01 55.22	347°7.63 1°33.23	6.6' 6.7'	27°46.74 27°43.20	-3.5' -3.7'	56.8' 56.8'
15	45°12.03	55.43	1 55.25 15°58.91	6.8'	27° 43.20 27° 39.50	-3.1 -3.9'	56.8'
16	60°11.91	55.64	30°24.67	6.8'	27°35.64	-4.0'	56.8'
17	75° 11.78	55.84	44°50.52	6.9'	27°31.62	-4.2'	56.7'
18	90°11.66	N22°56.05	59°16.45	7.0'	N27°27.45 27°23.12	-4.3'	56.7'
19 20	105°11.54 120°11.41	56.26 56.46	73°42.47 88°8.57	7.1' 7.2'	27°23.12 27°18.64	-4.5' -4.6'	56.7' 56.6'
21	135°11.29	56.67	102°34.77	7.3'	27°14.01	-4.8'	56.6'
22	$150^{\circ}11.16$	56.88	$117^{\circ}1.06$	7.4'	27° 9.23	-4.9'	56.6'
23	165°11.04	57.08	131°27.43	7.5'	27°4.30	-5.1'	56.5'
	SD = 15.8'	d = 0.2'		SI	D = 15.6'		
c.	CUA	D	GHA		D-:	J	LIP
Sun 0	GHA 180° 10.92	Dec N22°57.28	GHA 145°53.91	u 7.6'	Dec N26°59.22	d -5.2'	HP 56.5'
1	195° 10.79	57.49	160°20.47	7.7'	26°54.00	-5.4'	56.5'
2	$210^{\circ}10.67$	57.69	$174^{\circ}47.14$	7.8'	$26^{\circ}48.63$	-5.5'	56.5'
3	225°10.54	• • 57.89	189°13.89	7.9'	26°43.11	-5.7'	56.4'
4 5	240° 10.42 255° 10.30	58.09 58.29	203°40.75 218°7.71	8.0' 8.1'	26°37.46 26°31.66	-5.8' -5.9'	56.4' 56.4'
6	270° 10.17	N22°58.49	232°34.76	8.2'	N26°25.72	-6.1	56.3'
7	285° 10.05	58.69	247° 1.91	8.3'	26°19.64	-6.2	56.3'
8	300°9.92	58.89	261°29.17	8.4'	26°13.43	-6.4'	56.3'
9	315°9.80	• • 59.08	275°56.52	8.5'	26°7.08	-6.5'	56.3'
10 11	330°9.67 345°9.55	59.28 59.47	290°23.98 304°51.54	8.6' 8.7'	26°0.59 25°53.97	-6.6' -6.8'	56.2' 56.2'
12	0°9.42	N22°59.67	319°19.21	8.8'	N25°47.22	-6.9	56.2
13	15°9.30	22°59.86	333°46.98	8.9'	25°40.34	-7.0'	56.1'
14	30°9.17	23°0.06	348°14.85	9.0'	25°33.33	-7.1'	56.1'
15 16	45°9.05 60°8.92	· · 0.25 0.44	2°42.83 17°10.92	9.1' 9.2'	25°26.19 25°18.93	-7.3' -7.4'	56.1' 56.1'
17	75°8.80	0.44	31°39.11	9.2	25°11.54	-7.4 -7.5'	56.0'
18	90°8.67	N23°0.83	46°7.41	9.4'	N25° 4.03	-7.6'	56.0'
19	105°8.54	1.02	60°35.81	9.5'	24°56.39	-7.8'	56.0'
20 21	120°8.42 135°8.29	1.20 · · 1.39	75° 4.32 89° 32.94	9.6' 9.7'	24°48.64 24°40.76	-7.9' -8.0'	55.9' 55.9'
22	150°8.17	1.58	09 32.94 104°1.67	9. <i>1</i> 9.8'	24° 40.70 24° 32.77	-8.1'	55.9'
23	165°8.04	1.77	118°30.50	9.9'	24°24.66	-8.2'	55.9'
	SD = 15.7'	d = 0.2'		SI	D = 15.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°7.91	N23°1.96	132°59.44	10.0'	N24°16.43	-8.3'	55.8'
1	195°7.79	2.14	147°28.49	10.2'	$24^{\circ}8.10$	-8.5'	55.8'
2	210°7.66	2.33	161°57.65	10.3'	23°59.64	-8.6'	55.8'
3 4	225°7.53 240°7.41	· · 2.51 2.69	176°26.91 190°56.29	10.4' 10.5'	23°51.08 23°42.41	-8.7' -8.8'	55.8' 55.7'
5	255°7.28	2.88	205°25.77	10.5	23°33.63	-o.o -8.9'	55.7'
6	270°7.15	N23°3.06	219°55.35	10.7'	N23°24.75	-9.0'	55.7'
7	285°7.03	3.24	234°25.05	10.8'	23°15.75	-9.1'	55.7'
8	300°6.90 315°6.77	3.42 · · 3.60	248°54.85 263°24.76	10.9' 11.0'	23°6.66 22°57.46	-9.2' -9.3'	55.6' 55.6'
9 10	315°6.77 330°6.65	3.78	263°24.76 277°54.78	11.1'	22°57.46 22°48.16	-9.3° -9.4'	55.6'
11	345°6.52	3.96	292°24.90	11.2'	22°38.76	-9.5	55.6'
12	0°6.39	N23°4.14	306°55.13	11.3'	N22°29.26	-9.6'	55.5'
13	15°6.27	4.32	321°25.46	11.4'	22°19.66	-9.7'	55.5'
14 15	30°6.14 45°6.01	4.49 •• 4.67	335°55.90 350°26.45	11.5' 11.6'	22°9.97 22°0.19	-9.8' -9.9'	55.5' 55.5'
16	60°5.88	4.84	4°57.10	11.8'	21°50.31	-10.0'	55.4'
17	75°5.76	5.02	19°27.85	11.9'	21°40.33	-10.1'	55.4'
18	90°5.63	N23° 5.19	33°58.71	12.0'	N21°30.27	-10.2'	55.4'
19 20	105°5.50 120°5.37	5.37 5.54	48°29.67 63°0.73	12.1' 12.2'	21°20.12 21°9.88	-10.2' -10.3'	55.4' 55.3'
21	135°5.24	5.54 •• 5.71	77°31.90	12.2	21 9.00 20°59.55	-10.5 -10.4'	55.3'
22	150°5.12	5.88	92°3.17	12.4'	20°49.14	-10.5'	55.3'
23	165°4.99	6.05	106°34.54	12.5'	20°38.64	-10.6'	55.3'
	SD = 15.7'	d = 0.2'		SI	D = 15.2'		
							

	Twi	light			Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:32	23:33	////	////
64°	////	////	01:40	22:20	////	////
62°	////	////	02:15	21:45	////	////
60°	////	01:04	02:40	21:20	22:57	////
N 58°	////	01:47	02:59	21:00	22:13	////
56°	////	02:14	03:15	20:44	21:45	////
54°	00:58	02:36	03:29	20:30	21:24	23:03
52°	01:38	02:53	03:41	20:18	21:06	22:22
50°	02:04	03:07	03:51	20:08	20:52	21:56
45°	02:47	03:36	04:13	19:46	20:23	21:12
N 40°	03:17	03:58	04:31	19:28	20:01	20:42
35°	03:40	04:16	04:46	19:13	19:43	20:19
30°	03:58	04:31	04:58	19:01	19:28	20:01
20°	04:26	04:55	05:20	18:39	19:03	19:32
N 10°	04:49	05:16	05:38	18:20	18:43	19:10
0°	05:07	05:33	05:56	18:03	18:25	18:52
S 10°	05:24	05:50	06:13	17:46	18:09	18:35
20°	05:40	06:07	06:31	17:28	17:52	18:19
30°	05:56	06:25	06:52	17:07	17:33	18:03
35°	06:04	06:36	07:04	16:55	17:23	17:54
40°	06:13	06:47	07:18	16:41	17:11	17:45
45°	06:23	07:00	07:34	16:25	16:58	17:35
S 50°	06:35	07:16	07:54	16:04	16:42	17:24
52°	06:40	07:23	08:04	15:55	16:35	17:19
54°	06:45	07:31	08:15	15:44	16:27	17:13
56°	06:51	07:40	08:27	15:32	16:18	17:07
58°	06:58	07:50	08:41	15:17	16:08	17:01
S 60°	07:05	08:01	08:58	15:00	15:57	16:53
Lat		Moonris	e		:	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon

Lat.		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°			04:01			02:41
64°			05:08			01:34
62°		03:45	05:43		01:05	00:58
60°	02:58	04:28	06:08		00:22	00:32
N 58°	03:35	04:57	06:28	23:53		00:12
56°	04:02	05:19	06:44	23:30	23:55	
54°	04:23	05:37	06:58	23:12	23:40	23:58
52°	04:40	05:52	07:10	22:56	23:28	23:49
50°	04:55	06:06	07:21	22:43	23:16	23:40
45°	05:26	06:33	07:43	22:15	22:53	23:22
N 40°	05:49	06:54	08:01	21:53	22:34	23:07
35°	06:09	07:12	08:16	21:35	22:18	22:54
30°	06:25	07:27	08:29	21:19	22:05	22:43
20°	06:53	07:53	08:51	20:52	21:41	22:24
N 10°	07:17	08:15	09:10	20:29	21:21	22:07
0°	07:40	08:36	09:28	20:07	21:01	21:51
S 10°	08:02	08:56	09:45	19:45	20:42	21:35
20°	08:26	09:19	10:04	19:22	20:21	21:18
30°	08:54	09:44	10:26	18:55	19:57	20:58
35°	09:11	09:59	10:38	18:38	19:43	20:46
40°	09:30	10:16	10:53	18:20	19:26	20:33
45°	09:53	10:37	11:10	17:57	19:06	20:17
S 50°	10:23	11:03	11:31	17:27	18:41	19:57
52°	10:38	11:16	11:41	17:13	18:29	19:48
54°	10:55	11:30	11:52	16:56	18:15	19:37
56°	11:16	11:47	12:05	16:35	17:59	19:25
58°	11:41	12:07	12:20	16:10	17:39	19:11
S 60°	12:17	12:32	12:37	15:35	17:14	18:54

June 11, 12, 13 UT (Tue., Wed., Thu.)

h	Aries	Ven	us	Ma	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	259° 49.59		N23°24.43	230°14.23	N10°53.81	197°57.36	N20°12.17	269°3.94	S06°2.76			
1	274°52.06	193°12.21	24.71	245°14.93	54.46	212°59.23	12.28	284°6.33	2.74	Alpheratz	357°35.35	29°13.32
2	289°54.52	$208^{\circ}11.34$	24.98	260°15.63	55.12	228°1.09	12.39	299°8.72	2.72	Ankaa Schedar	353°7.73 349°31.81	-42°10.20 56°39.98
3	$304^{\circ}56.99$	$223^{\circ}10.46$	• • 25.26	$275^{\circ}16.33$	• • 55.78	243° 2.95	•• 12.50	$314^{\circ}11.11$	• • 2.69	Diphda	349° 31.01 348° 47.90	-17°51.09
4	319°59.45	238°9.59	25.53	290° 17.03	56.43	258° 4.81	12.61	329°13.50	2.67	Achernar	335°20.86	-57°6.53
5	335°1.91	253°8.72	25.80	305°17.73	57.09	273° 6.68	12.72	344°15.89	2.65	Hamal	327°51.99	23°34.55
6	350°4.38		N23°26.07	320°18.43	N10°57.74	288° 8.54	N20°12.83	359°18.28	S06°2.63	Polaris	314°40.80	89°21.81
7 8	5°6.84 20°9.31	283°6.97 298°6.10	26.34 26.61	335° 19.12 350° 19.82	58.40 59.06	303°10.40 318°12.27	12.94 13.05	14°20.67 29°23.06	2.61 2.59	Acamar	$315^{\circ}12.49$	-40°12.27
9	35° 11.77	313°5.23	. 26.88	5° 20.52	10°59.71	333°14.13	13.16	44°25.45	. 2.59	Menkar	314°6.93	4°11.10
10	50° 14.24	328°4.35	27.14	20°21.22	11° 0.37	348°15.99	13.27	59°27.84	2.55	Mirfak	308°29.41	49°56.72
11	65° 16.70	343°3.48	27.40	35°21.92	1.02	3°17.85	13.38	74°30.23	2.53	Aldebaran	290°40.53	16°33.47
12	80° 19.16		N23°27.67	50°22.62	N11° 1.67	18° 19.72	N20°13.49	89°32.62	S06°2.51	Rigel	281°4.68	-8°10.40
13	95°21.63	13°1.73	27.93	65°23.32	2.33	33°21.58	13.60	104°35.01	2.49	Capella Bellatrix	280°23.10 278°23.74	46°1.32 6°22.31
14	$110^{\circ}24.09$	28°0.86	28.19	80°24.02	2.98	48°23.44	13.70	119°37.40	2.47	Elnath	278°23.74	28°37.66
15	125° 26.56	42°59.98	• • 28.45	95°24.72	• • 3.64	63°25.31	• • 13.81	134°39.79	• • 2.45	Alnilam	275°38.56	-1°11.18
16	140°29.02	57°59.11	28.71	110°25.42	4.29	78°27.17	13.92	149°42.18	2.43	Betelgeuse	270°52.95	7°24.70
17	155°31.48	72°58.23	28.96	125°26.11	4.94	93°29.03	14.03	164°44.57	2.41	Canopus	263°53.16	-52°42.53
18	170°33.95 185°36.41	87°57.35 102°56.48	N23°29.22 29.48	140°26.81 155°27.51	N11° 5.60 6.25	108°30.90 123°32.76	N20°14.14	179°46.96 194°49.35	\$06°2.39 2.37	Sirius	$258^{\circ}27.01$	-16°44.99
19 20	200°38.88	102 50.46 117°55.60	29.46	170° 28.21	6.90	123 32.70 138°34.62	14.25 14.36	209°51.75	2.37	Adhara	255°6.61	-29°0.35
21	215° 41.34	132°54.73	. 29.98	185°28.91	7.56	153°36.49	• • 14.47	224°54.14	. 2.34	Procyon	244°51.64	5°9.76
22	230°43.80	147°53.85	30.23	200°29.61	8.21	168°38.35	14.58	239°56.53	2.32	Pollux	243°18.22	27°58.12
23	245° 46.27	162°52.97	30.48	215°30.31	8.86	183°40.21	14.69	254°58.92	2.30	Avior	234°15.44	-59°35.41
N 4	06:40		2/ 2.02		7/ 1 00		1/ 2.00			Suhail	222°46.95	-43°32.02
ivier.p	pass. 06:40	ν -0.9' d0.3	3° m-3.92	ν 0.7′ d0.	7 m1.02	ν 1.9° a 0.	.1′ m-2.00	ν 2.4′ d-0.	U mu.99	Miaplacidus Alphard	221°38.96 217°48.41	-69°49.25 -8°45.90
										Regulus	207°35.08	-6 45.90 11°50.94
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.66	61°37.46
0	260° 48.73		N23°30.73	230°31.00	N11° 9.51	198°42.08	N20°14.79	270°1.31	S06°2.28	Denebola	182°25.41	14°26.21
1	275°51.20	192°51.22	30.98	245°31.70	10.16	213°43.94	14.90	285°3.71	2.26	Gienah	175°44.02	-17°40.76
2	290°53.66	207°50.34	31.22	260°32.40	10.82	228°45.80	15.01	300°6.10	2.24	Acrux	173°0.49	-63°14.35
3 4	305°56.13 320°58.59	222° 49.47 237° 48.59	· · 31.47	275°33.10	• • 11.47	243°47.67	15.12	315°8.49	• • 2.22	Gacrux	171°52.05	-57°15.26
5	336°1.05	252° 47.71	31.71	290°33.80 305°34.50	12.12 12.77	258°49.53 273°51.39	15.23 15.34	330°10.88 345°13.28	2.20 2.18	Alioth	166°13.16	55°49.89
6	351°3.52		N23°32.20	320° 35.20	N11°13.42	288°53.26	N20°15.45	0°15.67	S06°2.16	Spica	158°22.65	-11°17.40
7	6°5.98	282°45.96	32.44	335°35.89	14.07	303°55.12	15.55	15°18.06	2.14	Alkaid	152°52.08	49°11.67
8	21°8.45	297°45.08	32.68	350°36.59	14.72	318°56.98	15.66	30°20.46	2.13	Hadar	148°36.29	-60°29.67
9	36° 10.91	312°44.20	• • 32.92	5°37.29	• • 15.37	333°58.85	• • 15.77	45°22.85	. 2.11	Menkent	147°57.94 145°48.12	-36°29.57 19°3.37
10	51° 13.37	327°43.32	33.15	20°37.99	16.02	349°0.71	15.88	60°25.24	2.09	Arcturus Rigil Kent.	145 48.12 139°40.49	-60°56.37
11	$66^{\circ}15.84$	342°42.44	33.39	35°38.69	16.67	4° 2.58	15.99	75°27.64	2.07	Kochab	137°18.80	74°3.45
12	81° 18.30		N23°33.62	50°39.38	N11°17.32	19° 4.44	N20°16.09	90°30.03	S06°2.05	Zuben'ubi	136°56.29	-16°8.67
13	96°20.77	12°40.68	33.86	65° 40.08	17.97	34°6.30	16.20	105°32.43	2.03	Alphecca	126° 3.82	26°37.98
14	111°23.23	27°39.80	34.09	80° 40.78	18.62	49°8.17	16.31	120°34.82	2.02	Antares	$112^{\circ}16.07$	-26°29.22
15 16	126°25.69 141°28.16	42°38.92 57°38.04	· · 34.32 34.55	95°41.48 110°42.18	· · 19.27 19.91	64°10.03 79°11.90	· · 16.42 16.53	135°37.22 150°39.61	2.00	Atria	$107^{\circ}10.17$	-69°4.32
17	156° 30.62	72°37.16	34.55	110 42.16 125°42.88	20.56	94°13.76	16.63	165°42.01	1.98 1.96	Sabik	102°2.99	-15°45.34
18	171°33.09		N23°35.00	140° 43.57		109°15.62	N20°16.74	180°44.40	S06° 1.94	Shaula	96°10.61	-37°7.30
19	186°35.55	102°35.40	35.23	155° 44.27	21.86	124°17.49	16.85	195°46.80	1.93	Rasalhague	95°58.65	12°32.48
20	201°38.02	117°34.52	35.45	170°44.97	22.51	139° 19.35	16.96	210°49.19	1.91	Eltanin Kaus Aust.	90°41.87 83°32.76	51°29.03 -34°22.35
21	$216^{\circ}40.48$	132°33.64	• • 35.68	185°45.67	• • 23.15	154°21.22	• • 17.07	225°51.59	• • 1.89	Vega	80°33.14	38°48.24
22	231° 42.94	$147^{\circ}32.76$	35.90	200°46.36	23.80	169°23.08	17.17	240°53.98	1.87	Nunki		-26°15.95
23	246°45.41	162°31.88	36.12	215°47.06	24.45	184°24.95	17.28	255°56.38	1.85	Altair	62°0.15	8°55.89
Mer.r	pass. 06:36	ν -0.9' d0.2	2′ m-3.92	$\nu 0.7' d0.$	7′ m1.02	$\nu 1.9' d0$.1′ m-2.00	$\nu 2.4' \ d-0.$	0′ m0.98	Peacock		-56°39.21
										Deneb	49°25.82	45°21.80
	CIIA	CIIA	Б	CIIA	ъ.	CIIA	Б	CIIA	ь.	Enif	33°39.13	$9^{\circ}59.12$
Thu 0	GHA 261° 47.87	GHA 177°31.00	Dec	GHA 230° 47.76	Dec N11°25.09	GHA 199°26.81	Dec	GHA 270°58.77	Dec 506°1.84	Al Na'ir	27°33.34	-46°50.36
1	201 47.87 276°50.34	177 31.00 192°30.12	36.56	230 47.76 245°48.46	N11 25.09 25.74	214°28.68	N20°17.39 17.50	270 58.77 286°1.17	1.82	Fomalhaut	15°14.99	-29°29.44
2	291°52.80	207°29.24	36.78	260°49.16	26.39	229°30.54	17.60	301°3.57	1.80	Scheat	13°45.64	28°12.72
3	306°55.26	222°28.35	• • 36.99	275° 49.85	• • 27.03	244°32.40	. 17.71	316°5.96	. 1.78	Markab	13°30.35	15°20.07
4	321°57.73	237°27.47	37.21	290° 50.55	27.68	259°34.27	17.82	331°8.36	1.77	Jun 11 Tue	SHA	Mer.pass
5	$337^{\circ}0.19$	252°26.59	37.42	$305^{\circ}51.25$	28.32	274°36.13	17.93	$346^{\circ}10.76$	1.75	Venus		12:08
6	352°2.66	267°25.71	N23°37.63	320°51.95	N11°28.97	289°38.00	N20°18.03	1°13.15	S06°1.73	Mars	330°24.64	08:39
7	7°5.12	282°24.83	37.85	335°52.64	29.62	304°39.86	18.14	$16^{\circ}15.55$	1.72	Jupiter	298°7.77	10:47
8	22°7.58	297°23.94	38.06	350°53.34	30.26	319°41.73	18.25	31°17.95	1.70	Saturn	9°14.35	06:03
9	37° 10.05	312°23.06	• • 38.27	5°54.04	• • 30.91	334°43.59	• • 18.35	46°20.34	• • 1.68	Jun 12 Wed	SHA	Mer.pass
10	52° 12.51	327°22.18	38.47	20°54.74	31.55	349°45.46	18.46	61°22.74	1.66	Venus	277°3.36	12:09
11	67° 14.98 82° 17.44	342°21.29 357°20.41	38.68 N23°38.89	35°55.43 50°56.13	32.19 N11°32.84	4°47.32 19°49.19	18.57 N20°18.67	76°25.14 91°27.54	1.65 \$06°1.63	Mars	329°42.27	08:38
12 13	97° 19.90	12°19.53	39.09	65° 56.83	33.48	34°51.05	N20 18.67 18.78	91°27.54 106°29.94	1.61	Jupiter		10:44
14	112° 22.37	27°18.64	39.09	80° 57.53	34.13	49°52.92	18.89	100 29.94 121°32.33	1.60	Saturn	9°12.58	05:59
15	127° 24.83	42°17.76	• • 39.50	95°58.22	• • 34.77	64°54.78	• • 19.00	136°34.73	. 1.58	Jun 13 Thu	SHA	Mer.pass
16	142°27.30	57° 16.87	39.70	110°58.92	35.41	79°56.65	19.10	151°37.13	1.56		275°43.13	12:11
17	157° 29.76	72°15.99	39.90	125°59.62	36.06	94°58.51	19.21	166°39.53	1.55	I	328°59.89	08:36
18	172°32.23	87° 15.11		141°0.31	N11°36.70	110°0.38	N20°19.32	181°41.93	S 06° 1.53		297°38.94	10:41
19	187° 34.69	102°14.22	40.29	156°1.01	37.34	125° 2.24	19.42	196°44.33	1.52	Saturn	$9^{\circ}10.90$	05:55
20	202°37.15	117°13.34	40.49	171°1.71	37.98	140°4.11	19.53	211°46.73	1.50	11	stal passile:	
21	217°39.62	132°12.45	• • 40.68	186°2.41	• • 38.63	155° 5.97	• 19.64	226°49.12	1.48	Horizor	ntal parallax Venus:	0.1
22	232° 42.08	147°11.57	40.87	201°3.10	39.27	170°7.84	19.74	241°51.52	1.47		venus: Mars:	0.1 0.1
23	247° 44.55	162°10.68	41.07	216°3.80	39.91	185° 9.70	19.85	256°53.92	1.45		141013.	U.1
Mer.pass. 06:32 ν -0.9′ d 0.2′ n		2′ m-3.91	u0.7′ d 0.	6′ m1.02	ν 1.9′ d0.	.1′ m-2.00	ν 2.4′ d-0.	0′ m0.98				

h	Su	Moon					
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°4.86	N23°6.22	121°6.00	12.6'	N20°28.06	-10.7'	55.2'
1	195° 4.73 210° 4.60	6.39 6.56	135°37.57 150°9.24	12.7'	20°17.40 20°6.66	-10.7'	55.2' 55.2'
2	210 4.00 225°4.47	· · 6.73	164°41.00	12.8' 12.9'	20 0.00 19°55.84	-10.8' -10.9'	55.2'
4	240° 4.35	6.89	179°12.87	13.0'	19°44.94	-11.0'	55.1'
5	255° 4.22	7.06	193°44.83	13.1'	19°33.96	-11.1'	55.1'
6	270° 4.09 285° 3.96	N23°7.22 7.39	208°16.88 222°49.03	13.2' 13.2'	N19°22.91 19°11.78	-11.1' -11.2'	55.1' 55.1'
7 8	285 3.96 300° 3.83	7.39 7.55	222 49.03 237°21.28	13.2	19 11.78 19°0.58	-11.2 -11.3'	55.1'
9	315°3.70	7.72	251°53.61	13.4'	18°49.31	-11.3'	55.0'
10	330° 3.57	7.88	266°26.05	13.5'	18°37.96	-11.4'	55.0'
11 12	345°3.44 0°3.32	8.04 N23°8.20	280°58.57 295°31.18	13.6' 13.7'	18°26.55 N18°15.07	-11.5' -11.6'	55.0' 55.0'
13	15° 3.19	8.36	295 31.16 310°3.89	13.8'	18°3.52	-11.6'	55.0'
14	30° 3.06	8.52	324°36.68	13.9'	17°51.90	-11.7'	54.9'
15	45° 2.93	• • 8.68	339°9.56	14.0'	17°40.22	-11.7'	54.9'
16	60°2.80 75°2.67	8.84 9.00	353°42.53 8°15.59	14.1' 14.1'	17°28.47 17°16.66	-11.8'	54.9' 54.9'
17 18	90° 2.54	9.00 N23°9.15	8°15.59 22°48.73	14.1	N17°4.79	-11.9' -11.9'	54.9'
19	105° 2.41	9.31	37°21.96	14.3'	16°52.85	-12.0'	54.8'
20	120°2.28	9.46	51°55.27	14.4'	$16^{\circ}40.86$	-12.1'	54.8'
21	135°2.15	• • 9.62	66°28.66	14.5'	16°28.81	-12.1'	54.8'
22 23	150°2.02 165°1.89	9.77 9.93	81°2.13 95°35.69	14.6' 14.6'	16°16.70 16°4.53	-12.2' -12.2'	54.8' 54.8'
23						-14.4	J+.0
	SD = 15.7'	d = 0.2'		SI	D = 15.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 1.76	N23°10.08	110°9.32	14.7'	N15°52.31	-12.3'	54.7'
1 2	195° 1.63 210° 1.50	10.23 10.38	124°43.04 139°16.83	14.8' 14.9'	15°40.03 15°27.70	-12.3' -12.4'	54.7' 54.7'
3	210° 1.50 225° 1.37	10.38	153° 50.70	14.9' 14.9'	15°27.70 15°15.31	-12.4 -12.4'	54.7' 54.7'
4	240° 1.24	10.68	168°24.64	15.0'	15°2.87	-12.5'	54.7'
5	255°1.11	10.83	182°58.66	15.1'	$14^{\circ}50.39$	-12.5'	54.7'
6	270°0.98	N23°10.98	197°32.75	15.2'	N14°37.85	-12.6'	54.6'
7 8	285° 0.85 300° 0.72	11.13 11.27	212°6.91 226°41.15	15.2' 15.3'	14°25.26 14°12.62	-12.6' -12.7'	54.6' 54.6'
9	315° 0.59	. 11.42	241°15.45	15.3 15.4'	14 12.02 13°59.94	-12.7'	54.6'
10	330° 0.46	11.57	255°49.83	15.4'	13°47.21	-12.8'	54.6'
11	345°0.33	11.71	270°24.27	15.5'	13°34.44	-12.8'	54.6'
12	0°0.20	N23°11.85	284°58.78	15.6'	N13°21.62	-12.9'	54.6'
13 14	15° 0.06 29° 59.93	12.00 12.14	299°33.35 314°7.99	15.6' 15.7'	13°8.75 12°55.85	-12.9' -12.9'	54.5' 54.5'
15	44°59.80	12.28	328°42.69	15.8'	12°42.90	-13.0'	54.5'
16	59°59.67	12.42	343°17.46	15.8'	$12^{\circ}29.91$	-13.0'	54.5'
17	74°59.54	12.56	357°52.29	15.9'	12°16.88	-13.1'	54.5'
18 19	89°59.41 104°59.28	N23°12.70 12.84	12°27.17 27°2.12	15.9' 16.0'	N12°3.81 11°50.71	-13.1' -13.1'	54.5' 54.5'
20	119°59.15	12.98	41°37.12		11°37.56		54.4'
21	134°59.02	• • 13.12	56°12.18	16.1'	11°24.38	-13.2'	54.4'
22	149°58.88	13.26	70°47.30	16.2'	11°11.16	-13.3'	54.4'
23	164°58.75	13.39	85°22.47	16.2'	10°57.91	-13.3'	54.4'
	SD = 15.7'	d = 0.2'		SI	D = 14.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°58.62	N23°13.53	99°57.69	16.3	N10°44.62	-13.3'	54.4'
1 2	194°58.49 209°58.36	13.66 13.80	114°32.97 129°8.30	16.3' 16.4'	10°31.30 10°17.95	-13.4' -13.4'	54.4' 54.4'
3	224°58.23	•• 13.93	143°43.67	16.4	10°17.93	-13.4'	54.4'
4	239°58.10	14.06	158°19.10	16.5'	09°51.14	-13.4'	54.4'
5	254°57.96	14.19	172°54.57	16.5'	09°37.70	-13.5'	54.4'
6 7	269°57.83 284°57.70	N23°14.33 14.46	187°30.09 202°5.65	16.6' 16.6'	N09°24.22 09°10.71	-13.5' -13.5'	54.3' 54.3'
8	299°57.57	14.40	202 5.05 216°41.26	16.7	09 10.71 08°57.18	-13.6'	54.3'
9	314°57.44	•• 14.72	$231^{\circ}16.91$	16.7'	08°43.62	-13.6'	54.3'
10	329°57.30	14.84	245°52.61	16.7'	08°30.03	-13.6'	54.3'
11 12	344°57.17 359°57.04	14.97 N23°15.10	260°28.34 275°4.11	16.8' 16.8'	08°16.41 N08°2.77	-13.6' -13.7'	54.3' 54.3'
13	359 57.04 14°56.91	N23 15.10 15.22	275 4.11 289°39.92	16.8	07°49.11	-13.7'	54.3'
14	29°56.78	15.35	304°15.77	16.9	07°35.42	-13.7	54.3'
15	44°56.64	• • 15.48	318°51.65	16.9'	07°21.71	-13.7'	54.3'
16	59°56.51 74°56.38	15.60 15.72	333°27.57 348°3.52	17.0'	07°7.97 06°54.22	-13.8'	54.3'
17 18	74°56.38 89°56.25	15.72 N23°15.85	348°3.52 2°39.50	17.0' 17.0'	06°54.22 N06°40.44	-13.8' -13.8'	54.3' 54.2'
19	104°56.11	15.97	17°15.52	17.0'	06°26.64	-13.8'	54.2'
20	119°55.98	16.09	31°51.56	17.1'	$06^{\circ}12.83$	-13.8'	54.2'
21	134°55.85	• • 16.21	46°27.63	17.1'	05°58.99	-13.9'	54.2'
22 23	149°55.72 164°55.58	16.33 16.45	61°3.73 75°39.86	17.1' 17.2'	05°45.14 05°31.26	-13.9' -13.9'	54.2' 54.2'
23	SD = 15.7'	d = 0.1'	. 5 59.00		D = 14.8'	10.5	J 1.2
	<u> </u>	<u>u — 0.1</u>		31			

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:02	////	////	////
64°	////	////	01:36	22:25	////	////
62°	////	////	02:12	21:49	////	////
60°	////	00:57	02:37	21:23	23:04	////
N 58°	////	01:44	02:57	21:03	22:17	////
56°	////	02:12	03:14	20:47	21:48	////
54°	00:53	02:34	03:28	20:33	21:27	23:09
52°	01:35	02:52	03:40	20:20	21:09	22:26
50°	02:02	03:06	03:51	20:10	20:54	21:59
45°	02:46	03:36	04:13	19:47	20:25	21:14
N 40°	03:16	03:58	04:31	19:30	20:02	20:44
35°	03:39	04:16	04:45	19:15	19:44	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:02
20°	04:26	04:56	05:20	18:40	19:04	19:34
N 10°	04:49	05:16	05:39	18:21	18:44	19:11
0°	05:08	05:34	05:56	18:04	18:26	18:52
S 10°	05:24	05:51	06:14	17:46	18:09	18:35
20°	05:40	06:08	06:32	17:28	17:52	18:19
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:05	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°	06:25	07:02	07:36	16:24	16:58	17:35
S 50°	06:36	07:18	07:56	16:04	16:42	17:23
52°	06:42	07:25	08:06	15:54	16:35	17:18
54°	06:47	07:33	08:17	15:43	16:27	17:13
56°	06:53	07:42	08:29	15:30	16:18	17:07
58°	07:00	07:52	08:44	15:16	16:07	17:00
S 60°	07:07	08:04	09:01	14:59	15:56	16:53

Lat.		Moonris	e		Moonset	<u> </u>
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°		07:27	09:47		02:32	01:39
N 70°	05:00	07:58	10:01	03:25	01:59	01:23
68°	06:08	08:21	10:11	02:16	01:35	01:10
66°	06:43	08:38	10:20	01:39	01:16	00:59
64°	07:09	08:53	10:28	01:13	01:00	00:50
62°	07:28	09:04	10:34	00:52	00:48	00:43
60°	07:44	09:14	10:39	00:36	00:36	00:36
N 58°	07:58	09:23	10:44	00:21	00:27	00:30
56°	08:09	09:31	10:48	00:09	00:18	00:25
54° 52°	08:19 08:28	09:37 09:43	10:52 10:56		00:11 00:04	00:20 00:16
50°	08:36	09:43	10:50	23:58		00:10
45°	08:53	10:00	11:05	23:45		00:12
N 40°	09:07	10:10	11:11	23:34	23:56	
35°	09:18	10:18	11:16	23:24	23:50	
30°	09:29	10:26	11:20	23:16	23:45	
20°	09:46	10:38	11:27	23:01	23:35	
N 10°	10:01	10:49	11:34	22:49	23:27	
0°	10:15	10:59	11:40	22:37	23:19	23:59
S 10°	10:29	11:09	11:45	22:24	23:11	23:55
20°	10:44	11:19	11:52	22:11	23:02	23:51
30°	11:01	11:32	11:59	21:56	22:52	23:46
35°	11:11	11:38	12:03	21:48	22:46	23:43
40°	11:22	11:46	12:08	21:38	22:40	23:40
45°	11:35	11:56	12:13	21:26	22:32	23:36
S 50°	11:51	12:07	12:19	21:11	22:23	23:32
52°	11:59	12:12	12:22	21:05	22:18	23:30
54°	12:07	12:17	12:25	20:57	22:14	23:27
56° 58°	12:16 12:26	12:23 12:30	12:29 12:33	20:49 20:39	22:08 22:02	23:25 23:22
S 60°	12:26	12:30 12:38	12:33 12:37	20:39	22:02	23:22
3 00	12:30	12:30	12:31	20:20	∠1:50	25:19

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	00 ^h 12 ^h Pass Upper Lower		5-7			
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	21-39%	
11	00:19	00:13	12:00	16:26	04:03		
12	00:07	00:01	12:00	17:09	04:48		
13	00:06	00:12	12:00	17:49	05:29		

June 14, 15, 16 UT (Fri., Sat., Sun.)

h	Aries	Venus	•	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	262°47.01		3°41.26	231°4.50	N11°40.55	200°11.57	N20°19.95	271°56.32	S 06°1.44			
1	277°49.47	192°8.91	41.45	246°5.19	41.19	215°13.44	20.06	286°58.72	1.42	Alpheratz	357°35.33	29°13.33
2	292°51.94	207°8.03	41.64	261°5.89	41.83	230°15.30	20.17	$302^{\circ}1.12$	1.40	Ankaa	353°7.70	-42°10.19
3	$307^{\circ}54.40$	222°7.14 · ·	41.82	276°6.59	• • 42.47	245°17.17	• • 20.27	$317^{\circ}3.52$	• • 1.39	Schedar Diphda	349°31.78 348°47.88	56°39.99 -17°51.08
4	$322^{\circ}56.87$	237°6.25	42.01	291°7.28	43.12	$260^{\circ}19.03$	20.38	332°5.92	1.37	Achernar	335°20.84	-57°6.52
5	337°59.33	252°5.37	42.20	306°7.98	43.76	275°20.90	20.49	347°8.32	1.36	Hamal	327°51.97	23°34.55
6	353°1.79		3°42.38	321°8.68	N11°44.40	290°22.76	N20°20.59		S06°1.34	Polaris	314°39.88	89°21.80
7	8°4.26	282°3.60	42.56	336°9.37	45.04	305°24.63	20.70	17°13.13	1.33	Acamar	315°12.47	-40°12.25
8 9	23°6.72 38°9.19	297°2.71 312°1.82 · ·	42.74 42.92	351°10.07 6°10.77	45.68 •• 46.32	320°26.50 335°28.36	20.80 •• 20.91	32°15.53 47°17.93	1.31 · · 1.29	Menkar	$314^{\circ}6.92$	4°11.11
10	53° 11.65	327°0.94	43.10	21°11.46	46.95	350°30.23	21.02	62°20.33	1.28	Mirfak	308°29.40	49°56.71
11	68° 14.11	342°0.05	43.28	36°12.16	47.59	5°32.09	21.12	77°22.73	1.26	Aldebaran	290°40.52	16°33.47
12	83° 16.58		3°43.46	51°12.86	N11°48.23	20°33.96	N20°21.23	92°25.13	S06° 1.25	Rigel	281° 4.67	-8°10.39
13	98° 19.04	11°58.27	43.63	66° 13.55	48.87	35°35.83	21.33	107°27.53	1.23	Capella	280°23.09	46°1.31
14	$113^{\circ}21.51$	26°57.39	43.81	81°14.25	49.51	50°37.69	21.44	122°29.94	1.22	Bellatrix	278°23.74 278°2.87	6°22.31 28°37.66
15	$128^{\circ}23.97$		43.98	96°14.95	• • 50.15	65°39.56	• • 21.54	137°32.34	• • 1.20	Elnath Alnilam	275°38.56	-1°11.17
16	143°26.43	56° 55.61	44.15	111° 15.64	50.79	80°41.42	21.65	152°34.74	1.19	Betelgeuse	270°52.95	7°24.71
17	158° 28.90	71°54.72	44.32	126° 16.34	51.42	95°43.29	21.76	167°37.14	1.17	Canopus	263°53.16	-52°42.51
18	173°31.36		3°44.49	141°17.04	N11°52.06	110°45.16	N20°21.86	182°39.54	S06° 1.16	Sirius	258°27.01	-16°44.98
19	188° 33.83 203° 36.29	101°52.95 116°52.06	44.66	156° 17.73 171° 18.43	52.70	125°47.02 140°48.89	21.97	197°41.95 212°44.35	1.14	Adhara	255°6.61	-29°0.33
20 21	203 30.29 218°38.76		44.82 44.99	171 16.43 186°19.12	53.34 •• 53.97	155°50.76	22.07 •• 22.18	212 44.35 227°46.75	1.13 •• 1.12	Procyon	244°51.64	5°9.77
22	233° 41.22	146°50.28	45.15	201° 19.82	54.61	170°52.62	22.28	242°49.16	1.12	Pollux	243°18.23	27°58.12
23	248° 43.68	161°49.39	45.32	216° 20.52	55.25	185°54.49	22.39	257°51.56	1.10	Avior	234°15.46	-59°35.39
										Suhail	222°46.97	-43°32.01
Mer.	pass. 06:28	ν-0.9' d0.2' m	n-3.91	$\nu 0.7' d0$.6′ m1.01	ν 1.9′ d0.	.1′ m-2.01	ν 2.4′ d-0.	0′ m0.98	Miaplacidus	221°39.00	-69°49.24 -8°45.89
										Alphard Regulus	217°48.42 207°35.09	-8 45.89 11°50.94
Sat	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.68	61°37.46
0	263°46.15		3°45.48	231°21.21	N11°55.88	200°56.36	N20°22.49	272°53.96	506°1.07	Denebola	182°25.43	14°26.22
1	278° 48.61	191°47.62	45.64	246°21.91	56.52	215°58.22	22.60	287°56.37	1.06	Gienah	175°44.03	-17°40.75
2 3	293°51.08 308°53.54	206° 46.73 221° 45.84 · ·	45.80 45.96	261°22.61 276°23.30	57.15 •• 57.79	231°0.09 246°1.96	22.70 •• 22.81	302°58.77 318°1.17	1.04	Acrux	173°0.52	-63°14.35
4	323°56.00	236°44.95	46.12	291°24.00	58.42	261° 3.82	22.91	333°3.58	1.02	Gacrux	171°52.07	-57°15.27
5	338°58.47	251°44.06	46.27	306°24.69	59.06	276° 5.69	23.02	348°5.98	1.00	Alioth	166°13.18	55°49.89
6	354°0.93		3°46.43	321°25.39	N11°59.69	291°7.56	N20°23.12	3°8.39	S06° 0.99	Spica Alkaid	158°22.66 152°52.09	-11°17.39 49°11.68
7	9°3.40	281°42.28	46.58	336°26.09	12°0.33	$306^{\circ}9.42$	23.23	$18^{\circ}10.79$	0.97	Hadar	148°36.31	-60°29.67
8	24°5.86	296°41.39	46.73	351°26.78	0.96	321°11.29	23.33	33°13.20	0.96	Menkent		-36°29.57
9	39°8.32		46.88	6°27.48	• • 1.60	336°13.16	• • 23.44	48°15.60	• • 0.95	Arcturus	145°48.13	19°3.38
10 11	54° 10.79 69° 13.25	326°39.61 341°38.72	47.03 47.18	21°28.17 36°28.87	2.23 2.87	351°15.02 6°16.89	23.54 23.65	63°18.01 78°20.41	0.93 0.92	Rigil Kent.	139°40.51	-60°56.38
12	84° 15.72		3°47.33	51°29.56	N12° 3.50	21°18.76	N20°23.75	93°22.82	S06° 0.91	Kochab	137°18.83	74°3.46
13	99° 18.18	11°36.94	47.47	66°30.26	4.13	36°20.63	23.86	108°25.22	0.89	Zuben'ubi	136°56.29 126°3.82	-16°8.67 26°37.99
14	114°20.64	26°36.05	47.62	81°30.96	4.77	51°22.49	23.96	123°27.63	0.88	Alphecca Antares	120 3.62 112° 16.07	-26°29.23
15	$129^{\circ}23.11$		47.76	96°31.65	• • 5.40	66°24.36	• • 24.07	138°30.03	• • 0.87	Atria	107° 10.17	-69°4.33
16	144° 25.57	56°34.27	47.91	111°32.35	6.03	81°26.23	24.17	153°32.44	0.85	Sabik	102°2.99	-15°45.34
17	159°28.04 174°30.50	71°33.38	48.05	126°33.04 141°33.74	6.66	96°28.10	24.28	168°34.84	0.84	Shaula	96°10.60	-37°7.30
18 19	189°32.97	86°32.48 N23 101°31.59	3°48.19 48.33	156° 34.43	N12°7.30 7.93	111°29.96 126°31.83	N20°24.38 24.48	183°37.25 198°39.66	\$06° 0.83 0.81	Rasalhague	95°58.65	12°32.49
20	204° 35.43	116° 30.70	48.46	171°35.13	8.56	141°33.70	24.59	213°42.06	0.80	Eltanin	90°41.86	51°29.04
21	219° 37.89		48.60	186° 35.82	9.19	156°35.57	• • 24.69	228°44.47	• • 0.79	Kaus Aust. Vega	83°32.75 80°33.13	-34°22.35 38°48.26
22	234°40.36	146°28.92	48.73	201°36.52	9.82	171°37.43	24.80	243°46.88	0.77	Nunki	75°48.00	-26°15.95
23	249°42.82	161°28.03	48.87	$216^{\circ}37.21$	10.45	186°39.30	24.90	258°49.28	0.76	Altair	62° 0.14	8°55.89
Mer	pass. 06:24	ν-0.9' d0.2' m	n-3 91	$v_0 7' d0$.6′ m1.01	v1.9'.d0	.1′ m-2.01	ν 2.4' d-0.	0′ m0 97	Peacock	53°6.01	-56°39.21
	puss. 00.21	- 0.5 40.2 11				- V1.5 UO				Deneb	49°25.81	45°21.82
•	6114	G114	_	6114		6114		6114	_	Enif	33°39.11	$9^{\circ}59.12$
Sun	GHA		Dec	GHA	Dec N12°11.08	GHA	Dec	GHA	Dec	Al Na'ir	27°33.32	-46°50.36
0 1	264° 45.29 279° 47.75	176°27.14 N23 191°26.24	49.00	231°37.91 246°38.60	11.71	201°41.17 216°43.04	N20°25.00 25.11	273°51.69 288°54.10	\$06° 0.75 0.74	Fomalhaut	15°14.97	-29°29.44
2	294° 50.21	206° 25.35	49.13	261°39.30	12.34	231°44.90	25.11	303°56.51	0.74	Scheat	13°45.62	28°12.72
3	309°52.68		49.39	276°39.99	. 12.97	246°46.77	25.32	318°58.91	. 0.72	Markab	13°30.33	15°20.08
4	324° 55.14	236° 23.57	49.52	291°40.69	13.60	261°48.64	25.42	334°1.32	0.70	Jun 14 Fri	SHA	Mer.pass
5	339°57.61	251°22.68	49.65	306°41.38	14.23	276°50.51	25.52	349°3.73	0.69	Venus	274°22.79	12:12
6	355°0.07		3°49.77	321°42.08	N12°14.86	291°52.38	N20°25.63		S 06° 0.67	Mars	328°17.49	08:35
7	10°2.53	281°20.89	49.90	336°42.77	15.49	306°54.25	25.73	19°8.55	0.66		297°24.56	10:38
8	25°5.00	296°20.00	50.02	351°43.47	16.12	321°56.11	25.84	34°10.96	0.65	Saturn	9°9.31	05:51
9	40°7.46		50.14	6°44.16	. 16.75	336°57.98	• • 25.94	49°13.36	0.64	Jun 15 Sat	SHA	Mer.pass
10 11	55°9.93 70°12.39	326° 18.21 341° 17.32	50.26 50.38	21°44.86 36°45.55	17.38 18.01	351°59.85 7°1.72	26.04 26.15	64°15.77 79°18.18	0.62 0.61	Venus	$273^{\circ}2.36$	12:13
12	85° 14.85		3°50.50	51° 46.25	N12°18.64	22° 3.59	N20°26.25	94°20.59	S06°0.60	Mars		08:34
13	100° 17.32	11° 15.54	50.62	66° 46.94	19.26	37° 5.45	26.35	109°23.00	0.59	Jupiter		10:35
14	$115^{\circ}19.78$	26°14.64	50.73	81°47.64	19.89	52°7.32	26.46	124°25.41	0.58	Saturn	9°7.81	05:47
15	130° 22.25		50.85	96° 48.33	• • 20.52	67° 9.19	• • 26.56	139°27.82	• • 0.57	Jun 16 Sun	SHA	Mer.pass
16	145°24.71	56°12.86	50.96	111°49.03	21.15	82°11.06	26.66	154°30.23	0.55	1	271°41.85	12:15
17	160°27.17	71°11.96	51.07	126°49.72	21.77	97°12.93	26.77	169°32.64	0.54		326°52.62	08:33
18 19	175°29.64 190°32.10	86°11.07 N23 101°10.18	3°51.18 51.29	141°50.42 156°51.11	N12°22.40 23.03	112°14.80 127°16.67	N20°26.87 26.97	184°35.05 199°37.46	\$06° 0.53 0.52		296°55.88	10:32
20	205° 34.57	116°9.28	51.40	171°51.81	23.65	142° 18.54	27.08	214°39.87	0.52	Saturn	9°6.41	05:44
21	220° 37.03		51.51	186° 52.50	• • 24.28	157°20.40	27.18	229°42.28	• • 0.50	Horizo	ntal parallax	
22	235°39.50	146°7.49	51.61	201°53.19	24.90	172°22.27	27.28	244°44.69	0.49		Venus:	0.1
23	250°41.96	161°6.60	51.72	216°53.89	25.53	187°24.14	27.39	259°47.10	0.47		Mars:	0.1
Mer.	pass. 06:20	ν-0.9' d0.1' m	n-3.91	ν 0.7′ d0	.6′ m1.01	ν 1.9' d0	.1′ m-2.01	ν 2.4′ d-0.	0′ m0.97			

h	Su			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.45	N23°16.57	90°16.01	17.2'	N05°17.38	-13.9'	54.2'
1 2	194° 55.32 209° 55.18	16.68 16.80	104°52.18 119°28.38	17.2' 17.2'	05°3.47 04°49.55	-13.9' -13.9'	54.2' 54.2'
3	209 55.18 224°55.05	. 16.92	134°4.60	17.2'	04° 49.55 04° 35.61	-13.9 -14.0'	54.2'
4	239° 54.92	17.03	148°40.84	17.3'	$04^{\circ}21.66$	-14.0'	54.2'
5	254° 54.79	17.15	163°17.09	17.3'	04°7.70	-14.0'	54.2'
6 7	269° 54.65 284° 54.52	N23°17.26 17.37	177°53.37 192°29.66	17.3' 17.3'	N03°53.72 03°39.73	-14.0' -14.0'	54.2' 54.2'
8	299° 54.39	17.37 17.49	207°5.97	17.3'	03°25.73	-14.0'	54.2'
9	314°54.25	• • 17.60	221°42.29	17.3'	03°11.72	-14.0'	54.2'
10	329°54.12	17.71	236°18.63	17.3'	02°57.70	-14.0'	54.2'
11 12	344° 53.99 359° 53.85	17.82 N23°17.93	250°54.97 265°31.33	17.4' 17.4'	02°43.67 N02°29.62	-14.0' -14.0'	54.2' 54.2'
13	14°53.72	18.04	280°7.70	17.4	02°15.57	-14.1'	54.2'
14	29°53.59	18.15	294°44.08	17.4'	$02^{\circ}1.52$	-14.1'	54.2'
15	44° 53.45 59° 53.32	18.26	309°20.46 323°56.85	17.4'	01°47.45 01°33.38	-14.1'	54.2'
16 17	59 53.32 74°53.19	18.36 18.47	323 50.85 338°33.24	17.4' 17.4'	01 33.38 01°19.30	-14.1' -14.1'	54.2' 54.2'
18	89° 53.05	N23°18.57	353°9.64	17.4'	N01°5.22	-14.1'	54.2'
19	104° 52.92	18.68	7°46.04	17.4'	00°51.13	-14.1'	54.2'
20 21	119°52.79 134°52.65	18.78 •• 18.89	22°22.44 36°58.84	17.4' 17.4'	00°37.04 00°22.95	-14.1' -14.1'	54.2' 54.2'
22	134 52.05 149°52.52	18.99	50 56.64 51°35.24	17.4'	N00°8.85	-14.1'	54.2'
23	164°52.39	19.09	66°11.63	17.4'	S00° 5.25	14.1'	54.2'
	SD = 15.7'	d = 0.1'		SI	D = 14.8'		
c - ·	CUA	D	CUA		D	.1	LID
Sat 0	GHA 179° 52.25	Dec N23°19.19	GHA 80°48.03	u 17.4'	Dec \$00°19.35	d 14.1'	HP 54.2'
1	194° 52.12	19.29	95°24.41	17.4'	00°33.45	14.1'	54.2'
2	209°51.98	19.39	110°0.80	17.4	00°47.55	14.1'	54.2'
3 4	224°51.85 239°51.72	· · 19.49 19.59	124°37.17 139°13.54	17.4' 17.4'	01°1.66 01°15.76	14.1' 14.1'	54.2' 54.2'
5	259 51.72 254°51.58	19.59	159 15.54 153°49.89	17.4	01 15.76 01°29.85	14.1	54.2'
6	269°51.45	N23°19.79	168°26.24	17.3'	S01°43.95	14.1'	54.2'
7	284°51.31	19.88	183°2.57	17.3'	01°58.04	14.1'	54.2'
8 9	299°51.18 314°51.05	19.98 •• 20.07	197°38.89 212°15.20	17.3' 17.3'	02°12.13 02°26.22	14.1' 14.1'	54.2' 54.2'
10	329°50.91	20.17	226°51.49	17.3'	02°40.30	14.1'	54.3'
11	344°50.78	20.26	241°27.76	17.3'	$02^{\circ}54.37$	14.1'	54.3'
12	359°50.64 14°50.51	N23°20.35 20.44	256°4.02 270°40.25	17.2' 17.2'	\$03°8.44 03°22.50	14.1' 14.1'	54.3' 54.3'
13 14	29° 50.38	20.44	270 40.25 285°16.47	17.2'	03 22.50 03°36.55	14.1	54.3'
15	44° 50.24	• • 20.63	299°52.66	17.2'	03°50.60	14.0'	54.3'
16	59°50.11	20.72	314°28.83	17.1'	04°4.63	14.0'	54.3'
17 18	74° 49.97 89° 49.84	20.80 N23°20.89	329°4.98 343°41.10	17.1' 17.1'	04°18.66 \$04°32.67	14.0' 14.0'	54.3' 54.3'
19	104° 49.70	20.98	358°17.20	17.1	04°46.67	14.0'	54.3'
20	119° 49.57	21.07	$12^{\circ}53.27$		$05^{\circ}0.67$	14.0'	54.3'
21	134° 49.43 149° 49.30	• • 21.15	27°29.31	17.0'	05°14.65 05°28.61	14.0'	54.3'
22 23	149°49.30 164°49.17	21.24 21.32	42°5.32 56°41.29	17.0' 16.9'	05°28.61 05°42.57	14.0' 13.9'	54.3' 54.4'
23	SD = 15.7'	d = 0.1'			D = 14.8'	15.5	31.1
				- 31			
Sun	GHA	Dec	GHA	ν 16.0'	Dec	d 12.0'	HP
0 1	179°49.03 194°48.90	N23°21.41 21.49	71°17.24 85°53.15	16.9' 16.9'	\$05°56.50 06°10.43	13.9' 13.9'	54.4' 54.4'
2	209° 48.76	21.57	100°29.03	16.8	$06^{\circ}24.33$	13.9	54.4'
3	224°48.63	• • 21.66	115°4.87	16.8'	06°38.22	13.9'	54.4'
4 5	239° 48.49 254° 48.36	21.74 21.82	129°40.67 144°16.44	16.8' 16.7'	06°52.09 07°5.95	13.9' 13.8'	54.4' 54.4'
6	254 48.30 269°48.22	N23°21.90	158°52.17	16.7	507°19.78	13.8	54.4
7	284°48.09	21.98	$173^{\circ}27.85$	16.6'	07°33.60	13.8'	54.4'
8	299° 47.95	22.05	188°3.50	16.6'	07°47.39	13.8'	54.5'
9 10	314° 47.82 329° 47.68	· · 22.13 22.21	202°39.10 217°14.65	16.6' 16.5'	08°1.16 08°14.91	13.8' 13.7'	54.5' 54.5'
11	344° 47.55	22.21	231°50.16	16.5	08°28.64	13.7	54.5
12	359°47.41	N23°22.36	246°25.63	16.4'	S08°42.35	13.7'	54.5'
13 14	14° 47.28 29° 47.14	22.44 22.51	261°1.04 275°36.41	16.4' 16.3'	08°56.03 09°9.68	13.7' 13.6'	54.5' 54.5'
14 15	29°47.14 44°47.01	22.58	275°36.41 290°11.73	16.3'	09°9.68 09°23.31	13.6'	54.5° 54.5°
16	59° 46.87	22.66	$304^{\circ}46.99$	16.2'	09°36.91	13.6'	54.6'
17	74°46.74	22.73	319°22.21	16.2'	09°50.49	13.5'	54.6'
18 19	89°46.60 104°46.47	N23°22.80 22.87	333°57.37 348°32.47	16.1' 16.0'	\$10°4.03 10°17.55	13.5' 13.5'	54.6' 54.6'
20	119°46.33	22.94	3°7.52	16.0'	10°17.55 10°31.03	13.5'	54.6'
21	134°46.20	• • 23.01	17°42.51	15.9'	10°44.49	13.4'	54.6'
22 23	149°46.06 164°45.93	23.08 23.14	32°17.44 46°52.32	15.9' 15.8'	10°57.91 11°11.30	13.4' 13.4'	54.7' 54.7'
23		$\frac{23.14}{d = 0.1'}$	40 52.32			13.4	54.7
	SD = 15.7'	a = 0.1		51	D = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:33	22:29	////	////
62°	////	////	02:10	21:52	////	////
60°	////	00:53	02:36	21:26	23:10	////
N 58°	////	01:41	02:56	21:05	22:20	////
56°	////	02:11	03:13	20:48	21:51	////
54°	00:48	02:33	03:27	20:34	21:29	23:14
52°	01:33	02:51	03:39	20:22	21:11	22:29
50°	02:01	03:06	03:50	20:11	20:56	22:01
45°	02:46	03:35	04:13	19:49	20:26	21:16
N 40°	03:16	03:58	04:31	19:31	20:04	20:45
35°	03:39	04:16	04:46	19:16	19:45	20:22
30°	03:58	04:31	04:59	19:03	19:30	20:04
20°	04:27	04:56	05:21	18:41	19:05	19:35
N 10°	04:49	05:16	05:39	18:22	18:45	19:12
0°	05:08	05:34	05:57	18:04	18:27	18:53
S 10°	05:25	05:52	06:14	17:47	18:10	18:36
20°	05:41	06:09	06:33	17:28	17:52	18:20
30°	05:58	06:28	06:54	17:07	17:34	18:03
35°	06:06	06:38	07:06	16:55	17:23	17:55
40°	06:16	06:50	07:20	16:41	17:11	17:45
45°	06:26	07:03	07:37	16:24	16:58	17:35
S 50°	06:38	07:19	07:58	16:03	16:42	17:23
52°	06:43	07:27	80:80	15:54	16:34	17:18
54°	06:49	07:35	08:19	15:42	16:26	17:12
56°	06:55	07:44	08:31	15:30	16:17	17:06
58°	07:02	07:54	08:46	15:15	16:07	17:00
S 60°	07:09	08:06	09:03	14:58	15:55	16:52
		Moonris	e		Moonset	+

Lat.		Moonris	e		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	11:47	13:44	15:47	01:02	00:31 23:59	23:20
N 70°	11:51	13:38	15:31	00:56	00:32	00:07 23:39
68°	11:54	13:34	15:18	00:50	00:32	00:14 23:53
66° 64°	11:56 11:58	13:31 13:28	15:08 14:59	00:46 00:42	00:33 00:33	00:20 00:25
62°	12:00	13:25	14:52	00:38	00:34	00:29
60°	12:01	13:23	14:46	00:35	00:34	00:33
N 58°	12:03	13:21	14:40	00:32	00:34	00:36
56°	12:04	13:19	14:35	00:30	00:34	00:39
54°	12:05	13:17	14:31	00:28	00:35	00:41
52°	12:06	13:16	14:27	00:26	00:35	00:44
50°	12:07	13:15	14:24	00:24	00:35	00:46
45°	12:09	13:12	14:16	00:20	00:35	00:51
N 40°	12:10	13:10	14:10	00:17	00:36	00:55
35°	12:12	13:08	14:04	00:14	00:36	00:59
30°	12:13	13:06	13:59	00:11	00:36	01:02
20°	12:15	13:03	13:51	00:06	00:37	01:07
N 10°	12:17	13:00	13:44	00:02	00:37	01:12
0°	12:19	12:58	13:37	•• ••	00:37	01:17
S 10°	12:21	12:55	13:31		00:38	01:21
20°	12:22	12:53	13:24		00:38	01:26
30°	12:25	12:50	13:16		00:38	01:31
35°	12:26	12:48	13:11	•• ••	00:39	01:35
40°	12:27	12:46	13:06		00:39	01:38
45°	12:29	12:44	13:00		00:39	01:43
S 50°	12:31	12:42	12:53		00:40	01:48
52°	12:31	12:40	12:50		00:40	01:50
54°	12:32	12:39	12:47		00:40	01:53
56°	12:33	12:38	12:43		00:40	01:55
58°	12:35	12:36	12:38	••••	00:40	01:59
S 60°	12:36	12:35	12:34		00:40	02:02

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	48-67%	
14	00:18	00:25	12:00	18:28	06:09		
15	00:31	00:37	12:01	19:07	06:47		
16	00:44	00:50	12:01	19:47	07:27		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	265°44.42	176°5.71 N23°51.82	231°54.58 N12°26.15	202°26.01 N20°27.49	274°49.51 \$06°0.46	
1	280°46.89	191°4.81 51.92	246° 55.28 26.78	217°27.88 27.59	289°51.92 0.45	Alpheratz 357°35.31 29°13.33 Ankaa 353°7.68 -42°10.18
2	295° 49.35	206°3.92 52.02	261°55.97 27.40	232°29.75 27.69	304°54.33 0.44	Schedar 349°31.75 56°39.99
3	310°51.82	221°3.02 · · 52.12	276°56.67 · · 28.03	247°31.62 · · 27.80	319°56.75 · · 0.43	Diphda 348°47.86 -17°51.07
4 5	325° 54.28 340° 56.74	236°2.13 52.22 251°1.24 52.32	291°57.36 28.65 306°58.05 29.28	262°33.49 27.90 277°35.36 28.00	334°59.16 0.42 350°1.57 0.41	Achernar 335°20.81 -57°6.51
6	355°59.21	266°0.34 N23°52.42	321°58.75 N12°29.90	292°37.23 N20°28.10	5°3.98 \$06°0.40	Hamal 327°51.95 23°34.55
7	11°1.67	280°59.45 52.51	336° 59.44 30.52	307°39.10 28.21	20°6.39 0.39	Polaris 314°38.74 89°21.79
8	26°4.14	295°58.55 52.60	352°0.14 31.15	322°40.96 28.31	35°8.81 0.38	Acamar 315°12.45 -40°12.24 Menkar 314°6.90 4°11.11
9	41°6.60	310°57.66 · · 52.70	7°0.83 · · 31.77	337°42.83 · · 28.41	50°11.22 · · 0.37	Mirfak 308°29.37 49°56.71
10	56°9.06	325°56.76 52.79	22°1.52 32.39	352°44.70 28.51	65°13.63 0.36	Aldebaran 290°40.51 16°33.47
11 12	71°11.53 86°13.99	340°55.87 52.88 355°54.97 N23°52.97	37°2.22 33.02 52°2.91 N12°33.64	7°46.57 28.62 22°48.44 N20°28.72	80°16.04 0.35 95°18.46 \$06°0.33	Rigel 281°4.67 -8°10.38
13	101° 16.46	10°54.08 53.05	67°3.61 34.26	37°50.31 28.82	110°20.87 0.32	Capella 280°23.08 46°1.30
14	116° 18.92	25°53.18 53.14	82°4.30 34.88	52°52.18 28.92	125°23.28 0.31	Bellatrix 278°23.73 6°22.32
15	131°21.39	40°52.29 · · 53.22	97°4.99 · · 35.51	67°54.05 · · 29.03	140°25.69 · · 0.30	Elnath 278° 2.86 28° 37.66 Alnilam 275° 38.55 -1° 11.16
16	146°23.85	55°51.39 53.31	112°5.69 36.13	82°55.92 29.13	155°28.11 0.29	Betelgeuse 270°52.95 7°24.71
17	161°26.31	70°50.50 53.39	127°6.38 36.75	97°57.79 29.23	170°30.52 0.28	Canopus 263°53.16 -52°42.50
18 19	176°28.78 191°31.24	85°49.60 N23°53.47 100°48.71 53.55	142°7.08 N12°37.37 157°7.77 37.99	112°59.66 N20°29.33 128°1.53 29.43	185°32.94	Sirius 258°27.01 -16°44.97
20	206°33.71	115° 47.81 53.63		143°3.40 29.54	215°37.76 0.25	Adhara 255°6.62 -29°0.32
21	221°36.17	130°46.92 · · 53.71	187°9.16 · · 39.23	158° 5.27 · · 29.64	230°40.18 · · 0.24	Procyon 244°51.64 5°9.77
22	236°38.63	145°46.02 53.79	202°9.85 39.85	173°7.14 29.74	245°42.59 0.24	Pollux 243°18.23 27°58.11 Avior 234°15.48 -59°35.38
23	251°41.10	160°45.12 53.86	217° 10.54 40.47	188° 9.01 29.84	260°45.01 0.23	Suhail 222°46.98 -43°32.00
Mer.p	pass. 06:16	ν-0.9' d0.1' m-3.91	$\nu 0.7' \ d0.6' \ m1.01$	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	ν2.4' d-0.0' m0.97	Miaplacidus 221°39.03 -69°49.23
			_		-	Alphard 217°48.43 -8°45.89
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.10 11°50.95
0	266° 43.56	175°44.23 N23°53.93	232°11.24 N12°41.09	203°10.88 N20°29.94	275°47.42 \$06°0.22	Dubhe 193°41.71 61°37.46 Denebola 182°25.44 14°26.22
1	281°46.03	190°43.33 54.01	247° 11.93 41.71	218°12.75 30.05	290°49.84 0.21	Denebola 182°25.44 14°26.22 Gienah 175°44.05 -17°40.75
2	296° 48.49	205° 42.44 54.08	262°12.62 42.33	233°14.62 30.15	305°52.25 0.20	Acrux 173°0.55 -63°14.35
3	311°50.95	220°41.54 · · 54.15	277°13.32 · · 42.95	248°16.49 · · 30.25	320°54.67 · · 0.19	Gacrux 171°52.09 -57°15.27
4 5	326° 53.42 341° 55.88	235° 40.65 54.22 250° 39.75 54.29	292°14.01 43.57 307°14.70 44.19	263°18.36 30.35 278°20.23 30.45	335°57.08 0.18 350°59.50 0.17	Alioth 166°13.20 55°49.90
6	356° 58.35	265°38.85 N23°54.35	322°15.40 N12°44.81	293°22.10 N20°30.55	6°1.91 S06°0.16	Spica 158°22.67 -11°17.39
7	12°0.81	280° 37.96 54.42	337°16.09 45.42	308°23.98 30.66	21°4.33 0.15	Alkaid 152°52.11 49°11.69
8	27°3.28	295°37.06 54.48	352°16.78 46.04	323°25.85 30.76	36°6.75 0.14	Hadar 148°36.33 -60°29.68 Menkent 147°57.96 -36°29.57
9	42°5.74	310°36.17 · · 54.55	7° 17.48 · · · 46.66	338°27.72 · · · 30.86	51°9.16 · · 0.13	Arcturus 145°48.14 19°3.38
10	57°8.20	325°35.27 54.61	22° 18.17 47.28	353°29.59 30.96	66°11.58 0.12	Rigil Kent. 139°40.53 -60°56.39
11 12	72°10.67 87°13.13	340°34.37 54.67 355°33.48 N23°54.73	37°18.86 47.89 52°19.55 N12°48.51	8°31.46 31.06 23°33.33 N20°31.16	81°13.99 0.12 96°16.41 \$06°0.11	Kochab 137°18.88 74°3.48
13	102° 15.60	10°32.58 54.78	67°20.25 49.13	23°33.33 N20°31.16 38°35.20 31.26	111°18.83 0.10	Zuben'ubi 136°56.30 -16°8.67
14	117° 18.06	25°31.68 54.84	82°20.94 49.74	53°37.07 31.36	126°21.24 0.09	Alphecca 126°3.83 26°38.00 Antares 112°16.07 -26°29.23
15	$132^{\circ}20.52$	40°30.79 · · 54.90	97°21.63 · · 50.36	68°38.94 · · 31.46	141°23.66 · · 0.08	Antares 112°16.07 -26°29.23 Atria 107°10.17 -69°4.34
16	147° 22.99	55°29.89 54.95	112°22.33 50.98	83°40.81 31.57	156°26.08 0.07	Sabik 102°2.99 -15°45.34
17	162°25.45	70°28.99 55.00	127°23.02 51.59	98°42.68 31.67	171°28.50 0.06	Shaula 96°10.60 -37°7.30
18 19	177°27.92 192°30.38	85°28.10 N23°55.06 100°27.20 55.11	142°23.71 N12°52.21 157°24.40 52.82	113°44.56 N20°31.77 128°46.43 31.87	186°30.91	Rasalhague 95°58.65 12°32.50
20	207° 32.85	100°27.20 55.11 115°26.30 55.16	_	143°48.30 31.97	216°35.75 0.04	Eltanin 90°41.86 51°29.06
21	222°35.31	130°25.41 · · 55.20		158°50.17 · · 32.07	231°38.17 · · 0.03	Kaus Aust. 83°32.74 -34°22.36 Vega 80°33.12 38°48.27
22	237°37.77	145°24.51 55.25		173°52.04 32.17	246°40.59 0.02	Nunki 75°47.99 -26°15.95
23	252°40.24	160°23.61 55.30	217°27.17 55.28	188°53.91 32.27	261°43.00 0.02	Altair 62°0.13 8°55.91
Mer.p	pass. 06:12	ν-0.9' d0.1' m-3.91	ν 0.7' d 0.6' m1.00	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	ν2.4' d-0.0' m0.96	Peacock 53°5.99 -56°39.22
						Deneb 49°25.79 45°21.83
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.09 9°59.13
0	267° 42.70	175°22.72 N23°55.34	232°27.87 N12°55.90	203°55.78 N20°32.37	276°45.42 \$06°0.01	Al Na'ir 27°33.29 -46°50.36 Fomalhaut 15°14.95 -29°29.43
1	282° 45.17	190°21.82 55.39	247°28.56 56.51	218°57.66 32.47	291°47.84 0.00	Scheat 13°45.60 28°12.73
2	297° 47.63	205°20.92 55.43	262°29.25 57.12	233°59.53 32.57	306°50.26 59.99	Markab 13°30.31 15°20.09
3	312°50.09	220°20.03 · · 55.47		249°1.40 · · 32.67	321°52.68 · · 59.98	Jun 17 Mon SHA Mer.pass
4 5	327° 52.56 342° 55.02	235°19.13 55.51 250°18.23 55.55	292°30.64 58.35 307°31.33 58.96	264° 3.27 32.77 279° 5.14 32.87	336°55.10 59.98 351°57.52 59.97	Jun 17 Mon SHA Mer.pass Venus 270°21.28 12:16
6	357° 57.49	265°17.34 N23°55.58		294°7.01 N20°32.97	6°59.94 S05°59.96	Mars 326°10.16 08:32
7	12°59.95	280°16.44 55.62		309°8.89 33.08	22°2.36 05°59.95	Jupiter 296°41.59 10:29
8	28°2.42	295°15.54 55.65	352° 33.40 0.80	324°10.76 33.18	37°4.78 05°59.95	Saturn 9° 5.09 05:40
9	43°4.88	310°14.65 · · 55.69		339°12.63 · · 33.28	52°7.20 · · 59.94	Jun 18 Tue SHA Mer.pass
10	58°7.34	325°13.75 55.72		354°14.50 33.38	67°9.62 59.93	Venus 269°0.67 12:18
11 12	73°9.81 88°12.27	340°12.85 55.75 355°11.95 N23°55.78		9°16.38 33.48 24°18.25 N20°33.58	82°12.04 59.93 97°14.46 \$05°59.92	Mars 325°27.67 08:31
13	00 12.27 103°14.74	10°11.06 55.81		39°20.12 33.68	112°16.88 59.91	Jupiter 296°27.32 10:26
14	118° 17.20	25°10.16 55.84		54°21.99 33.78	127°19.30 59.90	Saturn 9° 3.86 05:36
15	$133^{\circ}19.66$	40°9.26 · · 55.86	97°38.25 · · 5.08	69°23.86 · · 33.88	142°21.72 · · 59.90	Jun 19 Wed SHA Mer.pass
16	148°22.13	55°8.37 55.89	112°38.94 5.69	84°25.74 33.98	157°24.14 59.89	Venus 267°40.02 12:19
17	163°24.59	70°7.47 55.91	127°39.63 6.30	99°27.61 34.08	172°26.56 59.88	Mars 324°45.16 08:30
18 19	178° 27.06 193° 29.52	85°6.57 N23°55.93 100°5.67 55.95	142°40.32 N13°6.91 157°41.02 7.52	114°29.48 N20°34.18 129°31.35 34.27	187°28.98 S05°59.88 202°31.40 59.87	Jupiter 296°13.08 10:23
20	193 29.52 208°31.99	100 5.67 55.95 115°4.78 55.97		144°33.23 34.37	202 31.40 59.87 217°33.83 59.86	Saturn 9° 2.72 05:32
21	223°34.45	130°3.88 · · 55.99		159°35.10 · · 34.47	232°36.25 · · 59.86	Horizontal parallax
22	$238^{\circ}36.91$	145°2.98 56.01	202°43.09 9.34	174°36.97 34.57	247°38.67 59.85	Venus: 0.1
23	253°39.38	160°2.09 56.03	217°43.78 9.95	189°38.85 34.67	262°41.09 59.84	Mars: 0.1
Mer.p	pass. 06:08	ν-0.9′ d0.0′ m-3.91	ν0.7′ d0.6′ m1.00	ν1.9' d0.1' m-2.01	ν2.4' d-0.0' m0.96	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°45.79	$N23^{\circ}23.21$	61°27.13	15.8'	S11°24.66	13.3'	54.7'
1	194°45.66 209°45.52	23.28 23.34	76°1.88 90°36.57	15.7'	11°37.98 11°51.27	13.3' 13.3'	54.7' 54.7'
2	209 45.32 224°45.39	23.41	90 30.57 105°11.19	15.6' 15.6'	11 51.27 12°4.52	13.2	54.7'
4	239°45.25	23.47	119° 45.75	15.5'	12° 17.73	13.2'	54.7'
5	254°45.12	23.53	134° 20.24	15.4'	12°30.90	13.1'	54.8'
6 7	269°44.98 284°44.85	N23°23.60 23.66	148°54.66 163°29.02	15.4' 15.3'	\$12°44.04 12°57.14	13.1' 13.1'	54.8' 54.8'
8	299°44.71	23.72	178°3.31	15.2'	12° 10.19	13.1	54.8
9	314°44.58	• • 23.78	192°37.52	15.1'	13°23.20	13.0'	54.8'
10	329°44.44	23.84	207°11.66	15.1'	13°36.17	12.9'	54.9'
11 12	344°44.31 359°44.17	23.90 N23°23.96	221°45.73 236°19.73	15.0' 14.9'	13°49.10 \$14°1.98	12.9' 12.8'	54.9' 54.9'
13	14°44.04	24.01	250° 53.65	14.8'	14° 14.81	12.8'	54.9'
14	29°43.90	24.07	265°27.50	14.8'	14° 27.60	12.7'	54.9'
15	44°43.77 59°43.63	• • 24.13	280°1.26 294°34.95	14.7'	14°40.34 14°53.03	12.7'	55.0'
16 17	59 43.03 74°43.49	24.18 24.24	294 34.95 309°8.56	14.6' 14.5'	14 53.03 15°5.67	12.6' 12.6'	55.0' 55.0'
18	89°43.36	N23°24.29	323° 42.09	14.4'	\$15° 18.26	12.5'	55.0'
19	104°43.22	24.34	338° 15.54	14.4'	15°30.79	12.5'	55.0'
20 21	119°43.09 134°42.95	24.40 •• 24.45	352°48.90 7°22.18	14.3' 14.2'	15°43.28 15°55.71	12.4' 12.4'	55.1' 55.1'
22	134 42.95 149°42.82	24.45	7 22.18 21°55.38	14.2 14.1'	15 55.71 16°8.08	12.4	55.1'
23	164°42.68	24.55	36° 28.49	14.0'	16° 20.40	12.3'	55.1'
	SD = 15.7'	d = 0.1'		SE	0 = 14.9'		
			-				
Tue	GHA 179°42.55	Dec	GHA	ν 12.0'	Dec	d 12.2	HP
0 1	179°42.55 194°42.41	N23°24.60 24.65	51°1.51 65°34.45	13.9' 13.8'	\$16°32.66 16°44.86	12.2' 12.1'	55.1' 55.2'
2	209°42.28	24.70	80°7.29	13.8'	16° 57.00	12.1'	55.2'
3	224°42.14	• • 24.74	94° 40.05	13.7'	17°9.08	12.0'	55.2'
4	239°42.01 254°41.87	24.79	109° 12.72 123° 45.30	13.6'	17°21.09 17°33.05	12.0'	55.2'
5 6	254°41.87 269°41.73	24.84 N23°24.88	123° 45.30 138° 17.78	13.5' 13.4'	517° 44.94	11.9' 11.8'	55.2' 55.3'
7	284°41.60	24.93	152° 50.17	13.3'	17°56.76	11.8'	55.3'
8	299°41.46	24.97	167° 22.47	13.2'	18°8.52	11.7'	55.3'
9 10	314°41.33 329°41.19	· · 25.01 25.06	181°54.67 196°26.78	13.1' 13.0'	18° 20.20 18° 31.82	11.6' 11.5'	55.3' 55.4'
11	344°41.06	25.00	210° 58.79	12.9'	16 31.62 18°43.37	11.5'	55.4'
12	359°40.92	N23°25.14	225°30.70	12.8'	S18°54.84	11.4'	55.4'
13	14°40.79	25.18	240°2.52 254°34.23	12.7'	19°6.25	11.3'	55.4'
14 15	29°40.65 44°40.51	25.22 •• 25.26	254°34.23 269°5.85	12.6' 12.5'	19° 17.57 19° 28.82	11.3' 11.2'	55.5' 55.5'
16	59°40.38	25.30	283°37.36	12.4'	19°40.00	11.1'	55.5'
17	74°40.24	25.33	298°8.78	12.3'	19°51.09	11.0'	55.5'
18 19	89°40.11 104°39.97	N23°25.37 25.41	312°40.09 327°11.30	12.2' 12.1'	\$20°2.11 20°13.05	10.9' 10.9'	55.5' 55.6'
20	119°39.84	25.44	341° 42.41		20°13.03		55.6'
21	134°39.70	• • 25.48	356° 13.41	11.9'	20°34.67	10.7'	55.6'
22	149°39.57	25.51	10°44.31	11.8'	20°45.35	10.6'	55.6'
23	164°39.43	25.54	25°15.11	11.7'	20°55.95	10.5'	55.7'
	SD = 15.7'	d = 0.0'		SE	0 = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.29	N23°25.58	39°45.80	11.6'	S21°6.46	10.4'	55.7'
1	194°39.16 209°39.02	25.61	54° 16.38	11.5'	21°16.88	10.3'	55.7'
2	209°39.02 224°38.89	25.64 •• 25.67	68° 46.86 83° 17.23	11.4' 11.3'	21°27.21 21°37.45	10.2' 10.1'	55.7' 55.8'
4	239°38.75	25.70	97° 47.49	11.2'	21°47.59	10.1	55.8'
5	254°38.62	25.73	112° 17.65	11.0'	21°57.65	10.0'	55.8'
6 7	269°38.48 284°38.35	N23°25.76 25.78	126° 47.70 141° 17.63	10.9' 10.8'	\$22°7.60 22°17.46	9.9' 9.8'	55.8' 55.9'
8	284 38.35 299°38.21	25.78 25.81	141 17.03 155° 47.47	10.8	22 17.46 22°27.21	9.8 9.7'	55.9'
9	314°38.07	• • 25.84	170° 17.19	10.6'	$22^{\circ}36.87$	9.6'	55.9'
10	329°37.94	25.86	184° 46.80	10.5'	22°46.43	9.5'	55.9'
11 12	344°37.80 359°37.67	25.89 N23°25.91	199° 16.30 213° 45.70	10.4' 10.3'	22°55.88 \$23°5.23	9.3' 9.2'	56.0' 56.0'
13	14°37.53	25.93	228° 14.98	10.3	23° 14.47	9.1'	56.0'
14	29°37.40	25.95	242° 44.15	10.1'	23°23.60	9.0'	56.1'
15	44°37.26	25.98	257°13.22	10.0'	23° 32.63	8.9'	56.1'
16 17	59°37.13 74°36.99	26.00 26.02	271°42.17 286°11.02	9.8' 9.7'	23°41.54 23°50.34	8.8' 8.7'	56.1' 56.1'
18	89°36.86	N23°26.04	300°39.75	9.6'	\$23°59.03	8.6'	56.2
19	104°36.72	26.06	315°8.38	9.5'	24°7.60	8.5'	56.2
20 21	119°36.58 134°36.45	26.07 •• 26.09	329°36.89 344°5.30	9.4' 9.3'	24°16.06 24°24.40	8.3' 8.2'	56.2' 56.2'
21	134°36.45 149°36.31	26.09	344°5.30 358°33.60	9.3'	24°24.40 24°32.62	8.2	56.2'
23	164°36.18	26.12	13°1.79	9.1'	24° 40.72	8.0'	56.3
	SD = 15.7'	d = 0.0'		SE	0 = 15.2'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:31	22:32	////	////
62°	////	////	02:09	21:54	////	////
60°	////	00:50	02:36	21:27	23:13	////
N 58°	////	01:40	02:56	21:07	22:22	////
56°	////	02:10	03:13	20:50	21:52	////
54°	00:46	02:33	03:27	20:36	21:30	23:18
52°	01:32	02:51	03:39	20:23	21:12	22:31
50°	02:00	03:06	03:50	20:12	20:57	22:03
45°	02:46	03:35	04:13	19:50	20:27	21:17
N 40°	03:16	03:58	04:31	19:32	20:05	20:46
35°	03:39	04:16	04:46	19:17	19:46	20:23
30°	03:58	04:32	04:59	19:04	19:31	20:04
20°	04:27	04:56	05:21	18:42	19:06	19:35
N 10°	04:50	05:17	05:40	18:23	18:46	19:13
0°	05:09	05:35	05:58	18:05	18:27	18:54
S 10°	05:26	05:52	06:15	17:47	18:10	18:37
20°	05:42	06:10	06:34	17:29	17:53	18:20
30°	05:59	06:28	06:55	17:08	17:34	18:04
35°	06:07	06:39	07:07	16:55	17:23	17:55
40°	06:17	06:51	07:21	16:41	17:12	17:46
45°	06:27	07:04	07:38	16:24	16:58	17:35
S 50°	06:39	07:20	07:59	16:04	16:42	17:24
52°	06:44	07:28	08:09	15:54	16:35	17:18
54°	06:50	07:36	08:20	15:42	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:06
58°	07:03	07:56	08:47	15:15	16:07	17:00
S 60°	07:10	08:07	09:05	14:58	15:55	16:52
					N4	

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	18:19			22:16		
N 70°	17:40			22:57		
68°	17:13	19:42		23:26	22:32	
66°	16:53	18:56	_	00:05 23:47	23:19	_
64°	16:37	18:26	20:39	00:15	00:05 23:50	23:22
62°	16:24	18:04	19:55	00:24	00:19	00:13
60°	16:13	17:46	19:26	00:32	00:31	00:32
N 58°	16:03	17:32	19:04	00:38	00:42	00:47
56°	15:55	17:19	18:46	00:44	00:51	01:01
54°	15:48	17:08	18:31	00:49	00:59	01:12
52°	15:41	16:58	18:18	00:54	01:06	01:23
50°	15:35	16:50	18:07	00:58	01:13	01:32
45°	15:22	16:31	17:43	01:08	01:27	01:51
N 40°	15:12	16:17	17:24	01:16	01:39	02:07
35°	15:03	16:04	17:08	01:23	01:49	02:21
30°	14:55	15:53	16:55	01:29	01:58	02:33
20°	14:42	15:35	16:32	01:39	02:14	02:53
N 10°	14:30	15:19	16:12	01:48	02:28	03:11
0°	14:19	15:04	15:53	01:57	02:40	03:27
S 10°	14:08	14:49	15:35	02:06	02:53	03:44
20°	13:57	14:34	15:16	02:15	03:07	04:02
30°	13:44	14:16	14:53	02:26	03:23	04:23
35°	13:37	14:06	14:40	02:32	03:32	04:35
40°	13:28	13:54	14:25	02:39	03:43	04:49
45°	13:18	13:40	14:07	02:48	03:55	05:05
S 50°	13:07	13:23	13:46	02:58	04:10	05:26
52°	13:01	13:16	13:35	03:02	04:18	05:36
54°	12:55	13:07	13:23	03:07	04:26	05:47
56°	12:49	12:57	13:10	03:13	04:35	06:00
58°	12:41	12:46	12:55	03:20	04:45	06:15
S 60°	12:33	12:33	12:36	03:27	04:57	06:33

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-90%	
17	00:57	01:03	12:01	20:30	08:08		
18	01:10	01:16	12:01	21:16	08:52		
19	01:23	01:29	12:01	22:06	09:40		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	268°41.84	175°1.19 N23°56.04		204°40.72 N20°34.77	277°43.51 S 05°59.84	
1	$283^{\circ}44.31$	190°0.29 56.05	247°45.17 11.17	219°42.59 34.87	292°45.94 59.83	Alpheratz 357°35.28 29°13.34 Ankaa 353°7.65 -42°10.17
2	298°46.77	204°59.39 56.07		234°44.46 34.97	307°48.36 59.83	Schedar 349°31.70 56°39.99
3	313° 49.23	219°58.50 · · 56.08		249°46.34 · · 35.07	322°50.78 · · 59.82	Diphda 348°47.83 -17°51.06
4 5	328°51.70 343°54.16	234°57.60 56.09 249°56.70 56.10		264°48.21 35.17 279°50.08 35.27	337°53.21 59.81 352°55.63 59.81	Achernar 335°20.78 -57°6.50
6	358° 56.63	264°55.80 N23°56.11		294°51.96 N20°35.37	7°58.05 S05°59.80	Hamal 327°51.92 23°34.56
7	13°59.09	279°54.91 56.11		309°53.83 35.47	23°0.48 59.80	Polaris 314°37.33 89°21.78
8	$29^{\circ}1.56$	294°54.01 56.12		324°55.70 35.57	38°2.90 59.79	Acamar 315°12.43 -40°12.22 Menkar 314°6.88 4°11.12
9	44°4.02	309°53.11 · · 56.12		339°57.58 · · 35.67	53°5.32 · · 59.78	Mirfak 308°29.34 49°56.70
10	59°6.48	324°52.21 56.12		354°59.45 35.76	68°7.75 59.78	Aldebaran 290°40.49 16°33.48
11	74°8.95 89°11.41	339°51.32 56.12 354°50.42 N23°56.12		10°1.32 35.86 25°3.20 N20°35.96	83°10.17 59.77 98°12.59 \$05°59.77	Rigel 281°4.65 -8°10.37
12 13	104° 13.88	9°49.52 56.12		40° 5.07 36.06	113°15.02 59.76	Capella 280°23.06 46°1.30
14	119° 16.34	24°48.63 56.12	_	55° 6.95 36.16	128°17.44 59.76	Bellatrix 278°23.72 6°22.32
15	$134^{\circ}18.81$	39°47.73 ⋅⋅ 56.12	97°54.84 · · 19.66	70°8.82 · · 36.26	143°19.87 · · 59.75	Elnath 278°2.84 28°37.66 Alnilam 275°38.54 -1°11.16
16	149°21.27	54°46.83 56.11		85°10.69 36.36	158°22.29 59.75	Betelgeuse 270°52.94 7°24.71
17	164°23.73	69°45.93 56.11		100°12.57 36.46	173°24.72 59.74	Canopus 263°53.16 -52°42.48
18 19	179°26.20 194°28.66	84°45.04 N23°56.10 99°44.14 56.09		115°14.44 N20°36.56 130°16.32 36.65	188°27.14 S05°59.74 203°29.57 59.73	Sirius 258°27.00 -16°44.96
20	209°31.13	114°43.24 56.08		145°18.19 36.75	203 29.57 59.73 218°31.99 59.73	Adhara 255° 6.61 -29° 0.31
21	224°33.59	129°42.34 · · 56.07		160°20.06 · · 36.85	233°34.42 · · 59.72	Procyon 244°51.64 5°9.77
22	239°36.05	144°41.45 56.06	_	175°21.94 36.95	248°36.85 59.72	Pollux 243°18.23 27°58.11 Avior 234°15.49 -59°35.37
23	254°38.52	159° 40.55 56.05	218°0.37 24.49	190°23.81 37.05	263°39.27 59.71	Suhail 222°46.99 -43°32.00
Mer.	pass. 06:04	ν-0.9' d0.0' m-3.91	ν 0.7' d0.6' m1.00	$\nu 1.9' \ d0.1' \ \text{m-}2.01$	ν 2.4' d-0.0' m0.95	Miaplacidus 221°39.06 -69°49.22
						Alphard 217°48.43 -8°45.88
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.10 11°50.95
0	269° 40.98	174°39.65 N23°56.03		205°25.69 N20°37.15	278°41.70 S05°59.71	Dubhe 193°41.73 61°37.46
1	284° 43.45	189°38.76 56.02		220°27.56 37.24	293°44.12 59.70	Denebola 182°25.44 14°26.23 Gienah 175°44.05 -17°40.75
2	299°45.91	204°37.86 56.00	263°2.44 26.29	235°29.44 37.34	308°46.55 59.70	Gienah 175°44.05 -17°40.75 Acrux 173°0.57 -63°14.36
3	314°48.38	219°36.96 · · 55.98		250°31.31 · · 37.44	323°48.98 · · 59.69	Gacrux 171°52.11 -57°15.27
4	329° 50.84	234°36.06 55.96		265°33.18 37.54	338°51.40 59.69	Alioth 166°13.22 55°49.90
5 6	344° 53.30 359° 55.77	249°35.17 55.94 264°34.27 N23°55.92		280°35.06 37.64 295°36.93 N20°37.73	353°53.83 59.68 8°56.26 \$05°59.68	Spica 158°22.67 -11°17.39
7	14° 58.23	279°33.37 55.89	_	310°38.81 37.83	23°58.68 59.68	Alkaid 152°52.13 49°11.69
8	30°0.70	294°32.48 55.87		325°40.68 37.93	39°1.11 59.67	Hadar 148°36.34 -60°29.69 Menkent 147°57.96 -36°29.57
9	45°3.16	309°31.58 · · 55.84		340°42.56 · · 38.03	54°3.54 · · 59.67	Menkent 147°57.96 -36°29.57 Arcturus 145°48.14 19°3.39
10	60°5.63	324° 30.68 55.82		355°44.43 38.13	69°5.97 59.66	Rigil Kent. 139°40.53 -60°56.39
11	75°8.09	339°29.79 55.79		10°46.31 38.22	84°8.39 59.66	Kochab 137°18.92 74°3.49
12 13	90° 10.55 105° 13.02	354°28.89 N23°55.76 9°27.99 55.73		25°48.18 N20°38.32 40°50.06 38.42	99°10.82 \$05°59.66 114°13.25 59.65	Zuben'ubi 136°56.30 -16°8.67
14	105 15.02 120° 15.48	9 27.99 55.70 24°27.09 55.70		55°51.93 38.52	129°15.68 59.65	Alphecca 126°3.83 26°38.01
15	135° 17.95	39°26.20 · · 55.67		70°53.81 · · 38.62	144°18.11 · · 59.65	Antares 112°16.06 -26°29.23 Atria 107°10.16 -69°4.35
16	$150^{\circ}20.41$	54°25.30 55.63	113°12.10 34.70	85°55.68 38.71	159°20.54 59.64	Atria 107°10.16 -69°4.35 Sabik 102°2.98 -15°45.33
17	165°22.88	69°24.40 55.60		100°57.56 38.81	174°22.97 59.64	Shaula 96°10.58 -37°7.31
18	180° 25.34	84°23.51 N23°55.56		115°59.43 N20°38.91	189°25.39	Rasalhague 95°58.64 12°32.51
19 20	195°27.80 210°30.27	99°22.61 55.52 114°21.71 55.48	_	131°1.31 39.01 146°3.19 39.10	204°27.82 59.63 219°30.25 59.63	Eltanin 90°41.85 51°29.08
21	225°32.73	129°20.82 · · 55.44		161°5.06 · · 39.20	234°32.68 · · 59.62	Kaus Aust. 83°32.73 -34°22.36
22	240°35.20	144°19.92 55.40		176° 6.94 39.30	249°35.11 59.62	Vega 80°33.11 38°48.29 Nunki 75°47.97 -26°15.95
23	255° 37.66	159° 19.02 55.36	218° 16.93 38.88	191°8.81 39.39	264°37.54 59.62	Altair 62°0.11 8°55.92
Mer.	pass. 06:00	ν-0.9' d-0.0' m-3.91	ν 0.7' d0.6' m0.99	ν1.9' d0.1' m-2.01	ν2.4' d-0.0' m0.95	Peacock 53°5.96 -56°39.22
						Deneb 49°25.76 45°21.85
Sat	СПУ	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.07 9°59.15
Sat 0	GHA 270° 40.12	GHA Dec 174°18.13 N23°55.31		GHA Dec 206°10.69 N20°39.49	GHA Dec 279°39.97 \$05°59.61	Al Na'ir 27°33.26 -46°50.35 Fomalhaut 15°14.92 -29°29.42
1	285°42.59	189°17.23 55.27		221°12.56 39.59	294°42.40 59.61	Fomalhaut 15°14.92 -29°29.42 Scheat 13°45.57 28°12.75
2	300°45.05	204°16.34 55.22	263°19.00 40.67	236°14.44 39.69	309°44.83 59.61	Markab 13°30.28 15°20.10
3	315°47.52	219° 15.44 · · 55.17		251°16.32 · · 39.78	324°47.26 · · 59.61	
4	330°49.98	234°14.54 55.12		266°18.19 39.88 281°20.07 39.98	339°49.69 59.60	Jun 20 Thu SHA Mer.pass Venus 266°19.35 12:21
5 6	345°52.45 0°54.91	249°13.65 55.07 264°12.75 N23°55.02		281°20.07 39.98 296°21.94 N20°40.07	354°52.12 59.60 9°54.55 \$05°59.60	Mars 324° 2.63 08:29
7	15° 57.37	279°11.85 54.97		311°23.82 40.17	24°56.99 59.60	Jupiter 295°58.88 10:20
8	30°59.84	294°10.96 54.91		326°25.70 40.27	39°59.42 59.59	Saturn 9°1.67 05:28
9	46°2.30	309°10.06 · · 54.86	8°23.82 · · 44.84	341°27.57 · · 40.36	55°1.85 · · 59.59	Jun 21 Fri SHA Mer.pass
10	61°4.77	324°9.17 54.80		356°29.45 40.46	70°4.28 59.59	Venus 264°58.67 12:22
11	76°7.23	339°8.27 54.75		11°31.33 40.56	85°6.71 59.59	Mars 323°20.07 08:28
12 13	91°9.70 106°12.16	354°7.37 N23°54.69 9°6.48 54.63		26°33.20 N20°40.65 41°35.08 40.75	100°9.14 S05°59.58 115°11.57 59.58	Jupiter 295°44.70 10:17
14	100 12.10 121°14.62	24°5.58 54.57		56°36.96 40.85	130°14.01 59.58	Saturn 9° 0.71 05:24
15	136° 17.09	39°4.69 · · 54.50		71°38.83 · · 40.94	145°16.44 · · 59.58	Jun 22 Sat SHA Mer.pass
16	$151^{\circ}19.55$	54°3.79 54.44	113°28.64 48.99	86°40.71 41.04	160°18.87 59.58	Venus 263°38.00 12:24
17	166° 22.02	69°2.89 54.37		101°42.59 41.14	175°21.30 59.57	Mars 322°37.49 08:26
18	181°24.48	84°2.00 N23°54.31		116°44.46 N20°41.23	190°23.74 \$05°59.57	Jupiter 295°30.56 10:14
19 20	196° 26.95 211° 29.41	99°1.10 54.24 114°0.21 54.17		131°46.34 41.33 146°48.22 41.43	205°26.17 59.57 220°28.60 59.57	Saturn 8°59.85 05:20
21	211 29.41 226°31.87	128°59.31 · · 54.10		161°50.10 · · 41.52	235°31.04 · · 59.57	Horizontal parallax
22	241°34.34	143°58.42 54.03		176°51.97 41.62	250°33.47 59.56	Venus: 0.1
23	256° 36.80	158° 57.52 53.96	218° 33.46 53.13	191°53.85 41.71	265°35.90 59.56	Mars: 0.1
Mer.	pass. 05:56	ν-0.9' d-0.0' m-3.91	ν 0.7' d 0.6' m 0.99	ν1.9' d0.1' m-2.02	ν2.4' d-0.0' m0.95	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.04	$N23^{\circ}26.14$	27°29.87	9.0'	S24°48.70	7.9'	56.3'
1 2	194°35.91 209°35.77	26.15 26.17	41°57.84 56°25.70	8.9'	24°56.55 25°4.28	7.7' 7.6'	56.3'
3	209 35.77 224°35.64	26.18	70°53.46	8.8' 8.6'	25 4.26 25°11.88	7.0 7.5'	56.4' 56.4'
4	239° 35.50	26.19	85°21.10	8.5'	25°19.35	7.3'	56.4'
5	254° 35.37	26.20	99°48.65	8.4'	25°26.69	7.2'	56.5'
6	269°35.23 284°35.09	N23°26.22	114°16.08	8.3'	\$25°33.91 25°40.99	7.1'	56.5'
7 8	284 35.09 299° 34.96	26.23 26.24	128°43.41 143°10.64	8.2' 8.1'	25°40.99 25°47.93	6.9' 6.8'	56.5' 56.5'
9	314°34.82	. 26.24	157°37.76	8.0'	25°54.74	6.7'	56.6'
10	329° 34.69	26.25	172°4.78	7.9'	26°1.42	6.5'	56.6'
11	344°34.55	26.26 N23°26.27	186°31.70	7.8'	26°7.95	6.4'	56.6'
12 13	359°34.42 14°34.28	N23 26.27 26.27	200°58.51 215°25.23	7.7' 7.6'	\$26°14.35 26°20.60	6.3' 6.1'	56.6' 56.7'
14	29°34.15	26.28	229°51.84	7.5'	26°26.71	6.0'	56.7'
15	44°34.01	• • 26.28	244°18.36	7.4'	26°32.68	5.8'	56.7'
16	59°33.88 74°33.74	26.29	258°44.78 273°11.10	7.3'	26°38.51	5.7'	56.8'
17 18	74°33.74 89°33.61	26.29 N23°26.29	273°11.10 287°37.32	7.2' 7.1'	26°44.18 \$26°49.71	5.5' 5.4'	56.8' 56.8'
19	104°33.47	26.29	302°3.46	7.0'	26°55.09	5.2'	56.8
20	119°33.34	26.29	$316^{\circ}29.49$	6.9'	$27^{\circ}0.32$	5.1'	56.9'
21	134°33.20	• • 26.29	330°55.44	6.9'	27°5.40	4.9'	56.9'
22 23	149°33.07 164°32.93	26.29 26.29	345°21.30 359°47.06	6.8' 6.7'	27°10.32 27°15.09	4.8' 4.6'	56.9' 56.9'
23	SD = 15.7'		- 559 71.00		O = 15.4'	7.0	30.3
	$3\nu = 15.7'$	d = 0.0'		SL	υ = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°32.80	N23°26.29	14°12.74	6.6'	\$27°19.70	4.5'	57.0'
1	194°32.66 209°32.52	26.29 26.28	28°38.34 43°3.85	6.5' 6.4'	27°24.16 27°28.46	4.3' 4.1'	57.0' 57.0'
2	209° 32.52 224° 32.39	26.28	43°3.85 57°29.27	6.3	27° 28.46 27° 32.60	4.1	57.0° 57.1'
4	239° 32.25	26.27	71°54.62	6.3	27°36.58	3.8'	57.1'
5	254° 32.12	26.27	86°19.88	6.2'	27°40.39	3.7'	57.1'
6	269°31.98 284°31.85	N23°26.26 26.26	100°45.07 115°10.18	6.1' 6.0'	\$27°44.05 27°47.54	3.5' 3.3'	57.1' 57.2'
7 8	284 31.85 299°31.71	26.25	115 10.18 129°35.21	6.0'	27 47.54 27°50.87	3.3 3.2'	57.2'
9	314°31.58	• • 26.24	144° 0.17	5.9'	27°54.03	3.0'	57.2'
10	329°31.44	26.23	158°25.06	5.8'	27°57.02	2.8'	57.2'
11 12	344°31.31 359°31.17	26.22 N23°26.21	172°49.88 187°14.64	5.8' 5.7'	27°59.84 \$28°2.50	2.7' 2.5'	57.3' 57.3'
13	14°31.04	26.20	201°39.33	5.6'	28°4.98	2.3'	57.3'
14	29°30.91	26.19	216°3.95	5.6'	28°7.30	2.1'	57.3'
15	44°30.77	• • 26.17	230°28.52	5.5'	28°9.44	2.0'	57.4'
16 17	59° 30.64 74° 30.50	26.16 26.15	244°53.03 259°17.47	5.4' 5.4'	28°11.41 28°13.21	1.8' 1.6'	57.4' 57.4'
18	89°30.37	N23°26.13	273°41.87	5.3'	528°14.83	1.4'	57.4
19	104° 30.23	26.12	288° 6.21	5.3'	28°16.28	1.3'	57.5'
20	119°30.10	26.10	302°30.50		28°17.55	1.1'	57.5'
21 22	134°29.96 149°29.83	· · 26.08 26.07	316°54.74 331°18.94	5.2' 5.2'	28° 18.65 28° 19.57	0.9' 0.7'	57.5' 57.5'
23	164° 29.69	26.05	345°43.09	5.1'	28°20.31	0.6	57.6'
	SD = 15.7'	d = -0.0'			D = 15.5'		
	30 = 13.7	<u>u = -0.0</u>		J.	7 = 15.5		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°29.56 194°29.42	N23°26.03	0°7.21	5.1'	\$28°20.87	0.4'	57.6'
1 2	194° 29.42 209° 29.29	26.01 25.99	14°31.28 28°55.31	5.0' 5.0'	28°21.25 28°21.45	0.2' 0.0'	57.6' 57.6'
3	224°29.15	25.97	43°19.32	5.0'	28°21.48	-0.2	57.7'
4	239°29.02	25.94	57°43.29	4.9'	28°21.32	-0.3	57.7'
5	254°28.89	25.92 N23°25.90	72°7.23 86°31.14	4.9' 4.9'	28°20.98 \$28°20.46	-0.5'	57.7'
6 7	269°28.75 284°28.62	N23°25.90 25.87	86°31.14 100°55.03	4.9' 4.9'	28° 20.46 28° 19.76	-0.7' -0.9'	57.7' 57.8'
8	299° 28.48	25.85	115°18.89	4.8'	28°18.88	-1.1'	57.8'
9	314°28.35	• • 25.82	129°42.74	4.8'	28°17.81	-1.2'	57.8'
10 11	329°28.21 344°28.08	25.80 25.77	144°6.57 158°30.38	4.8' 4.8'	28°16.57 28°15.13	-1.4' -1.6'	57.8' 57.9'
11	359° 27.94	25.77 N23°25.74	158° 30.38 172° 54.18	4.8'	28° 15.13 \$28° 13.52	-1.8	57.9' 57.9'
13	14°27.81	25.71	187°17.97	4.8'	$28^{\circ}11.72$	-2.0'	57.9'
14	29°27.68	25.69	201°41.76	4.8'	28°9.74	-2.2'	57.9'
15 16	44°27.54 59°27.41	· · 25.66 25.63	216°5.53 230°29.31	4.8'	28°7.58 28°5.24	-2.3' -2.5'	58.0'
16 17	59°27.41 74°27.27	25.63 25.59	230°29.31 244°53.08	4.8' 4.8'	28°5.24 28°2.71	-2.5' -2.7'	58.0' 58.0'
18	89°27.14	N23°25.56	259°16.86	4.8'	\$27°59.99	-2.9'	58.0'
19	104°27.01	25.53	273°40.64	4.8'	27°57.10	-3.1'	58.0'
20	119°26.87	25.50	288°4.43	4.8'	27°54.02	-3.3'	58.1'
21 22	134°26.74 149°26.60	· · 25.46 25.43	302°28.23 316°52.03	4.8' 4.8'	27°50.76 27°47.32	-3.4' -3.6'	58.1' 58.1'
23	164°26.47	25.43	331° 15.86	4.8'	27°43.69	-3.8'	58.1
	SD = 15.7'	d = -0.0'		SI	D = 15.7'		
				J.	_ 13.1		

			2024	June 20	to Jur	ı. 22 U
Lat.	Twi Naut.	light Civil	Sunrise	Sunset	Tw Civil	ilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	7777	////	01:31	22:33	7///	7///
62°	7777	////	02:09	21:54	////	////
60°	////	00:49	02:36	21:28	23:14	////
N 58°	////	01:41	02:56	21:07	22:23	////
56°	17777	02:11	03:13	20:51	21:53	7777
54°	00:45	02:33	03:28	20:36	21:31	23:19
52°	01:32	02:51	03:40	20:24	21:13	22:31
50°	02:00	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:13	19:50	20:28	21:18
N 40°	03:17	03:59	04:31	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:50	05:18	05:41	18:23	18:46	19:13
0°	05:09	05:36	05:58	18:06	18:28	18:54
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:17	06:52	07:22	16:42	17:12	17:46
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:30	16:18	17:07
58° S 60°	07:04 07:11	07:56 08:08	08:48 09:06	15:16 14:58	16:08 15:56	17:00 16:53
3 00	07.11	Moonris		14.50	Moonse	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°						
62°	22:03			00:06		
60°	21:09	22:36	23:21	23:52 00:36	00:47	01:23
N 58°						02:03
N 58° 56°	20:37	21:55 21:27	22:46 22:20	00:58 01:17	01:20 01:44	02:03
54°	19:53	21:06	22:00	01:17	02:04	02:53
52°	19:37	20:48	21:43	01:46	02:20	02:33
50°	19:23	20:32	21:28	01:58	02:34	03:26
45°	18:54	20:01	20:59	02:22	03:03	03:57
N 40°	18:32	19:37	20:35	02:42	03:26	04:21
35°	18:14	19:18	20:16	02:59	03:45	04:41
30°	17:58	19:01	20:00	03:13	04:01	04:58
20°	17:31	18:32	19:32	03:38	04:29	05:27
N 10°	17:09	18:08	19:08	03:59	04:53	05:51
0°	16:47	17:45	18:45	04:19	05:15	06:14
S 10°	16:26	17:23	18:23	04:39	05:37	06:37
20°	16:04	16:58	17:59	05:00	06:01	07:01
30°	15:38	16:30	17:31	05:25	06:28	07:29
35°	15:22	16:14	17:14	05:40	06:45	07:46
40°	15:05	15:54	16:55	05:57	07:04	08:06
45°	14:43	15:31	16:31	06:17	07:27	08:29
S 50°	14:17	15:01	16:01	06:43	07:56	09:00
52°	14:04	14:46	15:46	06:56	08:11	09:15
54°	13.40	14.20	15.20	07:10	U8·38	00.33

<u> </u>	9 00	14.11	15.00	11.00	00.11	05.50	10.51	
	Sun				Moon			
l	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	Duy	00 ^h	12 ^h	Pass	Upper	Lower	14-16	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-100%	
	20	01:36	01:42	12:02	23:01	10:33		
	21	01:49	01:55	12:02	23:59	11:30		
	22	02:02	02:08	12:02	-:-	12:30		
1							l	

15:29 15:08 14:42

07:10

07:27

07:48

08:28

08:49

09:14

09:32

09:53

10:20

54°

56° 58°

13:49

13:31

13:10

14:29

14:08 13:42

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	271°39.27	173°56.63 N23°53.88	233°34.15 N13°53.73	206°55.73 N20°41.81	280°38.34 \$05°59.56	
1	286°41.73	188°55.73 53.81	248°34.84 54.32	221°57.60 41.91	295°40.77 59.56	Alpheratz 357°35.25 29°13.36 Ankaa 353°7.61 -42°10.16
2	301°44.19	203°54.84 53.73	263°35.53 54.91	236°59.48 42.00	310°43.20 59.56	Schedar 349°31.66 56°40.00
3	316°46.66	218°53.94 · · 53.66	278° 36.22 · · 55.50	252°1.36 · · 42.10	325°45.64 · · 59.56	Diphda 348°47.80 -17°51.04
4	331°49.12	233° 53.05 53.58	293°36.91 56.09	267° 3.24 42.19	340°48.07 59.56	Achernar 335°20.74 -57°6.48
5 6	346°51.59 1°54.05	248°52.15 53.50 263°51.26 N23°53.42	308°37.59 56.68 323°38.28 N13°57.26	282°5.11 42.29 297°6.99 N20°42.39	355°50.51 59.56 10°52.94 \$05°59.55	Hamal 327°51.89 23°34.57
7	1 54.05 16° 56.52	278°50.36 53.33	338° 38.97 57.85	312°8.87 42.48	25°55.38 59.55	Polaris 314°35.96 89°21.78
8	31°58.98	293°49.47 53.25	353°39.66 58.44	327°10.75 42.58	40°57.81 59.55	Acamar 315°12.41 -40°12.21
9	47°1.44	308°48.57 · · 53.17	8°40.35 · · 59.03	342°12.63 · · 42.67	56°0.25 · · 59.55	Menkar 314°6.86 4°11.13
10	62°3.91	323°47.68 53.08	23°41.03 13°59.62	357°14.50 42.77	71°2.68 59.55	Mirfak 308°29.31 49°56.70 Aldebaran 290°40.47 16°33.48
11	77°6.37	338°46.78 52.99	38°41.72 14°0.21	12°16.38 42.86	86°5.12 59.55	Rigel 281°4.64 -8°10.36
12	92°8.84	353°45.89 N23°52.90	53°42.41 N14°0.79	27°18.26 N20°42.96	101°7.55 \$05°59.55	Capella 280°23.04 46°1.29
13	107° 11.30	8°45.00 52.81	68°43.10 1.38	42°20.14 43.05	116°9.99 59.55	Bellatrix 278°23.70 6°22.33
14 15	122° 13.77 137° 16.23	23°44.10 52.72 38°43.21 · · 52.63	83°43.79 1.97 98°44.47 · · 2.56	57°22.02 43.15 72°23.89 · · 43.25	131°12.43 59.55 146°14.86 · · 59.55	Elnath 278° 2.82 28° 37.66
16	152° 18.69	53° 42.31 52.54	113°45.16 3.14	87°25.77 43.34	161°17.30 59.55	Alnilam 275°38.53 -1°11.15
17	167°21.16	68°41.42 52.44	128°45.85 3.73	102°27.65 43.44	176°19.73 59.55	Betelgeuse 270°52.92 7°24.72
18	182°23.62	83°40.53 N23°52.35	143°46.54 N14°4.32	117°29.53 N20°43.53	191°22.17 S 05°59.55	Canopus 263°53.16 -52°42.47
19	$197^{\circ}26.09$	98°39.63 52.25	158° 47.23 4.90	132°31.41 43.63	206°24.61 59.55	Sirius 258°26.99 -16°44.95 Adhara 255°6.60 -29°0.30
20	212°28.55	113°38.74 52.15	173°47.91 5.49	147°33.29 43.72	221°27.04 59.55	Procyon 244°51.63 5°9.78
21	227°31.02	128°37.84 · · 52.05	188° 48.60 · · 6.07	162°35.17 · · 43.82	236°29.48 · · 59.55	Pollux 243°18.22 27°58.11
22	242°33.48	143°36.95 51.95	203°49.29 6.66	177°37.04 43.91	251°31.92 59.55	Avior 234°15.50 -59°35.36
23	257° 35.94	158°36.06 51.85	218°49.98 7.24	192°38.92 44.01	266°34.36 59.55	Suhail 222°46.99 -43°31.99
Mer.	pass. 05:52	$\nu\text{-}0.9'~d\text{-}0.1'~\text{m-}3.91$	$ u 0.7' \ d0.6' \ m0.99$	$ u 1.9' \ d0.1' \ \text{m-}2.02$	ν 2.4′ <i>d</i> -0.0′ m0.94	Miaplacidus 221°39.09 -69°49.21
	-					Alphard 217°48.43 -8°45.88
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.10 11°50.95
0	272°38.41	173°35.16 N23°51.75	233°50.66 N14°7.83	207°40.80 N20°44.10	281°36.79 \$05°59.55	Dubhe 193°41.75 61°37.45 Denebola 182°25.45 14°26.23
1	287°40.87	188°34.27 51.64	248°51.35 8.41	222°42.68 44.20	296°39.23 59.55	Gienah 175°44.05 -17°40.75
2	302°43.34	203°33.38 51.54	263°52.04 9.00	237°44.56 44.29	311°41.67 59.55	Acrux 173°0.59 -63°14.36
3	317°45.80	218°32.48 · · 51.43	278° 52.72 · · 9.58	252°46.44 · · 44.39	326°44.11 · · 59.55	Gacrux 171°52.12 -57°15.27
4	332°48.26	233°31.59 51.32	293°53.41 10.16	267°48.32 44.48	341°46.55 59.55	Alioth 166°13.24 55°49.90
5 6	347°50.73 2°53.19	248°30.70 51.21 263°29.81 N23°51.10	308°54.10 10.75 323°54.79 N14°11.33	282°50.20 44.57 297°52.08 N20°44.67	356°48.98 59.55 11°51.42 \$05°59.55	Spica 158°22.67 -11°17.39
7	17°55.66	278°28.91 50.99	338° 55.47 11.91	312°53.96 44.76	26°53.86 59.55	Alkaid 152°52.14 49°11.70
8	32°58.12	293°28.02 50.88	353°56.16 12.50	327°55.84 44.86	41°56.30 59.55	Hadar 148°36.34 -60°29.70
9	48°0.59	308°27.13 · · 50.76	8°56.85 · · 13.08	342°57.71 · · 44.95	56°58.74 · · 59.55	Menkent 147°57.96 -36°29.58 Arcturus 145°48.14 19°3.39
10	63°3.05	323°26.24 50.65	23°57.53 13.66	357°59.59 45.05	72°1.18 59.55	Rigil Kent. 139°40.54 -60°56.40
11	78°5.51	338°25.34 50.53	38°58.22 14.24	13° 1.47 45.14	87°3.62 59.55	Kochab 137°18.97 74°3.49
12	93°7.98	353°24.45 N23°50.41	53°58.91 N14°14.82	28°3.35 N20°45.24	102°6.06 \$05°59.56	Zuben'ubi 136°56.30 -16°8.67
13	108° 10.44	8°23.56 50.29	68°59.60 15.41	43°5.23 45.33	117°8.50 59.56	Alphecca 126° 3.83 26° 38.02
14 15	123° 12.91	23°22.67 50.17 38°21.77 · · 50.05	84°0.28 15.99	58°7.11 45.42	132°10.94 59.56 147°13.38 • 59.56	Antares 112°16.05 -26°29.23
16	138° 15.37 153° 17.83	38°21.77 · · 50.05 53°20.88 49.93	99°0.97 · · 16.57 114°1.66	73°8.99 · · 45.52 88°10.87 45.61	147°13.38 · · 59.56 162°15.82 59.56	Atria 107°10.14 -69°4.37
17	168° 20.30	68°19.99 49.80	129°2.34 17.73	103°12.75 45.71	177°18.26 59.56	Sabik 102°2.96 -15°45.33
18	183°22.76	83°19.10 N23°49.68	144°3.03 N14°18.31	118°14.63 N20°45.80	192°20.70 S05°59.56	Shaula 96°10.57 -37°7.31
19	198°25.23	98°18.21 49.55	159°3.72 18.89	133°16.51 45.89	207°23.14 59.56	Rasalhague 95°58.63 12°32.52 Eltanin 90°41.85 51°29.09
20	213°27.69	113°17.32 49.43	174°4.40 19.47	148°18.39 45.99	222°25.58 59.57	Kaus Aust. 83°32.71 -34°22.36
21	228°30.16	128°16.43 · · 49.30	189°5.09 · · 20.05	163°20.27 · · 46.08	237°28.02 · · 59.57	Vega 80°33.10 38°48.31
22	243°32.62	143°15.53 49.17	204°5.78 20.63	178°22.15 46.18	252°30.46 59.57	Nunki 75°47.95 -26°15.95
23	258° 35.08	158°14.64 49.03	219°6.46 21.21	193°24.03 46.27	267°32.90 59.57	Altair 62°0.09 8°55.93
Mer.	pass. 05:48	$\nu\text{-}0.9'~d\text{-}0.1'~\text{m-}3.91$	$ u 0.7' \ d0.6' \ m0.99$	$ u 1.9' \ d0.1' \ \text{m-}2.02$	$\nu 2.4' \ d0.0' \ m0.94$	Peacock 53°5.92 -56°39.22
						Deneb 49°25.74 45°21.87
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.04 9°59.16 Al Na'ir 27°33.22 -46°50.35
0	273° 37.55	173°13.75 N23°48.90	234°7.15 N14°21.78	208°25.92 N20°46.36	282°35.34 S 05°59.57	Al Na'ir 27°33.22 -46°50.35 Fomalhaut 15°14.89 -29°29.41
1	288°40.01	188°12.86 48.77	249°7.84 22.36	223°27.80 46.46	297°37.78 59.57	Scheat 13°45.54 28°12.76
2	303°42.48	203°11.97 48.63	264°8.52 22.94	238°29.68 46.55	312°40.23 59.58	Markab 13°30.26 15°20.11
3	318° 44.94	218° 11.08 · · 48.50	279°9.21 · · 23.52	253°31.56 · · 46.64	327°42.67 · · 59.58	
4	333° 47.41	233°10.19 48.36	294°9.89 24.10	268°33.44 46.74 283°35.32 46.83	342°45.11 59.58	Jun 23 Sun SHA Mer.pass Venus 262°17.36 12:25
5 6	348° 49.87 3° 52.33	248°9.30 48.22 263°8.41 N23°48.08	309°10.58 24.67 324°11.27 N14°25.25	283°35.32 46.83 298°37.20 N20°46.93	357°47.55 59.58 12°49.99 \$05°59.59	Mars 321°54.89 08:25
7	18° 54.80	278°7.52 47.94	339°11.95 25.83	313°39.08 47.02	27°52.44 59.59	Jupiter 295°16.46 10:11
8	33° 57.26	293°6.63 47.80	354°12.64 26.40	328°40.96 47.11	42°54.88 59.59	Saturn 8°59.07 05:17
9	48°59.73	308°5.74 · · 47.65	9°13.32 · · 26.98	343°42.84 · · 47.21	57°57.32 · · 59.59	Lun 24 Many SHA Manyaran
10	64°2.19	323°4.85 47.51	24°14.01 27.56	358°44.72 47.30	72°59.76 59.60	Jun 24 Mon SHA Mer.pass Venus 260°56.76 12:26
11	79°4.65	338°3.96 47.36	39°14.70 28.13	13°46.61 47.39	88°2.21 59.60	Mars 321°12.26 08:24
12	94°7.12	353°3.07 N23°47.21	54°15.38 N14°28.71	28°48.49 N20°47.49	103°4.65 \$05°59.60	Jupiter 295°2.39 10:08
13 14	109°9.58 124°12.05	8°2.18 47.07 23°1.29 46.92	69°16.07 29.28 84°16.75 29.86	43°50.37 47.58 58°52.25 47.67	118°7.09 59.60 133°9.54 59.61	Saturn 8°58.39 05:13
14 15	124 12.05 139° 14.51	38°0.40 · · 46.77	84°16.75 29.86 99°17.44 · · 30.43	58°52.25 47.67 73°54.13 • 47.76	133 9.54 59.61 148°11.98 · · 59.61	Jun 25 Tue SHA Mer.pass
16	154° 16.97	52°59.51 46.61	114°18.13 31.01	88°56.01 47.86	163°14.43 59.61	Jun 25 Tue SHA Mer.pass Venus 259°36.20 12:28
17	169° 19.44	67°58.63 46.46	129° 18.81 31.58	103°57.89 47.95	178°16.87 59.61	Mars 320°29.60 08:23
18	184°21.90	82°57.74 N23°46.30	144°19.50 N14°32.15	118°59.78 N20°48.04	193°19.31 S 05°59.62	Jupiter 294°48.37 10:05
19	199°24.37	97° 56.85 46.15	159°20.18 32.73	134° 1.66 48.14	208°21.76 59.62	Saturn 8°57.79 05:09
20	214°26.83	112°55.96 45.99	174°20.87 33.30	149° 3.54 48.23	223°24.20 59.62	Horizontal parallax
21 22	229°29.30 244°31.76	127°55.07 · · 45.83 142°54.18 45.67	189°21.55 · · 33.87 204°22.24 34.45	164° 5.42 · · 48.32 179° 7.30 48.41	238°26.65 · · 59.63 253°29.09 59.63	Venus: 0.1
22	244°31.76 259°34.22	142°54.18 45.67 157°53.30 45.51	204°22.24 34.45 219°22.92 35.02	179°7.30 48.41 194°9.19 48.51	253°29.09 59.63 268°31.54 59.63	Mars: 0.1
ا، iVler	pass. 05:45	ν-0.9' d-0.1' m-3.91	ν0.7' d0.6' m0.98	ν1.9' d0.1' m-2.02	ν2.4' d0.0' m0.93	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	179°26.34	N23°25.35	345°39.70	4.9'	S27°39.88	-4.0'	58.2'
1	194°26.20	25.32	0°3.55	4.9'	27°35.90	-4.2'	58.2'
2	209°26.07 224°25.93	25.28 •• 25.24	14°27.43 28°51.33	4.9' 4.9'	27°31.73 27°27.37	-4.4' -4.5'	58.2' 58.2'
4	239°25.80	25.20	43° 15.26	5.0'	27°22.84	-4.7'	58.2'
5	254°25.67	25.16	57°39.21	5.0'	$27^{\circ}18.13$	-4.9'	58.3'
6	269°25.53	N23°25.12	72°3.20	5.0'	\$27°13.24	-5.1'	58.3'
7 8	284°25.40 299°25.27	25.08 25.04	86°27.21 100°51.26	5.0' 5.1'	27°8.17 27°2.92	-5.2' -5.4'	58.3' 58.3'
9	314°25.13	• • 25.00	115° 15.35	5.1'	26°57.50	-5.6'	58.3'
10	329°25.00	24.95	129°39.47	5.2'	$26^{\circ}51.90$	-5.8'	58.4'
11	344°24.87	24.91 N23°24.86	144°3.63	5.2'	26°46.12 \$26°40.17	-6.0'	58.4'
12 13	359°24.73 14°24.60	N23 24.86 24.82	158° 27.84 172° 52.09	5.2' 5.3'	26°34.04	-6.1' -6.3'	58.4' 58.4'
14	29°24.46	24.77	187° 16.38	5.3'	26°27.74	-6.5	58.4'
15	44°24.33	• • 24.73	201°40.73	5.4'	26°21.26	-6.6'	58.5'
16	59°24.20 74°24.07	24.68	216°5.12 230°29.56	5.4'	26°14.61 26°7.79	-6.8'	58.5'
17 18	89°23.93	24.63 N23°24.58	230 29.56 244°54.06	5.5' 5.6'	26 7.79 \$26°0.81	-7.0' -7.2'	58.5' 58.5'
19	104°23.80	24.53	259° 18.61	5.6'	25°53.65	-7.3	58.5'
20	119°23.67	24.48	273°43.22	5.7'	25°46.32	-7.5'	58.6'
21	134°23.53	· · 24.43 24.38	288°7.88	5.7'	25°38.82	-7.7'	58.6' 58.6'
22 23	149°23.40 164°23.27	24.38	302°32.61 316°57.39	5.8' 5.8'	25°31.16 25°23.34	-7.8' -8.0'	58.6'
	SD = 15.7'	d = -0.0'			D = 15.9'	3.0	
	JU = 13.1	u = -0.0			D — 13.9°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.13	N23°24.27	331°22.24	5.9'	\$25°15.35	-8.2'	58.6'
1 2	194°23.00 209°22.87	24.22 24.16	345°47.15 0°12.13	6.0' 6.0'	25°7.19 24°58.88	-8.3' -8.5'	58.6' 58.7'
3	224°22.73	24.11	14° 37.17	6.1	24°50.40	-8.6'	58.7'
4	239°22.60	24.05	29°2.28	6.2'	$24^{\circ}41.76$	-8.8'	58.7'
5	254°22.47	23.99	43°27.46	6.2'	24°32.97	-9.0'	58.7'
6 7	269°22.34 284°22.20	N23°23.93 23.88	57°52.71 72°18.03	6.3' 6.4'	\$24°24.02 24°14.91	-9.1' -9.3'	58.7' 58.7'
8	299°22.07	23.82	86°43.42	6.5'	24°5.64	-9.4	58.8'
9	314°21.94	• • 23.76	101°8.89	6.5'	23°56.23	-9.6'	58.8'
10	329°21.81 344°21.67	23.70	115°34.43 130°0.04	6.6'	23°46.66 23°36.94	-9.7'	58.8'
11 12	359°21.54	23.64 N23°23.57	130 0.04 144°25.73	6.7' 6.8'	23 36.94 \$23°27.07	-9.9' -10.0'	58.8' 58.8'
13	14°21.41	23.51	158°51.50	6.8'	23°17.06	-10.2	58.8'
14	29°21.28	23.45	173° 17.34	6.9'	23°6.90	-10.3'	58.8'
15 16	44°21.14 59°21.01	· · 23.38 23.32	187°43.27 202°9.27	7.0' 7.1'	22°56.59 22°46.14	-10.5' -10.6'	58.9' 58.9'
17	74°20.88	23.32	202 9.27 216°35.35	7.1 7.2'	22°35.54	-10.6 -10.7'	58.9'
18	89°20.75	N23°23.19	231°1.51	7.2'	S22°24.81	-10.9'	58.9'
19	104°20.62	23.12	245°27.75	7.3'	22°13.94	-11.0'	58.9'
20 21	119°20.48 134°20.35	23.05 •• 22.98	259° 54.07 274° 20.47	7.4' 7.5'	22°2.92 21°51.78	-11.1' -11.3'	58.9' 58.9'
22	149°20.22	22.91	288° 46.96	7.6'	21°40.49	-11.4'	58.9
23	164°20.09	22.84	303°13.52	7.6'	$21^{\circ}29.08$	-11.5'	59.0'
	SD = 15.7'	d = -0.1'		S	D = 16.0'		
_							
Tue	GHA 179° 19.96	Dec N23°22.77	GHA 317° 40.17	ν 7.7'	Dec S 21°17.53	d -11.7'	HP 59.0'
0 1	179° 19.96 194° 19.82	N23 22.77 22.70	317 40.17 332°6.90	7.7° 7.8'	21°5.85	-11.7 -11.8'	59.0' 59.0'
2	209°19.69	22.63	346°33.72	7.9'	20°54.05	-11.9'	59.0'
3	224°19.56	• • 22.56	1°0.62	8.0'	20°42.12	-12.1'	59.0'
4 5	239° 19.43 254° 19.30	22.48 22.41	15°27.59 29°54.66	8.1' 8.1'	20°30.06 20°17.88	-12.2' -12.3'	59.0' 59.0'
6	269°19.17	N23°22.34	44°21.80	8.2'	\$20°5.57	-12.4'	59.0'
7	284°19.03	22.26	58°49.03	8.3'	$19^{\circ}53.15$	-12.5'	59.0'
8	299°18.90	22.18	73° 16.34	8.4'	19°40.60	-12.7'	59.1'
9 10	314° 18.77 329° 18.64	· · 22.11 22.03	87°43.73 102°11.21	8.5' 8.6'	19°27.94 19°15.16	-12.8' -12.9'	59.1' 59.1'
11	344°18.51	21.95	116° 38.77	8.6'	19° 13.10	-13.0'	59.1
12	359°18.38	N23°21.87	131°6.41	8.7'	S18°49.27	-13.1'	59.1'
13	14° 18.25 29° 18.11	21.79	145°34.13 160°1.93	8.8'	18°36.15 18°22.93	-13.2'	59.1'
14 15	29°18.11 44°17.98	21.71 •• 21.63	160°1.93 174°29.82	8.9' 9.0'	18°22.93 18°9.60	-13.3' -13.4'	59.1' 59.1'
16	59°17.85	21.55	188° 57.78	9.0'	17°56.16	-13.5'	59.1
17	74° 17.72	21.47	203°25.83	9.1'	$17^{\circ}42.62$	-13.6'	59.1'
18	89°17.59	N23°21.38	217°53.96 232°22.16	9.2' 9.3'	\$17°28.97 17°15.23	-13.7'	59.1'
19 20	104°17.46 119°17.33	21.30 21.21	232°22.16 246°50.44	9.3'	17°15.23 17°1.38	-13.8' -13.9'	59.2' 59.2'
21	134° 17.20	21.13	261° 18.81	9.4'	16°47.44	-14.0'	59.2'
22	149° 17.07	21.04	275°47.25	9.5'	16°33.40	-14.1'	59.2'
23	164°16.94	20.95	290°15.76	9.6'	16°19.27	-14.2'	59.2'
	SD = 15.7'	d = -0.1'		S	D = 16.1'		

Naut. Civil Sumset Civil Naut. N 72° □ □ □ □ □ N 70° □ □ □ □ □ 68° □ □ □ □ □ 66° □ □ □ □ □ 60° //// //// 00:11 21:54 //// //// 60° //// 00:51 02:37 21:28 23:13 //// //// N 58° //// 01:42 02:57 21:07 22:23 //// //// ///// ////////////////////////////////////	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° □ □ □ □ 68° □ □ □ □ □ 66° □ □ □ □ □ 64° //// //// 02:11 □ □ □ 60° //// 00:51 02:37 21:28 23:13 //// M 56° //// 01:42 02:57 21:07 22:23 //// 56° //// 02:12 03:14 20:51 21:53 //// 56° //// 02:43 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68° □	N 72°						
G66°	N 70°						
64° //// //// 01:33 22:32 //// //// 62° //// //// 02:11 21:54 //// //// 60° //// 00:51 02:37 21:28 23:13 //// M 58° //// 01:42 02:57 21:07 22:23 //// 56° //// 02:12 03:14 20:51 21:53 //// 54° 00:47 02:34 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 04:59 04:33							
62° //// //// 02:11 21:54 //// //// 60° //// 00:51 02:37 21:28 23:13 //// N 58° //// 01:42 02:57 21:07 22:23 //// 56° //// 02:12 03:14 20:51 21:53 //// 54° 00:47 02:34 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:2							
60° //// 00:51 02:37 21:28 23:13 //// N 58° //// 01:42 02:57 21:07 22:23 //// 56° //// 02:12 03:14 20:51 21:53 //// 54° 00:47 02:34 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 <t< th=""><th>1</th><th></th><th></th><th></th><th>1</th><th></th><th></th></t<>	1				1		
N 58° //// 01:42 02:57 21:07 22:23 //// 56° //// 02:12 03:14 20:51 21:53 //// 54° 00:47 02:34 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 <	1						
56° //// 02:12 03:14 20:51 21:53 //// 54° 00:47 02:34 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53	1	////	00:51	02:37	21:28	23:13	////
54° 00:47 02:34 03:28 20:36 21:31 23:17 52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11		////	01:42	02:57	21:07	22:23	////
52° 01:34 02:52 03:41 20:24 21:13 22:31 50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 30° 03:59 04:33 05:00 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11 06:35 17:30 17:54 18:22 30° 06:00 06:30							
50° 02:01 03:07 03:52 20:13 20:58 22:03 45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11 06:35 17:30 17:54 18:22 30° 06:00 06:30 06:56 17:09 17:35 18:05 40° 06:18 06:52	1 -						
45° 02:47 03:37 04:14 19:51 20:28 21:18 N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11 06:35 17:30 17:54 18:22 30° 06:00 06:30 06:56 17:09 17:35 18:05 35° 06:09 06:40 07:08 16:57 17:25 17:57 40° 06:18 06:52							
N 40° 03:18 03:59 04:32 19:33 20:06 20:47 35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11 06:35 17:30 17:54 18:22 30° 06:00 06:30 06:56 17:09 17:35 18:05 35° 06:09 06:40 07:08 16:57 17:25 17:57 40° 06:18 06:52 07:23 16:43 17:13 17:47 45° 06:28 07:06							
35° 03:41 04:18 04:47 19:18 19:47 20:24 30° 03:59 04:33 05:00 19:05 19:32 20:06 20° 04:29 04:58 05:22 18:43 19:07 19:37 N 10° 04:51 05:18 05:41 18:24 18:47 19:14 0° 05:10 05:36 05:59 18:06 18:29 18:55 S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11 06:35 17:30 17:54 18:22 30° 06:00 06:30 06:56 17:09 17:35 18:05 35° 06:09 06:40 07:08 16:57 17:25 17:57 40° 06:18 06:52 07:23 16:43 17:13 17:47 45° 06:28 07:06 07:39 16:26 17:00 17:37 \$50° 06:40 07:22	1	02:47					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
S 10° 05:27 05:53 06:16 17:49 18:12 18:38 20° 05:43 06:11 06:35 17:30 17:54 18:22 30° 06:00 06:30 06:56 17:09 17:35 18:05 35° 06:09 06:40 07:08 16:57 17:25 17:57 40° 06:18 06:52 07:23 16:43 17:13 17:47 45° 06:28 07:06 07:39 16:26 17:00 17:37 \$50° 06:40 07:22 08:00 16:05 16:44 17:25 52° 06:45 07:29 08:10 15:55 16:36 17:20 54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01					1		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1	05:10					
30° 06:00 06:30 06:56 17:09 17:35 18:05 35° 06:09 06:40 07:08 16:57 17:25 17:57 40° 06:18 06:52 07:23 16:43 17:13 17:47 45° 06:28 07:06 07:39 16:26 17:00 17:37 \$50° 06:40 07:22 08:00 16:05 16:44 17:25 52° 06:45 07:29 08:10 15:55 16:36 17:20 54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
40° 06:18 06:52 07:23 16:43 17:13 17:47 45° 06:28 07:06 07:39 16:26 17:00 17:37 \$ 50° 06:40 07:22 08:00 16:05 16:44 17:25 52° 06:45 07:29 08:10 15:55 16:36 17:20 54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01							
45° 06:28 07:06 07:39 16:26 17:00 17:37 \$ 50° 06:40 07:22 08:00 16:05 16:44 17:25 52° 06:45 07:29 08:10 15:55 16:36 17:20 54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01					l		
S 50° 06:40 07:22 08:00 16:05 16:44 17:25 52° 06:45 07:29 08:10 15:55 16:36 17:20 54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01							
52° 06:45 07:29 08:10 15:55 16:36 17:20 54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01					1		
54° 06:51 07:37 08:21 15:44 16:28 17:14 56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01							
56° 06:57 07:46 08:34 15:31 16:19 17:08 58° 07:04 07:57 08:49 15:17 16:09 17:01					1		
58° 07:04 07:57 08:49 15:17 16:09 17:01					1		
3 00 07:11 08:08 09:00 14:59 15:57 16:54							
	5 00°	07:11	08:08	09:00	14:59	15:57	10:54

Lat.		Moonris	e		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°			01:44			04:26
66°			00:55			05:14
64°		00:58	00:24		03:12	05:45
62°	00:27	80:00	00:00 23:54	01:38	04:02	06:07
60°	23:36	23:41	23:42	02:44	04:33	06:25
N 58°	23:12	23:25	23:32	03:19	04:56	06:40
56°	22:53	23:11	23:23	03:44	05:15	06:53
54°	22:36	23:00	23:15	04:04	05:31	07:04
52°	22:22	22:49	23:08	04:21	05:44	07:14
50°	22:10	22:40	23:02	04:35	05:56	07:23
45°	21:44	22:20	22:48	05:04	06:21	07:41
N 40°	21:24	22:04	22:36	05:27	06:40	07:56
35°	21:07	21:50	22:26	05:46	06:56	08:09
30°	20:52	21:38	22:18	06:02	07:10	08:19
20°	20:27	21:17	22:02	06:29	07:34	08:38
N 10°	20:06	21:00	21:49	06:52	07:54	08:54
0°	19:45	20:43	21:37	07:14	08:13	09:09
S 10°	19:25	20:26	21:24	07:36	08:32	09:24
20°	19:03	20:07	21:11	07:59	08:52	09:39
30°	18:37	19:46	20:55	08:25	09:14	09:57
35°	18:22	19:34	20:46	08:41	09:28	10:07
40°	18:05	19:20	20:36	08:59	09:43	10:19
45°	17:44	19:03	20:23	09:21	10:01	10:33
S 50°	17:17	18:42	20:09	09:48	10:24	10:49
52°	17:04	18:32	20:02	10:02	10:34	10:57
54°	16:49	18:20	19:54	10:17	10:46	11:06
56°	16:31	18:07	19:45	10:35	11:00	11:15
58°	16:10	17:52	19:35	10:57	11:16	11:26
S 60°	15:42	17:33	19:23	11:25	11:35	11:39

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-89%	
23	02:15	02:21	12:02	01:00	13:30		
24	02:27	02:34	12:03	01:59	14:28		
25	02:40	02:46	12:03	02:56	15:23		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	274°36.69	172°52.41 N23°45.35	234°23.61 N14°35.59	209°11.07 N20°48.60	283°33.98	
1	289°39.15	187°51.52 45.19	249°24.30 36.16	224°12.95 48.69	298°36.43 59.64	Alpheratz 357°35.22 29°13.37
2	304°41.62	202°50.63 45.02	264°24.98 36.74	239°14.83 48.78	313°38.87 59.64	Ankaa 353°7.58 -42°10.15
3	319°44.08	217°49.75 · · 44.86	279°25.67 · · 37.31	254°16.71 · · 48.88	328°41.32 · · 59.65	Schedar 349°31.63 56°40.01
4	334°46.54	232°48.86 44.69	294° 26.35 37.88	269°18.60 48.97	343°43.77 59.65	Diphda 348°47.78 -17°51.03 Achernar 335°20.70 -57°6.47
5	349°49.01	247° 47.97 44.52	309°27.04 38.45	284°20.48 49.06	358°46.21 59.66	Achernar 335°20.70 -57°6.47 Hamal 327°51.87 23°34.58
6	4°51.47	262°47.08 N23°44.35	324°27.72 N14°39.02	299°22.36 N20°49.15	13°48.66 \$05°59.66	Polaris 314°34.83 89°21.77
7	19°53.94	277°46.20 44.18	339°28.41 39.59	314°24.25 49.25	28°51.10 59.66	Acamar 315°12.38 -40°12.19
8	34°56.40	292°45.31 44.01	354°29.09 40.16	329°26.13 49.34	43°53.55 59.67	Menkar 314°6.84 4°11.14
9	49° 58.87	307°44.42 · · 43.84	9°29.78 · · 40.73	344°28.01 · · 49.43	58°56.00 · · 59.67	Mirfak 308°29.28 49°56.70
10	65°1.33	322°43.54 43.66	24°30.46 41.30	359°29.89 49.52	73°58.44 59.68	Aldebaran 290°40.45 16°33.49
11	80°3.79	337°42.65 43.49	39°31.15 41.87	14°31.78 49.61	89°0.89 59.68	Rigel 281°4.62 -8°10.35
12	95°6.26	352°41.76 N23°43.31	54°31.83 N14°42.44	29°33.66 N20°49.71	104°3.34 S05°59.68	Capella 280°23.02 46°1.29
13	110°8.72 125°11.19	7°40.88 43.13 22°39.99 42.95	69°32.52 43.01 84°33.20 43.58	44°35.54 49.80 59°37.43 49.89	119°5.78 59.69 134°8.23 59.69	Bellatrix 278°23.69 6°22.33
14 15	140° 13.65	37°39.11 · · 42.77	99°33.89 · · 44.15	74°39.31 · · 49.98	134°8.23 59.69 149°10.68 •• 59.70	Elnath 278°2.81 28°37.66
16	155° 16.11	52°38.22 42.59	114°34.57 44.71	89°41.19 50.07	164°13.13 59.70	Alnilam 275°38.52 -1°11.14
17	170° 18.58	67°37.34 42.41	129°35.26 45.28	104°43.08 50.17	179°15.58 59.71	Betelgeuse 270°52.91 7°24.73
18	185°21.04	82°36.45 N23°42.22	144°35.94 N14°45.85	119°44.96 N20°50.26	194°18.02 S05°59.71	Canopus 263°53.16 -52°42.45
19	200°23.51	97°35.57 42.04	159°36.62 46.42	134°46.84 50.35	209°20.47 59.72	Sirius 258°26.99 -16°44.94
20	215°25.97	112°34.68 41.85	174°37.31 46.98	149°48.73 50.44	224°22.92 59.72	Adhara 255°6.60 -29°0.28
21	230°28.43	127°33.80 · · 41.67	189°37.99 · · 47.55	164°50.61 · · 50.53	239°25.37 · · 59.73	Procyon 244°51.63 5°9.78
22	245°30.90	142°32.91 41.48	204° 38.68 48.12	179°52.49 50.62	254°27.82 59.73	Pollux 243°18.21 27°58.11
23	260°33.36	157°32.03 41.29	219° 39.36 48.68	194°54.38 50.71	269°30.27 59.74	Avior 234° 15.52 -59° 35.35
1/1	DE: 41	ν-0.9' d-0.2' m-3.91	ν0.7' d0.6' m0.98	ν1.9' d0.1' m-2.02		Suhail 222°47.00 -43°31.98 Miaplacidus 221°39.13 -69°49.20
ivier.	pass. 05:41	ν-υ.9 α-υ.2 m-3.91	νυ.ι αυ.ο mυ.98	ν1.9 αυ.1 m-2.02	ν2.4' d0.0' m0.93	Miaplacidus 221°39.13 -69°49.20 Alphard 217°48.43 -8°45.87
						Regulus 207°35.11 11°50.95
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.76 61°37.45
0	275° 35.83	172°31.14 N23°41.09	234°40.05 N14°49.25	209°56.26 N20°50.81	284°32.72 S 05°59.74	Denebola 182°25.45 14°26.23
1	290°38.29	187°30.26 40.90	249° 40.73 49.82	224°58.15 50.90	299°35.16 59.75	Gienah 175°44.06 -17°40.74
2	305°40.75	202°29.38 40.71	264°41.42 50.38	240°0.03 50.99	314°37.61 59.75	Acrux 173°0.62 -63°14.36
3	320° 43.22	217°28.49 · · 40.51	279°42.10 · · 50.95	255°1.91 · · 51.08	329°40.06 · · 59.76	Gacrux 171°52.14 -57°15.28
4	335° 45.68	232°27.61 40.32	294°42.78 51.51	270° 3.80 51.17	344°42.51 59.76	Alioth 166°13.25 55°49.91
5	350°48.15	247°26.72 40.12	309°43.47 52.08	285° 5.68 51.26	359°44.96 59.77	Spica 158°22.68 -11°17.39
6	5°50.61	262°25.84 N23°39.92	324°44.15 N14°52.64	300°7.57 N20°51.35	14°47.41 \$05°59.77	Alkaid 152°52.15 49°11.70
7	20°53.08	277°24.96 39.72	339° 44.84 53.20	315° 9.45 51.44	29°49.86 59.78	Hadar 148°36.37 -60°29.70
8 9	35°55.54	292°24.08 39.52	354°45.52 53.77	330°11.34 51.54	44°52.31 59.79 59°54.76 59.79	Menkent 147°57.97 -36°29.58
10	50°58.00 66°0.47	307°23.19 · · 39.32 322°22.31 39.11	9°46.20 · · 54.33 24°46.89 54.89	345°13.22 · · 51.63 0°15.10 51.72	59°54.76 · · 59.79 74°57.21 59.80	Arcturus 145°48.15 19°3.40
11	81°2.93	337°21.43 38.91	39°47.57 55.46	15°16.99 51.81	89°59.67 59.80	Rigil Kent. 139°40.56 -60°56.41
12	96°5.40	352°20.55 N23°38.70	54°48.26 N14°56.02	30°18.87 N20°51.90	105°2.12 S05°59.81	Kochab 137°19.00 74°3.50
13	111°7.86	7°19.66 38.50	69°48.94 56.58	45°20.76 51.99	120°4.57 59.81	Zuben'ubi 136°56.30 -16°8.67
14	126° 10.32	22°18.78 38.29	84°49.62 57.15	60°22.64 52.08	135°7.02 59.82	Alphecca 126°3.83 26°38.02
15	141°12.79	37°17.90 · · 38.08	99°50.31 · · 57.71	75°24.53 · · 52.17	150°9.47 · · 59.83	Antares 112°16.05 -26°29.23
16	156° 15.25	52°17.02 37.87	114°50.99 58.27	90°26.41 52.26	165°11.92 59.83	Atria 107°10.14 -69°4.38
17	171° 17.72	67°16.14 37.66	129°51.68 58.83	105°28.30 52.35	180°14.37 59.84	Sabik 102°2.96 -15°45.34 Shaula 96°10.56 -37°7.32
18	186°20.18	82°15.26 N23°37.44	144°52.36 N14°59.39	120°30.18 N20°52.44	195°16.83	Rasalhague 95°58.62 12°32.53
19	201°22.64	97° 14.37 37.23	159°53.04 14°59.95	135°32.07 52.53	210°19.28 59.85	Eltanin 90°41.85 51°29.11
20	216°25.11	112°13.49 37.01	174°53.73 0.51	150°33.96 52.62	225°21.73 59.86	Kaus Aust. 83°32.69 -34°22.37
21	231°27.57	127°12.61 · · 36.79	189°54.41 · · 1.07	165°35.84 · · 52.71	240°24.18 · · 59.87	Vega 80°33.09 38°48.32
22	246°30.04	142°11.73 36.58	204°55.09 1.63	180°37.73 52.80	255°26.64 59.87	Nunki 75°47.94 -26°15.95
23	261°32.50	157° 10.85 36.36	219°55.78 2.19	195°39.61 52.89	270°29.09 59.88	Altair 62°0.07 8°55.94
Mer.	pass. 05:37	ν -0.9' d-0.2' m-3.91	ν0.7' d0.6' m0.98	ν1.9' d0.1' m-2.02	ν 2.4' d0.0' m0.93	Peacock 53°5.89 -56°39.23
						Deneb 49°25.72 45°21.88
	G11.4	G.114 B	6114	6114	G.1.4 B	Enif 33°39.02 9°59.17
Fri	GHA 276°34.96	GHA Dec 172°9.97 N23°36.14	GHA Dec 234°56.46 N15°2.75	GHA Dec 210°41.50 N20°52.98	GHA Dec 285°31.54 \$05°59.89	Al Na'ir 27°33.19 -46°50.35
0 1	276° 34.96 291° 37.43	172°9.97 N23°36.14 187°9.09 35.91	234°56.46 N15°2.75 249°57.14 3.31	210°41.50 N20°52.98 225°43.38 53.07	300°33.99 59.89	Fomalhaut 15°14.86 -29°29.41
2	306°39.89	202°8.21 35.69	264° 57.83 3.87	240°45.27 53.16	315°36.45 59.90	Scheat 13°45.52 28°12.77
3	321° 42.36	217°7.33 · · 35.47	279°58.51 · · 4.43	255°47.15 · · 53.25	330°38.90 · · 59.91	Markab 13°30.23 15°20.12
4	336° 44.82	232°6.45 35.24	294°59.19 4.99	270°49.04 53.34	345°41.35 59.91	Jun 26 Wed SHA Mer.pass
5	351° 47.29	247°5.58 35.02	309°59.88 5.55	285°50.93 53.43	0°43.81 59.92	Venus 258°15.72 12:29
6	6° 49.75	262°4.70 N23°34.79	325°0.56 N15°6.11	300°52.81 N20°53.52	15°46.26 S05°59.93	Mars 319°46.92 08:22
7	21°52.21	277°3.82 34.56	340°1.24 6.66	315°54.70 53.61	30°48.72 59.93	Jupiter 294°34.38 10:02
8	36°54.68	292°2.94 34.33	355°1.93 7.22	330°56.59 53.70	45°51.17 59.94	Saturn 8° 57.29 05:05
9	51°57.14	307°2.06 · · 34.10	10°2.61 · · 7.78	345°58.47 · · 53.79	60°53.62 05°59.95	lun 27 Thu CHA May
10	$66^{\circ}59.61$	322°1.18 33.86	25°3.29 8.34	1°0.36 53.88	75°56.08 05°59.96	Jun 27 Thu SHA Mer.pass Venus 256°55.32 12:31
11	82°2.07	337°0.30 33.63	40°3.98 8.89	16°2.25 53.97	90°58.53 59.96	Mars 319°4.22 08:21
12	97°4.53	351°59.43 N23°33.39	55°4.66 N15°9.45	31°4.13 N20°54.06	106°0.99 S05°59.97	Jupiter 294° 20.44 09:59
13	112°7.00	6°58.55 33.16	70°5.34 10.00	46° 6.02 54.15	121°3.44 59.98	Saturn 8°56.89 05:01
14	127°9.46	21°57.67 32.92	85°6.02 10.56	61°7.91 54.24	136°5.90 59.99	
15	142°11.93	36°56.79 · · 32.68	100°6.71 · · 11.12	76° 9.79 · · 54.33	151°8.35 · · 0.00	Jun 28 Fri SHA Mer.pass
16	157°14.39	51°55.92 32.44	115°7.39 11.67	91°11.68 54.42	166°10.81 0.00	Venus 255° 35.01 12:32
17	172° 16.85 187° 19.32	66°55.04 32.20 81°54.16 N23°31.96	130°8.07 12.23 145°8.76 N15°12.78	106°13.57 54.51 121°15.45 N20°54.60	181°13.26 0.01 196°15.72 \$06°0.02	Mars 318° 21.50 08:20
18 19	202°21.78	96°53.29 31.71	145 8.76 N15 12.78 160°9.44 13.34	136°17.34 54.69	211°18.18 0.03	Jupiter 294° 6.53 09:56
20	202 21.76 217°24.25	111°52.41 31.47	175°10.12 13.89	150 17.34 54.09 151°19.23 54.78	226°20.63 0.04	Saturn 8°56.58 04:57
21	232°26.71	126°51.54 · · 31.22	190°10.80 · · 14.44	166°21.11 · · 54.87	241°23.09 · · 0.04	Horizontal parallax
22	247°29.17	141°50.66 30.98	205°11.49 15.00	181°23.00 54.96	256°25.55 0.05	Venus: 0.1
23	262°31.64	156°49.78 30.73	220°12.17 15.55	196°24.89 55.05	271°28.00 0.06	Mars: 0.1
ıvıer.	pass. 05:33	ν -0.9′ <i>d</i> -0.2′ m-3.90	$ u 0.7' \ d0.6' \ m0.98$	$ u 1.9' \ d0.1' \ \text{m-}2.02$	$ u 2.5' \ d0.0' \ m0.92$	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°16.81	N23°20.87	304°44.36	9.7'	S 16°5.04	-14.3'	59.2'
1	194°16.68	20.78	319°13.03	9.7'	15°50.72	-14.4'	59.2'
2	209°16.55 224°16.42	20.69	333°41.77 348°10.59	9.8' 9.9'	15°36.32 15°21.82	-14.5' -14.6'	59.2' 59.2'
4	239°16.28	20.51	2°39.48	10.0'	15°7.24	-14.7'	59.2'
5	254°16.15	20.42	17°8.45	10.0'	14°52.58	-14.7'	59.2'
6	269°16.02	N23°20.33	31°37.48	10.1'	S14°37.83	-14.8'	59.2'
7	284°15.89	20.23	46°6.59	10.2'	14°23.00	-14.9'	59.2'
8 9	299°15.76 314°15.63	20.14	60°35.77 75°5.02	10.2' 10.3'	14°8.09 13°53.10	-15.0' -15.1'	59.2' 59.2'
10	329°15.50	19.95	89°34.33	10.4	13°38.04	-15.1'	59.2'
11	344°15.37	19.86	104°3.72	10.5'	13°22.90	-15.2'	59.3'
12	359°15.24	N23°19.76	118°33.17	10.5'	\$13°7.69	-15.3'	59.3'
13 14	14°15.11 29°14.98	19.66 19.57	133°2.68 147°32.26	10.6' 10.6'	12°52.41 12°37.05	-15.4' -15.4'	59.3' 59.3'
14 15	29 14.98 44°14.86	19.57	147 32.20 162°1.91	10.6	12 37.05 12°21.63	-15.4 -15.5'	59.3'
16	59°14.73	19.37	176°31.61	10.8'	12°6.14	-15.6'	59.3'
17	74°14.60	19.27	191°1.38	10.8'	$11^{\circ}50.59$	-15.6'	59.3'
18	89°14.47	N23°19.17	205°31.21	10.9'	S11°34.98	-15.7'	59.3'
19 20	104°14.34 119°14.21	19.07 18.97	220°1.10 234°31.05	10.9' 11.0'	11°19.30 11°3.56	-15.7' -15.8'	59.3' 59.3'
21	134°14.08	• • 18.86	249°1.05	11.1'	10°47.76	-15.8'	59.3'
22	149°13.95	18.76	263°31.11	11.1'	10°31.91	-15.9'	59.3'
23	164°13.82	18.66	278°1.22	11.2'	$10^{\circ}16.00$	-16.0'	59.3'
	SD = 15.7'	d = -0.1'		SI	D = 16.1'		
- .							
Thu 0	GHA 179°13.69	Dec N23°18.55	GHA 292°31.39	u 11.2'	Dec \$10°0.04	<i>d</i> −16.0'	HP 59.3'
1	194°13.56	18.45	307°1.61	11.3'	09°44.03	-16.1	59.3'
2	209°13.43	18.34	321°31.89	11.3'	09°27.96	-16.1'	59.3'
3	224°13.30	• • 18.23	336°2.21	11.4'	09°11.85	-16.2'	59.3'
4 5	239°13.18 254°13.05	18.12 18.02	350°32.58 5°3.00	11.4' 11.5'	08°55.69 08°39.48	-16.2' -16.3'	59.3' 59.3'
6	269°12.92	N23°17.91	19°33.46	11.5'	508°23.23	-16.3'	59.3'
7	284°12.79	17.80	34°3.97	11.6'	08°6.93	-16.3'	59.3'
8	299°12.66	17.69	48°34.53	11.6'	07°50.60	-16.4'	59.3'
9	314°12.53	• • 17.58	63°5.13	11.6'	07°34.22	-16.4'	59.3'
10 11	329°12.40 344°12.28	17.46 17.35	77°35.77 92°6.45	11.7' 11.7'	07°17.81 07°1.36	-16.5' -16.5'	59.3' 59.3'
12	359°12.15	N23°17.24	106°37.16	11.8'	S06°44.87	-16.5	59.3'
13	14°12.02	17.12	121°7.92	11.8'	$06^{\circ}28.35$	-16.6'	59.3'
14	29°11.89	17.01	135°38.71	11.8'	06°11.80	-16.6'	59.3'
15 16	44°11.76 59°11.64	· · 16.89 16.78	150°9.54 164°40.40	11.9' 11.9'	05°55.22 05°38.61	-16.6' -16.6'	59.3' 59.3'
17	74°11.51	16.66	179°11.29	11.9'	05°21.97	-16.7'	59.3'
18	89°11.38	N23°16.54	193°42.21	12.0'	S05°5.31	-16.7'	59.3'
19	104°11.25	16.43	208°13.17	12.0'	04°48.62	-16.7'	59.3'
20 21	119°11.13 134°11.00	16.31 •• 16.19	222°44.15 237°15.16	12.0' 12.0'	04°31.91 04°15.17	-16.7' -16.8'	59.3' 59.3'
22	134 11.00 149°10.87	16.07	251°46.19	12.1'	04 15.17 03°58.42	-16.8'	59.3'
23	164°10.74	15.95	266° 17.25	12.1'	03°41.65	-16.8'	59.3'
	SD = 15.7'	d = -0.1'		SI	D = 16.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°10.62	N23°15.82	280°48.33	12.1'	503°24.86	-16.8'	59.3'
1	194°10.49	15.70	295°19.43	12.1'	$03^{\circ}8.06$	-16.8'	59.3'
2	209°10.36	15.58	309°50.55	12.1'	02°51.24	-16.8'	59.3'
3 4	224°10.23 239°10.11	· · 15.45 15.33	324°21.69 338°52.85	12.2' 12.2'	02°34.41 02°17.57	-16.8' -16.9'	59.3' 59.3'
4 5	254° 9.98	15.33 15.20	353° 24.03	12.2'	02 17.57 02°0.72	-16.9'	59.3' 59.3'
6	269° 9.85	N23°15.08	7°55.21	12.2'	S01°43.86	-16.9'	59.3'
7	284° 9.73	14.95	22°26.42	12.2'	01°27.00	-16.9'	59.3'
8 9	299° 9.60 314° 9.47	14.82 •• 14.70	36°57.63 51°28.85	12.2' 12.2'	01°10.13 00°53.25	-16.9' -16.9'	59.3' 59.3'
10	314 9.47 329 9.35	14.57	66°0.09	12.2'	00°53.25 00°36.38	-16.9'	59.3' 59.3'
11	344° 9.22	14.44	80°31.33	12.2'	00°19.50	-16.9'	59.3'
12	359° 9.09	N23°14.31	95°2.57	12.3'	S00°2.63	-16.9'	59.3'
13	14°8.97 29°8.84	14.18 14.05	109°33.82 124°5.08	12.3' 12.3'	N00°14.25 00°31.12	16.9'	59.3' 59.3'
14 15	29°8.84 44°8.71	14.05	124°5.08 138°36.33	12.3'	00°31.12	16.9' 16.9'	59.3' 59.2'
16	59°8.59	13.78	153°7.59	12.3'	01°4.84	16.9'	59.2'
17	74°8.46	13.65	167°38.85	12.3'	01°21.69	16.8'	59.2'
18	89°8.34	N23°13.51	182°10.10	12.3'	N01°38.53	16.8'	59.2'
19 20	104° 8.21 119° 8.09	13.38 13.24	196°41.35 211°12.60	12.2' 12.2'	01°55.36 02°12.18	16.8' 16.8'	59.2' 59.2'
21	134° 7.96	13.10	211 12.00 225°43.84	12.2'	02 12.18 02°28.99	16.8	59.2'
22	149°7.83	12.97	240°15.07	12.2'	$02^{\circ}45.78$	16.8'	59.2'
23	164°7.71	12.83	254°46.29	12.2'	03°2.55	16.8'	59.2'
	SD = 15.7'	d = -0.1'		SI	O = 16.2'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:36	22:30	////	////
62°	////	////	02:13	21:53	////	////
60°	////	00:56	02:39	21:27	23:09	////
N 58°	////	01:44	02:59	21:07	22:21	////
56°	////	02:14	03:16	20:50	21:52	////
54°	00:51	02:36	03:30	20:36	21:30	23:14
52°	01:36	02:54	03:42	20:24	21:13	22:30
50°	02:03	03:08	03:53	20:13	20:58	22:03
45°	02:48	03:38	04:15	19:51	20:28	21:18
N 40°	03:19	04:00	04:33	19:33	20:06	20:47
35°	03:42	04:19	04:48	19:18	19:48	20:24
30°	04:00	04:34	05:01	19:05	19:33	20:06
20°	04:29	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:14
0°	05:11	05:37	06:00	18:07	18:29	18:56
S 10°	05:28	05:54	06:17	17:50	18:12	18:39
20°	05:44	06:11	06:35	17:31	17:55	18:23
30°	06:00	06:30	06:56	17:10	17:36	18:06
35°	06:09	06:41	07:09	16:58	17:26	17:58
40°	06:18	06:52	07:23	16:44	17:14	17:48
45°	06:29	07:06	07:40	16:27	17:01	17:38
S 50°	06:40	07:22	08:00	16:06	16:45	17:26
52°	06:45	07:29	08:10	15:57	16:37	17:21
54°	06:51	07:37	08:21	15:46	16:29	17:15
56°	06:57	07:46	08:34	15:33	16:20	17:09
58°	07:04	07:56	08:48	15:18	16:10	17:03
S 60°	07:11	80:80	09:05	15:01	15:59	16:55
	ı			1		

Lat.		Moonris	e		Moonset	:
Ldt.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	01:47	00:42	00:01 23:25	06:19	09:10	11:35
N 70°	01:11	00:27 23:56	23:29	06:53	09:22	11:36
68°	00:44	00:15 23:52	23:32	07:17	09:32	11:36
66°	00:24	00:05 23:49	23:35	07:36	09:40	11:36
64°	00:08 23:56	23:46	23:37	07:51	09:46	11:36
62° 60°	23:49 23:42	23:44 23:42	23:39 23:41	08:03 08:14	09:52 09:57	11:37 11:37
N 58° 56° 54° 52° 50° 45° N 40° 35°	23:37 23:32 23:27 23:23 23:19 23:11 23:04 22:58	23:40 23:38 23:37 23:35 23:34 23:31 23:29 23:26	23:43 23:44 23:45 23:47 23:48 23:50 23:52 23:54	08:23 08:31 08:38 08:44 08:50 09:02 09:12	10:01 10:05 10:08 10:12 10:14 10:20 10:25 10:30	11:37 11:37 11:37 11:37 11:37 11:38 11:38
30° 20° N 10° 0°	22:52 22:43 22:35 22:27	23:25 23:21 23:19 23:16	23:56 23:59 	09:27 09:40 09:51 10:01	10:33 10:40 10:45 10:51	11:38 11:38 11:38 11:39
\$ 10° 20° 30° 35° 40° 45° \$ 50°	22:20 22:12 22:02 21:57 21:50 21:43 21:34	23:13 23:11 23:07 23:05 23:03 23:01 22:58		10:11 10:22 10:34 10:41 10:49 10:58 11:09	10:56 11:01 11:07 11:11 11:15 11:19 11:25	11:39 11:39 11:39 11:39 11:39 11:39 11:39
52° 54° 56° 58° S 60°	21:30 21:26 21:21 21:15 21:09	22:57 22:55 22:54 22:52 22:50		11:14 11:19 11:25 11:32 11:40	11:27 11:30 11:33 11:36 11:40	11:39 11:39 11:39 11:39 11:39
3 00	21.09	22.30		11.70	11.70	11.55

	Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	81-61%	
26	02:53	02:59	12:03	03:49	16:14		
27	03:05	03:11	12:03	04:39	17:03		
28	03:18	03:24	12:03	05:27	17:51		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	277°34.10	171°48.91 N23°30.48	235°12.85 N15°16.10	211°26.78 N20°55.13	286°30.46 S 06°0.07	
1	292°36.57	186°48.03 30.23	250° 13.53 16.66	226°28.66 55.22	301°32.92 0.08	Alpheratz 357°35.20 29°13.37
2	307°39.03	201°47.16 29.98	265°14.22 17.21	241°30.55 55.31	316°35.37 0.09	Ankaa 353°7.56 -42°10.14
3	322°41.49	216°46.28 · · 29.72	280°14.90 · · 17.76	256°32.44 · · 55.40	331°37.83 · · 0.09	Schedar 349°31.59 56°40.01 Diphda 348°47.76 -17°51.02
4	337°43.96	231°45.41 29.47	295° 15.58 18.31	271°34.33 55.49	346°40.29 0.10	Achernar 335°20.67 -57°6.46
5	352°46.42	246°44.54 29.21	310°16.26 18.87	286°36.22 55.58	1°42.74 0.11	Hamal 327°51.85 23°34.58
6	7°48.89	261°43.66 N23°28.95	325°16.95 N15°19.42	301°38.10 N20°55.67	16°45.20 S06°0.12	Polaris 314°33.63 89°21.76
7	22°51.35	276°42.79 28.70	340°17.63 19.97	316°39.99 55.76	31°47.66 0.13	Acamar 315°12.36 -40°12.18
8 9	37° 53.82 52° 56.28	291°41.91 28.44 306°41.04 · · 28.18	355°18.31 20.52 10°18.99 · · 21.07	331°41.88 55.84 346°43.77 •• 55.93	46°50.12 0.14 61°52.58 · · 0.15	Menkar 314°6.82 4°11.15
10	67° 58.74	321°40.17 27.92	25°19.67 21.62	1°45.66 56.02	76°55.03 0.16	Mirfak 308°29.26 49°56.70
11	83°1.21	336°39.29 27.65	40°20.36 22.17	16°47.54 56.11	91°57.49 0.17	Aldebaran 290°40.44 16°33.49
12	98°3.67	351°38.42 N23°27.39	55°21.04 N15°22.72	31°49.43 N20°56.20	106°59.95 \$06°0.17	Rigel 281°4.62 -8°10.34
13	113°6.14	6°37.55 27.12	70°21.72 23.27	46°51.32 56.29	122°2.41 0.18	Capella 280°23.01 46°1.28
14	128°8.60	21°36.68 26.86	85°22.40 23.82	61°53.21 56.37	137°4.87 0.19	Bellatrix 278°23.68 6°22.34 Elnath 278°2.80 28°37.66
15	$143^{\circ}11.06$	36°35.80 · · 26.59	100°23.08 · · 24.37	76°55.10 · · 56.46	$152^{\circ}7.33 \cdot \cdot \cdot 0.20$	Alnilam 275°38.51 -1°11.13
16	158° 13.53	51°34.93 26.32	115°23.77 24.92	91°56.99 56.55	167°9.79 0.21	Betelgeuse 270°52.90 7°24.73
17	173°15.99	66°34.06 26.05	130°24.45 25.47	106°58.88 56.64	182°12.25 0.22	Canopus 263°53.15 -52°42.43
18	188° 18.46	81°33.19 N23°25.78	145°25.13 N15°26.01	122°0.77 N20°56.73	197°14.71	Sirius 258°26.98 -16°44.93
19 20	203°20.92 218°23.38	96°32.32 25.50 111°31.45 25.23	160°25.81 26.56 175°26.49 27.11	137° 2.65 56.82 152° 4.54 56.90	212°17.17 0.24 227°19.63 0.25	Adhara 255°6.60 -29°0.27
21	210 23.30 233°25.85	111 31.45 25.25 126°30.58 •• 24.96	175 20.49 27.11 190°27.17 · · 27.66	167° 6.43 · · 56.99	242°22.09 · · 0.26	Procyon 244°51.63 5°9.79
22	248°28.31	141°29.71 24.68	205°27.86 28.20	182°8.32 57.08	257°24.55 0.27	Pollux 243°18.21 27°58.10
23	263°30.78	156°28.84 24.40	220°28.54 28.75	197°10.21 57.17	272°27.01 0.28	Avior 234°15.53 -59°35.33
_						Suhail 222°47.01 -43°31.96
Mer.	pass. 05:29	ν-0.9' d-0.3' m-3.90	ν0.7' d0.6' m0.97	ν1.9' d0.1' m-2.03	ν2.5′ d0.0′ m0.92	Miaplacidus 221°39.16 -69°49.19 Alphard 217°48.44 -8°45.87
						Alphard 217°48.44 -8°45.87 Regulus 207°35.11 11°50.95
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.79 61°37.44
0	278°33.24	171°27.97 N23°24.12	235°29.22 N15°29.30	212°12.10 N20°57.26	287°29.47 \$06°0.29	Denebola 182°25.46 14°26.23
1	293°35.70	186°27.10 23.84	250°29.90 29.84	227°13.99 57.34	302°31.93 0.30	Gienah 175°44.07 -17°40.74
2	308° 38.17 323° 40.63	201°26.23 23.56 216°25.36 · · 23.28	265°30.58 30.39 280°31.26 · · 30.94	242°15.88 57.43 257°17.77 · · · 57.52	317°34.39 0.31 332°36.85 · · 0.32	Acrux 173°0.65 -63°14.36
4	338°43.10	231°24.49 23.00	295°31.95 31.48	272°19.66 57.61	347°39.31 0.33	Gacrux 171°52.17 -57°15.27
5	353°45.56	246°23.62 22.71	310°32.63 32.03	287°21.55 57.69	2°41.77 0.34	Alioth 166°13.28 55°49.91
6	8°48.03	261°22.75 N23°22.43	325°33.31 N15°32.57	302°23.44 N20°57.78	17°44.24 S 06°0.35	Spica 158°22.69 -11°17.38 Alkaid 152°52.17 49°11.71
7	23°50.49	276°21.88 22.14	340°33.99 33.12	317°25.33 57.87	32°46.70 0.36	Hadar 148°36.39 -60°29.71
8	38° 52.95	291°21.01 21.85	355°34.67 33.66	332°27.22 57.96	47°49.16 0.37	Menkent 147°57.98 -36°29.58
9	53°55.42	306°20.15 · · 21.56	10°35.35 · · 34.20	347°29.11 · · 58.04	62°51.62 · · 0.38	Arcturus 145°48.16 19°3.41
10	68° 57.88	321°19.28 21.27	25°36.03 34.75	2°31.00 58.13	77°54.08 0.39	Rigil Kent. 139°40.58 -60°56.42
11 12	84°0.35 99°2.81	336°18.41 20.98 351°17.54 N23°20.69	40°36.71 35.29 55°37.40 N15°35.84	17°32.89 58.22 32°34.78 N20°58.31	92°56.55 0.40 107°59.01 \$06°0.42	Kochab 137°19.05 74°3.51
13	114°5.27	6°16.68 20.39	70°38.08 36.38	47°36.67 58.39	123°1.47 0.43	Zuben'ubi 136°56.31 -16°8.67
14	129°7.74	21°15.81 20.10	85°38.76 36.92	62°38.56 58.48	138°3.93 0.44	Alphecca 126°3.84 26°38.03
15	$144^{\circ}10.20$	36°14.94 · · 19.80	100°39.44 ⋅⋅ 37.46	77°40.45 · · 58.57	153°6.40 · · 0.45	Antares 112°16.06 -26°29.24 Atria 107°10.15 -69°4.39
16	$159^{\circ}12.67$	51°14.08 19.50	115°40.12 38.01	92°42.34 58.65	168°8.86 0.46	Sabik 102°2.96 -15°45.33
17	174° 15.13	66°13.21 19.20	130°40.80 38.55	107°44.23 58.74	183°11.32 0.47	Shaula 96°10.56 -37°7.32
18	189° 17.59 204° 20.06	81°12.35 N23°18.90	145°41.48 N15°39.09 160°42.16 39.63	122°46.12 N20°58.83 137°48.02 58.91	198°13.79 \$06°0.48	Rasalhague 95°58.62 12°32.54
19 20	204 20.00 219°22.52	96°11.48 18.60 111°10.62 18.30	160° 42.16 39.63 175° 42.84 40.17	137°48.02 58.91 152°49.91 59.00	213°16.25 0.49 228°18.72 0.50	Eltanin 90°41.85 51°29.12
21	234°24.99	126°9.75 · · 18.00	190°43.52 · · 40.71	167°51.80 · · 59.09	243°21.18 · · 0.52	Kaus Aust. 83°32.69 -34°22.37
22	249°27.45	141°8.89 17.69	205°44.21 41.25	182°53.69 59.17	258°23.64 0.53	Vega 80°33.09 38°48.34 Nunki 75°47.93 -26°15.95
23	264°29.92	156°8.02 17.38	220°44.89 41.79	197°55.58 59.26	273°26.11 0.54	Nunki 75°47.93 -26°15.95 Altair 62°0.07 8°55.95
Meri	pass. 05:25	ν-0.9' d-0.3' m-3.90	ν0.7' d0.5' m0.97	$\nu 1.9' \ d0.1' \ \text{m-}2.03$	$\nu 2.5' \ d0.0' \ m0.91$	Peacock 53°5.87 -56°39.24
		- V 0.5 U 0.5 III 3.50		- 1.5 do.1 iii 2.03		Deneb 49°25.71 45°21.89
						Enif 33°39.00 9°59.18
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.16 -46°50.35
0 1	279° 32.38 294° 34.84	171°7.16 N23°17.08 186°6.29 16.77	235°45.57 N15°42.33 250°46.25 42.87	212°57.47 N20°59.35 227°59.36 59.43	288°28.57 S 06°0.55 303°31.04 0.56	Fomalhaut 15°14.84 -29°29.40
2	309°37.31	201°5.43 16.46	265°46.93 43.41	243°1.25 59.52	318°33.50 0.57	Scheat 13°45.50 28°12.78
3	324°39.77	216°4.57 · · 16.15	280° 47.61 · · 43.95	258° 3.15 · · 59.61	333°35.97 · · 0.59	Markab 13°30.21 15°20.13
4	339°42.24	231°3.70 15.84	295°48.29 44.49	273°5.04 59.69	348°38.43 0.60	Jun 29 Sat SHA Mer.pass
5	354°44.70	246°2.84 15.52	310°48.97 45.03	288° 6.93 59.78	3°40.90 0.61	Venus 254°14.81 12:33
6	9°47.16	261°1.98 N23°15.21	325°49.65 N15°45.57	303°8.82 N20°59.87	18°43.36 S 06°0.62	Mars 317°38.75 08:19
7	24°49.63	276°1.12 14.89	340°50.33 46.10	318°10.71 20°59.95	33°45.83 0.63	Jupiter 293°52.67 09:53
8	39°52.09	291°0.25 14.58	355°51.01 46.64	333°12.61 0.04	48°48.29 0.65	Saturn 8°56.36 04:53
9 10	54° 54.56 69° 57.02	305°59.39 · · 14.26 320°58.53 13.94	$10^{\circ}51.69 \cdot \cdot 47.18$ $25^{\circ}52.37 \cdot 47.72$	348°14.50 · · 0.13 3°16.39 0.21	63°50.76 · · 0.66 78°53.23 0.67	Jun 30 Sun SHA Mer.pass
11	84°59.48	335°57.67 13.62	40°53.05 48.25	18°18.28 0.30	93°55.69 0.68	Venus 252°54.73 12:35
12	100°1.95	350°56.81 N23°13.30	55°53.73 N15°48.79	33°20.18 N21°0.38	108°58.16 S06°0.70	Mars 316°55.98 08:18
13	115°4.41	5°55.95 12.97	70°54.41 49.33	48°22.07 0.47	124°0.63 0.71	Jupiter 293°38.86 09:50
14	130°6.88	20°55.09 12.65	85°55.09 49.86	63°23.96 0.56	139°3.09 0.72	Saturn 8°56.23 04:49
15	145°9.34	35°54.23 · · 12.32	100°55.77 · · 50.40	78°25.85 · · 0.64	154°5.56 · · 0.73	Jul 01 Mon SHA Mer.pass
16	160°11.81	50°53.37 12.00	115°56.45 50.93	93°27.75 0.73	169°8.03 0.75	Venus 251°34.78 12:36
17	175° 14.27 190° 16.73	65°52.51 11.67 80°51.65 N23°11.34	130°57.13 51.47 145°57.81 N15°52.00	108°29.64 0.81 123°31.53 N21°0.90	184°10.49 0.76 199°12.96 \$06°0.77	Mars 316°13.19 08:17
18 19	205° 19.20	95°50.79 11.01	145°57.81 N15°52.00 160°58.50 52.54	138°33.42 0.98	214°15.43 0.78	Jupiter 293°25.09 09:47 Saturn 8°56.19 04:45
20	220°21.66	110°49.93 10.68	175°59.18 53.07	153°35.32 1.07	229°17.90 0.80	
21	235°24.13	125°49.07 · · 10.35	190°59.86 · · 53.61	168°37.21 · · 1.16	244°20.36 · · 0.81	Horizontal parallax
22	250°26.59	140°48.21 10.01	206°0.54 54.14	183°39.10 1.24	259°22.83 0.82	Venus: 0.1
23	265°29.05	155°47.35 9.68	221°1.22 54.67	198°41.00 1.33	274°25.30 0.84	Mars: 0.1
Mer.ı	pass. 05:21	ν-0.9' d-0.3' m-3.90	ν0.7' d0.5' m0.97	ν1.9' d0.1' m-2.03	ν2.5' d0.0' m0.91	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°7.58	N23°12.69	$269^{\circ}17.50$	12.2'	$N03^{\circ}19.30$	16.7'	59.2'
1	194°7.46	12.55	283°48.70	12.2'	03°36.04	16.7'	59.2'
2	209°7.33 224°7.21	12.41 •• 12.27	298° 19.89 312° 51.06	12.2' 12.2'	03°52.75 04°9.44	16.7' 16.7'	59.2' 59.2'
4	239°7.08	12.13	327°22.21	12.1'	04°26.11	16.6'	59.2'
5	254°6.96	11.98	$341^{\circ}53.35$	12.1'	$04^{\circ}42.75$	16.6'	59.2'
6	269°6.83	N23°11.84	356°24.47	12.1'	N04°59.37	16.6'	59.2'
7 8	284°6.71 299°6.58	11.70 11.55	10°55.57 25°26.65	12.1' 12.1'	05° 15.95 05° 32.51	16.6' 16.5'	59.2' 59.2'
9	314°6.46	• • 11.41	39° 57.71	12.0'	05°49.04	16.5	59.1'
10	329°6.33	11.26	54°28.74	12.0'	$06^{\circ}5.53$	16.5'	59.1'
11	344°6.21	11.12	68° 59.75	12.0'	06°21.99	16.4	59.1'
12 13	359°6.09 14°5.96	N23° 10.97 10.82	83°30.73 98°1.68	12.0' 11.9'	N06°38.41 06°54.80	16.4' 16.3'	59.1' 59.1'
14	29°5.84	10.67	112°32.60	11.9'	00° 34.00 07° 11.15	16.3	59.1'
15	44°5.71	• • 10.52	127°3.49	11.9'	$07^{\circ}27.46$	16.3'	59.1'
16	59°5.59	10.37	141°34.35	11.8'	07°43.73	16.2'	59.1'
17 18	74°5.47 89°5.34	10.22 N23° 10.07	156°5.18 170°35.97	11.8' 11.8'	07°59.95 N08°16.13	16.2' 16.1'	59.1' 59.1'
19	104°5.22	9.92	185°6.73	11.7'	08° 32.27	16.1	59.1
20	119°5.09	9.77	199° 37.45	11.7'	08°48.36	16.0'	59.1'
21	134°4.97	• • 9.61	214°8.13	11.6'	09°4.40	16.0'	59.1'
22	149°4.85 164°4.72	9.46	228° 38.78 243° 9.38	11.6' 11.6'	09°20.39 09°36.33	15.9'	59.0'
23		9.30	243 9.38			15.9'	59.0'
	SD = 15.7'	d = -0.1'		SE	O = 16.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°4.60	N23°9.15	257°39.94	11.5'	$N09^{\circ}52.21$	15.8'	59.0'
1	194°4.48	8.99	272° 10.46	11.5'	10°8.04	15.8'	59.0'
2	209°4.35 224°4.23	8.83	286° 40.93 301° 11.36	11.4' 11.4'	10°23.82 10°39.54	15.7'	59.0' 59.0'
3 4	224 4.23 239°4.11	· · 8.68 8.52	301 11.30 315°41.74	11.4	10 39.54 10°55.20	15.7' 15.6'	59.0'
5	254°3.99	8.36	330° 12.07	11.3'	11° 10.80	15.5'	59.0'
6	269°3.86	N23°8.20	344°42.36	11.2'	N11°26.33	15.5'	59.0'
7	284°3.74	8.04	359°12.60	11.2'	11°41.81	15.4'	59.0'
8	299°3.62	7.88	13°42.78	11.1'	11°57.22	15.3'	59.0'
9 10	314°3.50 329°3.37	· · 7.71 7.55	28° 12.91 42° 43.00	11.1' 11.0'	12°12.56 12°27.84	15.3' 15.2'	58.9' 58.9'
11	344°3.25	7.39	57° 13.02	11.0'	12° 43.05	15.1	58.9'
12	359°3.13	N23°7.22	71°42.99	10.9'	N12°58.18	15.1'	58.9'
13	14°3.01	7.06	86° 12.91	10.9'	13° 13.25	15.0'	58.9'
14 15	29°2.89 44°2.76	6.89 • • 6.73	100° 42.76 115° 12.56	10.8' 10.7'	13°28.24 13°43.16	14.9' 14.8'	58.9' 58.9'
16	59°2.64	6.56	115 12.50 129°42.31	10.7'	13°58.00	14.8	58.9'
17	74°2.52	6.39	144° 11.99	10.6'	14° 12.76	14.7'	58.9'
18	89°2.40	N23°6.22	158°41.61	10.6'	N14°27.44	14.6'	58.9'
19	104°2.28	6.05	173°11.16	10.5'	14° 42.05	14.5'	58.8'
20 21	119°2.16 134°2.04	5.88 •• 5.71	187° 40.66 202° 10.09	10.4' 10.4'	14°56.57 15°11.00	14.4' 14.4'	58.8' 58.8'
22	149°1.92	5.54	202 10.09 216° 39.46	10.4	15° 11.00	14.4	58.8'
23	164°1.79	5.37	231°8.76	10.2'	15°39.62	14.2'	58.8'
	SD = 15.7'	d = -0.2'		SE	0 = 16.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°1.67 194°1.55	N23°5.20 5.03	245°38.00 260°7.17	10.2' 10.1'	N15°53.79 16°7.88	14.1' 14.0'	58.8' 58.8'
2	209°1.43	4.85	274°36.27	10.1	16°21.87	13.9'	58.8'
3	224°1.31	• • 4.68	289°5.31	10.0'	16°35.77	13.8'	58.7'
4	239°1.19	4.50	303°34.27	9.9'	16°49.58	13.7'	58.7'
5	254°1.07 269°0.95	4.32 N23°4.15	318°3.17 332°32.00	9.8' 9.8'	17°3.29 N17°16.91	13.6' 13.5'	58.7' 58.7'
6 7	269°0.95 284°0.83	N23 4.15 3.97	332°32.00 347°0.75	9.8° 9.7'	17° 30.43	13.4	58.7' 58.7'
8	299°0.71	3.79	1°29.44	9.6'	17°43.84	13.3'	58.7'
9	314°0.59	• • 3.61	15° 58.05	9.5'	17°57.16	13.2'	58.7'
10	329°0.47	3.43	30°26.59	9.5'	18° 10.37	13.1'	58.7'
11 12	344°0.35 359°0.23	3.25 N23°3.07	44° 55.06 59° 23.46	9.4' 9.3'	18°23.47 N18°36.47	13.0' 12.9'	58.6' 58.6'
13	359 0.23 14°0.11	N23 3.07 2.89	73°51.78	9.3 9.2'	18° 49.37	12.9	58.6'
14	28°59.99	2.71	88°20.03	9.2	19°2.15	12.7'	58.6'
15	43°59.87	• • 2.53	102°48.20	9.1'	19° 14.82	12.6'	58.6'
16	58°59.76	2.34	117° 16.30	9.0'	19°27.39	12.4'	58.6'
17 18	73°59.64 88°59.52	2.16 N23°1.97	131° 44.33 146° 12.28	8.9' 8.9'	19°39.83 N19°52.17	12.3' 12.2'	58.6' 58.6'
19	103°59.40	N23 1.97 1.79	140 12.28 160°40.15	8.9 8.8'	20°4.38	12.2	58.5'
20	118°59.28	1.60	175°7.95	8.7'	20° 16.48	12.0'	58.5'
21	133°59.16	• • 1.41	189°35.68	8.6'	20°28.46	11.9'	58.5'
22	148°59.04 163°58.93	1.22	204°3.32 218°30.90	8.6' 8.5'	20° 40.32 20° 52.06	11.7'	58.5' 58.5'
23		1.03	∠18 30.90			11.6'	26.5
	SD = 15.7'	d = -0.2'		SE	D = 16.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:13	23:44	////	////
64°	////	////	01:40	22:26	////	////
62°	////	////	02:16	21:51	////	////
60°	////	01:02	02:42	21:25	23:04	////
N 58°	////	01:48	03:02	21:06	22:19	////
56°	////	02:16	03:18	20:49	21:50	////
54°	00:57	02:38	03:32	20:35	21:29	23:09
52°	01:39	02:56	03:44	20:23	21:12	22:27
50°	02:06	03:10	03:55	20:13	20:57	22:01
45°	02:50	03:40	04:17	19:51	20:28	21:17
N 40°	03:20	04:02	04:35	19:33	20:05	20:47
35°	03:43	04:20	04:49	19:18	19:48	20:24
30°	04:02	04:35	05:02	19:05	19:33	20:06
20°	04:30	05:00	05:24	18:43	19:08	19:37
N 10°	04:53	05:20	05:43	18:25	18:48	19:15
0°	05:11	05:38	06:00	18:07	18:30	18:56
S 10°	05:28	05:55	06:17	17:50	18:13	18:39
20°	05:44	06:12	06:36	17:32	17:56	18:23
30°	06:00	06:30	06:57	17:11	17:37	18:07
35°	06:09	06:41	07:09	16:59	17:27	17:59
40°	06:18	06:52	07:23	16:45	17:15	17:49
45°	06:28	07:06	07:39	16:28	17:02	17:39
S 50°	06:40	07:21	08:00	16:08	16:46	17:28
52°	06:45	07:29	08:09	15:58	16:39	17:23
54°	06:51	07:37	08:20	15:47	16:31	17:17
56°	06:57	07:46	08:33	15:35	16:22	17:11
58°	07:03	07:56	08:47	15:21	16:12	17:04
S 60°	07:11	08:07	09:04	15:04	16:01	16:57

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	22:45	21:45		13:59	16:43	
N 70°	22:59	22:18		13:48	16:12	
68°	23:10	22:42	21:52	13:39	15:50	18:29
66°	23:19	23:01	22:34	13:32	15:33	17:49
64°	23:27	23:17	23:02	13:26	15:19	17:21
62°	23:34	23:30	23:24	13:21	15:08	17:00
60°	23:40	23:41	23:42	13:16	14:58	16:43
N 58°	23:46	23:50	23:57	13:12	14:49	16:29
56°	23:51	23:59		13:09	14:42	16:17
54°	23:55		00:06	13:06	14:35	16:07
52°	23:59		00:13	13:03	14:29	15:57
50°		00:02	00:19	13:00	14:24	15:49
45°		00:10	00:33	12:55	14:12	15:31
N 40°		00:17	00:44	12:50	14:03	15:17
35°		00:23	00:53	12:46	13:55	15:05
30°		00:28	01:02	12:42	13:48	14:54
20°		00:36	01:16	12:36	13:36	14:36
N 10°	00:01	00:44	01:29	12:31	13:25	14:21
0°	00:04	00:52	01:42	12:26	13:15	14:06
S 10°	00:06	00:59	01:54	12:21	13:05	13:52
20°	00:09	01:07	02:07	12:16	12:55	13:36
30°	00:12	01:16	02:22	12:10	12:43	13:19
35°	00:13	01:22	02:31	12:07	12:36	13:09
40°	00:16	01:28	02:41	12:03	12:28	12:57
45°	00:18	01:35	02:54	11:58	12:19	12:44
S 50°	00:21	01:44	03:08	11:53	12:09	12:27
52°	00:22	01:48	03:15	11:51	12:04	12:19
54°	00:24	01:52	03:23	11:48	11:58	12:11
56°	00:25	01:57	03:32	11:45	11:52	12:01
58°	00:27	02:03	03:42	11:42	11:45	11:51
S 60°	00:29	02:09	03:53	11:38	11:38	11:38

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	49-27%	
29	03:30	03:36	12:04	06:15	18:39		
30	03:42	03:47	12:04	07:03	19:28		
01	03:53	03:59	12:04	07:54	20:20		

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	280°31.52	170° 46.50	N23°9.34	236°1.90	N15°55.21	213°42.89	N21°1.41	289°27.77	S06°0.85		ЗПА	Dec
1	295° 33.98	185° 45.64	9.01	251°2.58	55.74	213 42.89 228°44.78	1.50	304°30.24	0.86	Alpheratz	357°35.17	29°13.39
2	295 33.96 310°36.45	200° 44.78		266°3.26		243°46.68				Ankaa	353°7.53	-42°10.13
	325°38.91	200 44.78 215°43.92	8.67		56.27 •• 56.81		1.58	319°32.71	0.88	Schedar	349°31.55	56°40.02
3 4	340°41.38	215 43.92 230°43.07	· · 8.33 7.99	281°3.93 296°4.61	· · 56.81 57.34	258°48.57 273°50.47	· · 1.67 1.75	334°35.17 349°37.64	• • 0.89	Diphda	348°47.73	-17°51.01
5	355° 43.84	245° 42.21	7.65	311°5.29	57.34 57.87	288°52.36	1.73	4°40.11	0.90 0.92	Achernar	335°20.64	-57°6.45
6	10° 46.30	260°41.36	N23°7.30	326°5.97	N15°58.40	303°54.25	N21°1.92	19° 42.58	506°0.93	Hamal	327°51.82	23°34.59
7	25° 48.77	275°40.50	6.96	341°6.65	58.93	318°56.15	2.01	34°45.05	0.94	Polaris	314°32.07	89°21.75
8	40°51.23	290°39.64	6.61	356°7.33	15°59.46	333°58.04	2.09	49°47.52	0.96	Acamar	315°12.34	-40° 12.17
9	55°53.70	305°38.79	. 6.27	11°8.01	15°59.99	348°59.94	2.18	64°49.99	• • 0.97	Menkar	314°6.80	4°11.16
10	70°56.16	320°37.93	5.92	26°8.69	0.52	4°1.83	2.26	79°52.46	0.99	Mirfak	308°29.23	49°56.70
11	85°58.63	335° 37.08	5.57	41°9.37	1.06	19° 3.72	2.35	94° 54.93	1.00	Aldebaran	290°40.42	16°33.49
12	101°1.09	350°36.23	N23°5.22	56° 10.05	N16° 1.58	34° 5.62	N21°2.43	109°57.40	S06°1.01	Rigel	281°4.60	-8°10.33
13	116°3.55	5°35.37	4.87	71°10.73	2.11	49°7.51	2.52	124°59.87	1.03	Capella	280°22.99	46°1.28
14	131°6.02	20°34.52	4.52	$86^{\circ}11.41$	2.64	64°9.41	2.60	140°2.34	1.04	Bellatrix	278°23.67	6°22.34
15	146°8.48	35°33.66	• • 4.16	101°12.09	• • 3.17	79°11.30	• • 2.69	155°4.81	• • 1.06	Elnath	278°2.78	28°37.66
16	161°10.95	50°32.81	3.81	$116^{\circ}12.77$	3.70	94°13.20	2.77	170°7.28	1.07	Alnilam	275°38.49	-1°11.12
17	176° 13.41	65°31.96	3.45	131° 13.45	4.23	109°15.09	2.86	185°9.76	1.08	Betelgeuse	270°52.89 263°53.15	7°24.73 -52°42.42
18	191°15.87	80°31.10	N23°3.09	$146^{\circ}14.13$	N16° 4.76	124°16.99	N21°2.94	200° 12.23	S06°1.10	Canopus Sirius	258° 26.98	-32 42.42 -16°44.92
19	206° 18.34	95°30.25	2.74	$161^{\circ}14.81$	5.29	139°18.88	3.03	$215^{\circ}14.70$	1.11	Adhara	255°6.60	-10 44.92 -29°0.26
20	221°20.80	110°29.40	2.38	176° 15.49	5.81	154°20.78	3.11	230° 17.17	1.13	Procyon	244°51.62	5°9.79
21	236°23.27	125°28.55	• • 2.01	191°16.17	• • 6.34	169°22.67	• • 3.20	245° 19.64	• • 1.14	Pollux	243°18.21	27°58.10
22	251°25.73	140°27.70	1.65	206° 16.85	6.87	184°24.57	3.28	260°22.11	1.16	Avior	234° 15.54	-59°35.32
23	266° 28.20	155°26.85	1.29	221°17.53	7.39	199°26.46	3.36	275°24.59	1.17	Suhail	234 15.54 222°47.02	-39 35.32 -43°31.96
Merr	pass. 05:17	ν-0.9' d-0	3′ m-3 90	ν0 7' d0	.5′ m0.96	v1 9' d0	1' m-2.03	$\nu 2.5' d0.$	0′ m0 a0	Miaplacidus	221°39.18	-69°49.18
	Jass. 05.11	ν-0.9 α-0	.5 11-5.90	- VO.1 UO	.5 1110.90	ν1.9 do.	1 111-2.05	ν2.5 do.		Alphard	217°48.44	-8° 45.86
										Regulus	207°35.12	11°50.95
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.81	61°37.44
0	281°30.66	170°26.00	$N23^{\circ}0.93$	236° 18.21	$N16^{\circ}7.92$	214°28.36	N21°3.45	290°27.06	S06°1.19	Denebola	182°25.47	14° 26.23
1	296°33.12	185°25.14	0.56	251°18.88	8.45	229°30.26	3.53	305°29.53	1.20	Gienah	175°44.08	-17°40.74
2	311°35.59	200°24.29	23°0.19	$266^{\circ}19.56$	8.97	244°32.15	3.62	320°32.00	1.22	Acrux	173°0.67	-63°14.36
3	326° 38.05	215°23.44	22°59.83	281°20.24	• • 9.50	259°34.05	• • 3.70	335° 34.48	• • 1.23		171°52.18	-57° 15.27
4	341°40.52	230°22.59	59.46	296°20.92	10.02	274°35.94	3.79	350° 36.95	1.25	Alioth	166°13.30	55°49.91
5	356° 42.98	245°21.75	59.09	311°21.60	10.55	289°37.84	3.87	5°39.42	1.26	Spica	158°22.70	-11°17.38
6	11° 45.44	260°20.90	N22°58.72	326°22.28	N16°11.07	304°39.74	N21°3.95	20°41.89	S06°1.28	Alkaid	152°52.19	49°11.71
7	26°47.91	275°20.05	58.34	341°22.96	11.60	319°41.63	4.04	35°44.37	1.29	Hadar	148°36.40	-60°29.71
8	41°50.37	290° 19.20	57.97	356°23.64	12.12	334°43.53	4.12	50°46.84	1.31	Menkent	147°57.99	-36°29.58
9	56°52.84	305°18.35	• • 57.59	11°24.32	• • 12.65	349°45.42	• • 4.21	65°49.31	• • 1.32	Arcturus	145°48.17	19°3.41
10	71°55.30	320° 17.50	57.22	26°25.00	13.17	4°47.32	4.29	80°51.79	1.34	Rigil Kent.	139°40.60	-60°56.42
11	86° 57.77	335°16.66	56.84	41°25.68	13.69	19°49.22	4.37	95°54.26	1.35	Kochab	$137^{\circ}19.10$	74°3.52
12	102°0.23	350° 15.81	N22°56.46	56° 26.35	N16°14.22	34°51.11	N21°4.46	110°56.74	S06°1.37	Zuben'ubi	136°56.31	-16°8.66
13	117°2.69	5°14.96	56.08	71°27.03	14.74	49°53.01	4.54	125° 59.21	1.39	Alphecca	126°3.85	26°38.04
14	132°5.16	20°14.12	55.70	86°27.71	15.26	64°54.91	4.62	141°1.69	1.40	Antares	$112^{\circ}16.05$	-26°29.23
15	147°7.62	35° 13.27	• • 55.32	101°28.39	• • 15.78	79°56.80	• • 4.71	156°4.16	• • 1.42	Atria	$107^{\circ}10.16$	-69°4.40
16	162°10.09	50° 12.42	54.94	116°29.07	16.31	94°58.70	4.79	171°6.63	1.43	Sabik	102°2.96	-15°45.33
17	177° 12.55 192° 15.02	65°11.58 80°10.73	54.55	131°29.75	16.83 N16° 17.35	110° 0.60 125° 2.50	4.87	186°9.11 201°11.59	1.45 \$06°1.47	Shaula	96°10.55	-37°7.33
18 19	207° 17.48	95°9.89	N22°54.17 53.78	146°30.43 161°31.11		140° 4.39	N21°4.96	201 11.59 216°14.06		Rasalhague	95°58.62	12°32.55
20	207 17.46 222° 19.94	110°9.04	53.76	176°31.78	17.87 18.39	155° 6.29	5.04 5.12	231° 16.54	1.48 1.50	Eltanin	90°41.85	51°29.14
21	237°22.41	125°8.20	• • 53.01	191°32.46	18.91	170° 8.19	. 5.21	246° 19.01	. 1.51	Kaus Aust.	83°32.68	-34°22.37
22	252°24.87	140°7.35	52.62	206°33.14	19.43	185°10.09	5.29	261°21.49	1.53	Vega	80°33.08	38°48.35
23	267°27.34	155°6.51	52.22	221°33.82	19.45	200°11.98	5.37	276°23.96	1.55	Nunki	75°47.92	-26°15.95
										Altair	62°0.05	8°55.96
Mer.p	pass. 05:13	ν -0.9′ d-0	.4′ m-3.90	$ u$ 0.7 $^{\prime}$ d0	.5' m 0.96	$\nu 1.9' \ d0.$	1′ m-2.03	$\nu 2.5' \ d0.$	0' m 0.90	Peacock	53°5.84	-56°39.24
										Deneb	49°25.69	45°21.91
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.98	9°59.19
0	282°29.80		N22°51.83	236°34.50	N16°20.47	215°13.88		291°26.44	S06°1.56	Al Na'ir	27°33.14	-46°50.35
1	297°32.27	185°4.82	51.44	251°35.18	20.99	230°15.78	5.54	306° 28.92	1.58	Fomalhaut Scheat	15°14.81 13°45.47	-29°29.40 28°12.80
2	312°34.73	200°3.98	51.04	266° 35.86	21.51	245°17.68	5.62	321°31.39	1.60	Markab	13 45.47 13°30.19	28 12.80 15°20.14
3	327°37.19	215°3.14	• • 50.65	281°36.53	• • 22.03	260°19.57	• • 5.71	336°33.87	• 1.61	ividikaD	13 30.19	15 20.14
4	342°39.66	230°2.30	50.25	$296^{\circ}37.21$	22.55	275°21.47	5.79	351°36.35	1.63	Jul 02 Tue	SHA	Mer.pass
5	$357^{\circ}42.12$	245°1.46	49.85	311°37.89	23.06	290°23.37	5.87	6°38.82	1.65		$250^{\circ}14.98$	12:38
6	12°44.59	260°0.61	N22°49.45	326°38.57	N16°23.58	305°25.27		21°41.30	S06°1.66	Mars	$315^{\circ}30.38$	08:15
7	27°47.05	274°59.77	49.05	341°39.25	24.10	320°27.17	6.04	36°43.78	1.68		293°11.37	09:44
8	$42^{\circ}49.51$	289°58.93	48.65	356° 39.93	24.62	335°29.07	6.12	51°46.25	1.70	Saturn	8°56.25	04:41
9	57°51.98	304°58.09	• • 48.25	11°40.61	• • 25.13	350°30.96	• • 6.20	66°48.73	• • 1.71	Jul 03 Wed	SHA	Mer.pass
10	72°54.44	319°57.25	47.84	26°41.28	25.65	5°32.86	6.29	81°51.21	1.73		248°55.34	12:39
11	87°56.91	334°56.41	47.44	41°41.96	26.17	20°34.76	6.37	96°53.69	1.75		314°47.55	08:14
12	102°59.37	349°55.57	N22°47.03	56°42.64	N16°26.68	35°36.66		111°56.16	S 06°1.77		292°57.70	09:41
13	118°1.84	4°54.73	46.63	71°43.32	27.20	50°38.56	6.53	126°58.64	1.78	Saturn	8°56.40	04:37
14	133°4.30	19°53.89	46.22	86°44.00	27.71	65°40.46	6.62	142°1.12	1.80			
15	148°6.76	34°53.06	• • 45.81	101°44.68	• • 28.23	80°42.36	• • 6.70	157°3.60	• • 1.82	Jul 04 Thu	SHA	Mer.pass
16	163°9.23	49°52.22	45.40	116°45.35	28.74	95°44.26	6.78	172°6.08	1.84		247°35.87	12:40
17	178° 11.69	64°51.38	44.98	131°46.03	29.26	110°46.16	6.86	187°8.56	1.85	Mars	314°4.70	08:13
18	193°14.16	79°50.54	N22°44.57	146° 46.71	N16°29.77	125°48.06	N21°6.95	202°11.04	S06°1.87		292°44.08	09:38
19	208° 16.62	94°49.70	44.16	161°47.39	30.29	140°49.96	7.03	217° 13.52	1.89	Saturn	8°56.64	04:33
20	223°19.09	109°48.87	43.74	176°48.07	30.80	155°51.86	7.11	232°15.99	1.91	Horizo	ntal parallax	
21	238°21.55	124°48.03	43.32	191°48.74	• • 31.32	170°53.75	· · 7.19	247°18.47	1.92	11011201	Venus:	0.1
22	253°24.01	139° 47.20	42.91	206°49.42	31.83	185°55.65	7.27	262°20.95	1.94		Mars:	0.1
23	268° 26.48	154°46.36	42.49	221°50.10	32.34	200°57.55	7.36	277°23.43	1.96		ividio.	0.1
Mer.p	pass. 05:09	ν -0.8′ d-0	.4′ m-3.90	$ u$ 0.7 $^{\prime}$ d0	.5′ m0.96	$\nu 1.9' \ d0.$	1′ m-2.04	$\nu 2.5' \ d0.$	0′ m0.89			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.81	N23°0.85	232°58.39	8.4'	N21°3.68	11.5'	58.5'
1 2	193°58.69 208°58.57	0.66 0.46	247°25.82 261°53.16	8.3' 8.3'	21°15.17 21°26.53	11.4' 11.2'	58.5' 58.4'
3	223°58.45	0.27	276° 20.43	8.2'	21°37.77	11.1'	58.4
4	238°58.34	23°0.08	290°47.63	8.1'	21°48.87	11.0'	58.4'
5	253°58.22 268°58.10	22°59.89 N22°59.69	305° 14.75 319° 41.79	8.0'	21°59.85 N22°10.69	10.8'	58.4'
6 7	268 58.10 283°57.98	N22 59.69 59.50	319 41.79 334°8.76	8.0' 7.9'	N22 10.69 22°21.41	10.7' 10.6'	58.4' 58.4'
8	298°57.87	59.30	348°35.66	7.8'	22°31.98	10.4'	58.3'
9	313°57.75	• • 59.11	3°2.48	7.7'	22°42.42	10.3'	58.3'
10 11	328°57.63 343°57.52	58.91 58.72	17°29.23 31°55.91	7.7' 7.6'	22°52.73 23°2.90	10.2' 10.0'	58.3' 58.3'
12	358°57.40	N22°58.52	46°22.51	7.5'	N23°12.92	9.9'	58.3
13	13°57.28	58.32	$60^{\circ}49.04$	7.5'	23°22.81	9.7'	58.3'
14	28°57.17	58.12	75° 15.50	7.4'	23°32.55	9.6'	58.2'
15 16	43°57.05 58°56.93	· · 57.92 57.72	89°41.89 104°8.21	7.3' 7.3'	23°42.15 23°51.61	9.5' 9.3'	58.2' 58.2'
17	73°56.82	57.52	118°34.46	7.2'	24°0.92	9.2'	58.2'
18	88°56.70	N22°57.32	133°0.65	7.1'	N24°10.08	9.0'	58.2'
19 20	103°56.59 118°56.47	57.11 56.91	147°26.76 161°52.81	7.0' 7.0'	24°19.10 24°27.96	8.9' 8.7'	58.2' 58.1'
21	133°56.35	56.71	176° 18.79	6.9'	24° 27.90 24° 36.68	8.6'	58.1
22	148°56.24	56.50	$190^{\circ}44.70$	6.9'	24°45.24	8.4'	58.1'
23	163°56.12	56.30	205° 10.55	6.8'	24°53.65	8.3'	58.1'
	SD = 15.7'	d = -0.2'		SI	D = 15.9'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.01	N22°56.09	219°36.34	6.7'	N25° 1.91	8.1'	58.1'
1	193°55.89	55.88	234°2.07	6.7'	25°10.01	7.9'	58.1'
2	208°55.78 223°55.66	55.68 •• 55.47	248°27.73 262°53.34	6.6' 6.5'	25°17.95 25°25.74	7.8' 7.6'	58.0' 58.0'
4	238°55.55	55.26	202 33.34 277°18.89	6.5	25°33.37	7.5'	58.0'
5	253°55.43	55.05	291°44.38	6.4'	25°40.84	7.3'	58.0'
6	268°55.32 283°55.21	N22°54.84 54.63	306°9.81 320°35.19	6.4' 6.3'	N25°48.15 25°55.30	7.1' 7.0'	58.0' 58.0'
7 8	283 55.21 298°55.09	54.63 54.42	320 35.19 335°0.52	6.3	25° 55.30 26° 2.29	7.0 6.8'	58.0 57.9'
9	313°54.98	• • 54.20	349°25.79	6.2'	26°9.11	6.7'	57.9'
10	328°54.86	53.99	3°51.02	6.2'	26°15.78	6.5'	57.9'
11 12	343°54.75 358°54.64	53.78 N22° 53.56	18° 16.19 32° 41.32	6.1' 6.1'	26°22.27 N26°28.61	6.3' 6.2'	57.9' 57.9'
13	13°54.52	53.35	47°6.40	6.0'	26°34.77	6.0'	57.8'
14	28°54.41	53.13	61°31.44	6.0'	26°40.77	5.8'	57.8'
15 16	43°54.30 58°54.18	· · 52.91 52.70	75°56.44 90°21.39	6.0' 5.9'	26°46.60 26°52.26	5.7' 5.5'	57.8' 57.8'
17	73°54.07	52.70 52.48	90 21.39 104°46.31	5.9'	26°57.76	5.3'	57.8'
18	88°53.96	N22°52.26	119° 11.19	5.8'	N27°3.08	5.2'	57.7'
19	103°53.84	52.04	133°36.03	5.8'	27°8.24	5.0'	57.7'
20 21	118°53.73 133°53.62	51.82 •• 51.60	148°0.84 162°25.62	5.8' 5.7'	27°13.22 27°18.03	4.8' 4.6'	57.7' 57.7'
22	148°53.51	51.38	176° 50.37	5.7'	27°22.67	4.5'	57.7'
23	163°53.39	51.16	191°15.09	5.7'	27°27.14	4.3'	57.6'
	SD = 15.7'	d = -0.2'		SI	D = 15.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.28	N22°50.93	205°39.79	5.7'	N27°31.44	4.1'	57.6'
1	193°53.17	50.71	220°4.46	5.6'	27°35.56	3.9'	57.6'
2	208°53.06 223°52.95	50.49 •• 50.26	234°29.11 248°53.74	5.6' 5.6'	27°39.51 27°43.28	3.8' 3.6'	57.6' 57.6'
4	238°52.84	50.20	263° 18.35	5.6'	27°46.88	3.4'	57.5'
5	253°52.72	49.81	277°42.95	5.6'	27°50.31	3.3'	57.5'
6 7	268°52.61 283°52.50	N22°49.58 49.36	292°7.53 306°32.10	5.6' 5.6'	N27°53.56 27°56.63	3.1' 2.9'	57.5' 57.5'
8	203 52.50 298°52.39	49.30	320° 56.66	5.6'	27°59.53	2.7'	57.5'
9	313°52.28	• • 48.90	$335^{\circ}21.22$	5.5'	28°2.25	2.5'	57.4'
10	328°52.17	48.67	349°45.77	5.5'	28°4.80	2.4'	57.4'
11 12	343°52.06 358°51.95	48.44 N22°48.21	4° 10.31 18° 34.86	5.5' 5.5'	28°7.18 N28°9.37	2.2' 2.0'	57.4' 57.4'
13	13°51.84	47.98	32°59.41	5.6'	28°11.39	1.8'	57.4'
14	28°51.73	47.74	47°23.96	5.6'	28°13.24	1.7'	57.3'
15 16	43°51.62 58°51.51	· · 47.51 47.28	61°48.52 76°13.08	5.6' 5.6'	28°14.91 28°16.40	1.5' 1.3'	57.3' 57.3'
17	73°51.40	47.28	90°37.66	5.6'	28°17.72	1.1'	57.3'
18	88°51.29	N22°46.81	105°2.25	5.6'	N28°18.86	1.0'	57.2'
19 20	103°51.18 118°51.07	46.57 46.33	119°26.85 133°51.47	5.6' 5.6'	28°19.83 28°20.62	0.8' 0.6'	57.2' 57.2'
21	133°50.96	46.10	148° 16.11	5.7'	28°21.23	0.4	57.2'
22	148°50.85	45.86	162°40.77	5.7'	28°21.68	0.3'	57.2'
23	163°50.75	45.62	177°5.46	5.7'	28°21.94	0.1'	57.1'
	SD = 15.7'	d = -0.2'		SI	D = 15.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:38	23:25	////	////
64°	////	////	01:46	22:21	////	////
62°	////	////	02:20	21:47	////	////
60°	////	01:10	02:45	21:23	22:57	////
N 58°	////	01:52	03:04	21:04	22:15	////
56°	////	02:20	03:21	20:48	21:48	////
54°	01:04	02:41	03:34	20:34	21:27	23:03
52°	01:43	02:58	03:46	20:22	21:10	22:24
50°	02:09	03:13	03:57	20:12	20:55	21:59
45°	02:53	03:42	04:19	19:50	20:27	21:16
N 40°	03:22	04:04	04:36	19:32	20:05	20:46
35°	03:45	04:21	04:51	19:18	19:47	20:24
30°	04:03	04:36	05:03	19:05	19:32	20:05
20°	04:31	05:01	05:25	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:30	18:57
S 10°	05:29	05:55	06:18	17:51	18:14	18:40
20°	05:45	06:12	06:36	17:33	17:57	18:24
30°	06:01	06:30	06:57	17:12	17:39	18:08
35°	06:09	06:41	07:09	17:00	17:28	18:00
40°	06:18	06:52	07:22	16:46	17:17	17:51
45°	06:28	07:05	07:39	16:30	17:04	17:41
S 50°	06:39	07:21	07:59	16:10	16:48	17:29
52°	06:44	07:28	80:80	16:01	16:41	17:24
54°	06:50	07:36	08:19	15:50	16:33	17:19
56°	06:56	07:45	08:31	15:38	16:24	17:13
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:10	08:06	09:02	15:07	16:03	16:59

Lat.		Moonris	e		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°	22:36			19:43		
62°	23:19	23:10		19:01	21:11	
60°	23:48		00:02	18:32	20:19	21:42
N 58°	••••	00:10	00:34	18:11	19:47	21:04
56°	00:10	00:28	00:58	17:53	19:23	20:37
54°	00:22	00:44	01:18	17:38	19:04	20:16
52°	00:32	00:57	01:34	17:25	18:48	19:58
50°	00:41	01:09	01:48	17:14	18:34	19:43
45°	01:00	01:34	02:17	16:50	18:05	19:12
N 40°	01:15	01:53	02:40	16:31	17:43	18:48
35°	01:29	02:10	02:59	16:16	17:25	18:29
30°	01:40	02:24	03:15	16:02	17:09	18:12
20°	02:00	02:49	03:43	15:39	16:42	17:44
N 10°	02:18	03:10	04:06	15:19	16:19	17:19
0°	02:34	03:30	04:28	15:01	15:58	16:57
S 10°	02:51	03:50	04:51	14:42	15:37	16:34
20°	03:09	04:12	05:15	14:23	15:14	16:10
30°	03:30	04:37	05:43	14:00	14:47	15:41
35°	03:42	04:52	05:59	13:47	14:32	15:25
40°	03:56	05:10	06:19	13:32	14:14	15:05
45°	04:13	05:31	06:42	13:14	13:52	14:41
S 50°	04:34	05:57	07:12	12:51	13:25	14:11
52°	04:44	06:10	07:27	12:41	13:11	13:55
54°	04:55	06:25	07:45	12:29	12:56	13:38
56°	05:08	06:43	08:06	12:15	12:38	13:16
58°	05:23	07:04	08:33	12:00	12:16	12:49
S 60°	05:41	07:31	09:11	11:41	11:48	12:11

	Sun			Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-5%	
02	04:05	04:10	12:04	08:47	21:15		
03	04:16	04:21	12:04	09:44	22:13		
04	04:27	04:32	12:05	10:43	23:12		

2. 2873-204 1907-4528 1924-207 2875-107 1915-108 13.547 24.07 25.07	h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
1												SHA	Dec
28 1973 1974 1973 1974 1975												357°35.14	29°13.40
3 3879-364												353°7.49	-42°10.12
3 9 39 39 30 20 24 125 0.00 27 39 50 30 30 31 55 52 36 30 50 50 50 50 50 50 50 50 50 50 50 50 50												349°31.51	56°40.03 -17°51.00
18 1971 1971 2974 1972 1973 1974 1975 1975 1975 1975 1974 1975 1974 1975 1974 1975 1975 1974 1975 1975 1974 1975 1975 1975 1975 1975 1975 1975 1975	4	343°38.80		40.37		34.90		7.77				348°47.70 335°20.60	-17 51.00 -57°6.44
Polaris 1, 12												327°51.79	23°34.60
9 58°51.12 300°58.02 380°59.02 39.99 49 390°14.05 809 92°49.76 2.13 44.214 110 73°33.83 339°51.09 378 02°57.05 378 078 078 078 078 078 078 078 078 078 0												314°30.45	89°21.75
5875 12 30a ² 800 7.38 23 11°56 88 37.45 537 1656 8.17 67°48 24 214 Michael March 10 10 27°550 33a ² 8750 33a ² 8750 32a												$315^{\circ}12.31$	-40°12.15
10 173 53 58 319 57.19 57.29 26*57.56 37.96 6*18.46 8.20 82*50.72 2.16 Monthly and the company of the company o											Menkar	314°6.77	4°11.17
11												308°29.19	49°56.70
Capable 1987												290°40.39	16°33.50
Bellatin 1985												281° 4.58	-8°10.32
	13	$119^{\circ}0.98$	4°34.70	36.50	71°59.59	39.49	51°24.16	8.50	127°58.17	2.22		280°22.96 278°23.65	46°1.27 6°22.35
A												278°2.76	28°37.65
17 1 1 19°1083 0 4°3137 83.75 13°2°330 41.52 11°3177 83.82 188°8.10 2.30 186°8.10 2.30 19°3056 180°327 19°207 180°108 50°27 180°208 19°207 180°108 19°207 180°108 19°207 180°108 19°207 180°108 19°207 180°108 19°207 180°108 19°207 180°108 180°207 180°207											l l	275°38.48	-1°11.12
18 194 13,30												270°52.87	7°24.74
19											Canopus	263°53.14	-52°42.40
20 224*18.23 109°28.89 134.2 177°4.33 43.05 156°37.48 9.07 233°1.55 2.35 2.36 122 239°6.00 124°28.06 32.98 109°5.01 4.36 180°41.28 9.03 203°2.05 2.37 190°2.00 244°2.16 132.09 122°6.01 4.45 6 201°43.18 9.31 9.33 203°2.05 1.2.39 140°2.25 22°6.37 4.46 6 180°41.28 9.23 203°2.05 1.2.39 140°2.25 1.2.39 140												258°26.96	-16°44.91
21 239°20.09 124°38.06 · 22.98 192°5.01 · · · · · · · · · · · · · · · · · · ·												255°6.59	-29°0.25
Mer.pass. 05:05 154°26.1 32:09 222°6.37 44:06 186°41.28 9.23 263°20.51 2.39 54:06 222°6.37 44:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.18 9.31 233°23.00 2.41 54:06 201°43.00 201°												244°51.61	5°9.79
Mer.												243°18.19	27°58.10
Mer pass 05.05 v-0.8' d-0.4' m-3.90 v-0.7' d-0.5' m0.96 v-0.19' d-0.1' m-2.04 v-2.5' d-0.0' m0.89 Misplacidus 221' state 314' 316' 318' 318' 318' 318' 318' 318' 318' 318					222°6.37							234°15.54 222°47.02	-59°35.31 -43°31.95
Sat GHA	Mer	pass กระกร	ν-0.8/ d-0) 4' m-3 00	ν0 7' d0	5′ m0 96	ν1 9' dΩ	1′ m-2 04	ν2 5' dΩ	0′ m0 80	l l	222 47.02 221°39.20	-45 31.95 -69°49.17
Sear CHA	IVICI.	Jass. 05.05	ν-0.0 α-0	7.4 111-3.90	νο.τ ασ	.5 1110.90	ν1.9 do.		ν2.5 do.			217°48.44	-8°45.86
0 284°2808 1 189°285 8 N22°11.04 237°7.04 N16°4507 216°4508 N21°9.39 299°25.48 S06°2.45 Gloriah 179°21 189°285 189°427 8 311.9 227°7.72 45.88 231°3.04 267°8.40 46.08 246°48.89 9.55 332°30.45 2.47 Amount 47.89 231°3.04 46.08 246°48.89 9.55 332°30.45 2.47 Amount 47.89 241°42 47.89 289°20.62 228°9.08 40.08 246°48.89 9.55 332°30.45 2.47 Amount 47.89 241°42 47.89 289°20.62 N22°83 32°11.14 N16°45.10 306°56.50 N21°9.87 23°30.39 506°25.5 Alicah 166° 14°42.47 259°20.62 N22°83 32°11.14 N16°45.10 306°56.50 N21°9.87 23°40.39 506°25.5 Alicah 166° 166°40.09 246°42.45 248°3.39 22°11.14 N16°45.10 306°56.50 N21°9.87 23°40.39 506°25.5 Alicah 166° 166°40.09 28°47 34°41.179 36°40.09 306°56.50 N21°9.87 33°40.55 2.57 Alicah 166° 166°40.09 306°18.15 27.56 21°31.34 49.11 337°0.31 10.04 53°45.36 2.59 Alicah 166°	_			_		_		_		_		207°35.12	11°50.95
1 999°3055 184°24.75 311.9 252°7.72 45.58 231°46.99 94.77 308°27.96 2.45 66:nah 172°3 17												193°41.83	$61^{\circ}37.43$
2 314°33.01 199°29.33 30.74 267°8.40 46.08 246°8.48 9 .9.55 323°30.45 2.47 3 339°35.48 214°33.10 30.20 262°29.27 262°40.90 276°52.69 .9.11 33°30.45 2.47 4 344°37.94 229°22.7 29.84 297°9.75 47.09 276°52.69 .9.11 33°30.35.42 2.51 5 330°40.40 244°21.45 29.38 312°10.43 47.59 29°10.60 0.79 18°37.09 0.25.3 5 530°40.40 244°21.45 29.38 312°10.43 47.59 29°10.60 0.79 18°37.09 0.25.3 5 526°20.62 N22°28.93 32°11.11 N16°48.10 306°56.50 N21°9.67 0.29°43.09 506°25.5 8 44°47.80 289°18.98 28.01 35°712.46 49.11 33°70.31 10.04 53°45.36 2.59 Hadar 18'10 74°52.23 310°17.33 27.10 22°13.82 50.11 7°4.11 10.20 83°50.33 2.64 2.61 10 74°52.73 310°17.33 27.10 22°13.82 50.11 7°4.11 10.20 83°50.33 2.62 56 11 88°5519 334°16.51 26.64 42°14.49 56.01 32°2.60 10.38 98°52.81 2.65 12 104°57.65 340°15.68 N22°26.18 57°15.17 N16°51.12 37°7.92 N21°10.36 113°55.30 506°2.67 13 120°10.12 4"14.86 25.71 72°15.85 51.62 52°9.82 11.46°2.77 2.76 51 340°15.26 14 135°25.8 19°14.04 25.25 87°16.33 55.12 97°15.54 10.60 159°2.76 2.74 14 135°25.8 19°14.04 25.25 87°16.33 55.12 97°15.54 10.60 159°2.76 2.74 16 165°75.1 40°12.20 24.32 117°17.88 53.12 97°15.54 10.60 159°2.76 2.74 17 180°90 64°11.88 23.85 102°17.20 5.50 2.82 823.13 63 0.10 0.1 11.20 27°1.20 2.20 2.20 2.20 2.20 2.20 2.20 2.20											Denebola	182°25.47	14°26.23
3 329°35.48 244°23.10 30.29 282°9.08 46.59 261°50.79 9.63 338°32.93 2.49 46.54 46.45 47.59												175°44.08	-17°40.74
4 344°37.94 0, 244°21.45 2.93.8 312°10.34 47.59 92°6.96 9.71 353°35.42 2.51 Alichi 166 5 359°40.40 244°21.45 2.93.8 312°10.34 47.59 92°15.46 0, 979 83°32.40 30°6.25 Alichi 166 6 14°42.87 259°20.62 N22°8.89 3 312°10.34 47.59 29°15.46 0, 995 33°42.87 2.55 Alichi 156 6 14°42.87 259°20.62 N22°8.89 3 32°11.11 N16°48.10 306°5.65 N21°9.87 22°40.39 60°2.55 Alichi 156 6 14°42.87 20°42.89 18.15 1.27 2.27 18.28 2.00.11 27°41.1 10.20 33°45.36 2.59 Alichi 152°10.10 19°42.10 19°												173°0.69	-63°14.36
5 389°40.40 244°21.65 29.38 312°10.43 347'59 291°34.60 9.97 8°37.90 2.33 5.35 5.35 5.35 5.35 5.35 5.35 7 29°45.33 274°19.80 28.47 327°11.79 48.60 321°58.40 9.95 38°42.27 2.57 4.54 3.55 4.55 2.59 4.55 4.55 2.59 4.55 4.55 2.59 4.55 4.55 2.55 4.5												171°52.20	-57°15.27
6 14'4287 259'2062 390'389 337''11.11 N16'48.10 306'555 N21'9.87 23'40.39 50'2.55	5	359° 40.40	244°21.45	29.38	$312^{\circ}10.43$	47.59	291°54.60	9.79	8°37.90		l l	166°13.32 158°22.70	55°49.91 -11°17.38
7 29'45'3.0 269'1898 28.17 357'12.46 49.11 337'0.31 10.04 53'45'3.6 2.57 9 59'50.26 304'18.15 27.56 129'13.14 49.61 332'2.21 10.12 668'47.84 2.261 10 74'52.73 319'17.33 27.10 27'13.82 50.11 7'4.11 10.20 88'50.33 2.63 Regil Kent. 139' 51.11 89'55.19 334'16.51 26.64 42'14.49 6.11 352'2.21 10.10 28 98'52.81 2.65 11 89'55.19 334'16.51 26.64 42'14.49 50.61 22'6.02 10.28 98'52.81 2.65 Regil Kent. 139' Rochab 137' Rochab 137' Rochab 131' 120'0.12 4'14.86 25.71 72'15.85 51.62 52'9.82 10.44 128'57.78 2.69 14 135'2.58 10'14.04 25.25 87'16.53 52.12 67'11.73 10.52 144'0.27 2.72 Antares 112' 151 510'5.05 3'41'3.22 2.47.8 102'17.20 52.62 82'13.63 10.06 159'2.76 2.274 Antares 112' 151 180'9.94 64'11.58 23.85 132'18.56 53.62 112'17.44 10.76 189'7.73 2.78 Antares 112' 17 180'9.94 64'11.58 23.85 132'18.56 53.62 112'17.44 10.76 189'7.73 2.78 Rochab 137' 240' 24.32 117'17.88 53.12 12'7'19.34 N21'10.84 20'10.2 50'6.2 80 19 210''14.90 94''9.94 22.91 162'19.91 54.62 142'2.125 10.92 219'12.70 2.52 225'5'1.37 10'9.91 22 244 177'20.59 55.12 12'7'19.34 N21'10.84 20'10.2 50'6.2 80 Rasalhague 95' 22 25'5'2.20 139''74.8 21.50 20''72.94 55.12 15''72.31 11.00 24''15.19 2.28 225'2.22 0.133''74.8 21.50 20''72.94 55.12 15''72.31 11.00 24''15.19 2.28 225'2.22 0.133''74.8 21.50 20''72.94 56.12 137''2.50 6 11.16 264''2.25 2.90 Althirt of 154''6.66 21.03 22''2.26 56.12 13''93.07 N21''11.31 30''92''2.65 2.90 Althirt of 154''6.66 21.03 22''2.26 56.12 13''93.07 N21''11.31 30''92''2.65 2.90 Althirt of 154''6.64 29''0.10 2.52'' 23.97 57.62 22''2.28 87 11.24 294''1.15 2.94 2.94 22 35''2.22 10''2.39 11.00 22''2.7 55.62 172''2.50 6 11.16 264''2.55 0.99 Althirt of 154''6.66 21.03 22''2.26 55.12 21''2.93.7 N21''11.31 30''92''2.65 2.90 Althirt of 154''6.66 21.03 22''2.26 55.12 21''2.93.7 N21''11.31 30''92''2.65 2.90 Althirt of 154''6.66 21.03 22''2.25 53 56.11 24''73.39 11.10 29''73.50 S Charles of 154''6.10 18''73.39 11.10 18''73.30 11.71 19''74.40 11.18 7 324''93.11 2.97 Althirt of 154''6.66 21.13 29 10''	6	14°42.87	259°20.62	N22°28.93	327°11.11	N16°48.10	306°56.50	N21°9.87	23°40.39	S06°2.55		150° 52.70	49°11.71
8 44"478.0 289"18.98 28.01 33"712.46 49.11 337"0.31 10.04 68"47.84 2.26 1 1.01.27 65 34"18.15 27.56 12"13.14 49.61 352"2.21 10.12 68"47.84 2.26 1 1.01.27 68"4.84 2.27 6 1.01.27 68"4.8												148°36.41	-60°29.72
10 74°52.73 319°17.33 27.10 27°13.82 50.11 7°4.11 10.20 83°50.33 2.63												147°57.99	-36°29.58
11 88°55.19 334°16.51 26.64 42°14.49 50.61 22°6.02 10.28 88°5.19 13°5.21 2.65 Kochab 13°5.21 21°10.20 12°10.20 13°5.50 13°5.50 12°10.20 13°5.50 13°5.50 13°5.50 12°10.20 13°5.50 13°5											Arcturus	145°48.17	19°3.41
12 104°57.65 349°15.68 N22°26.18 57°15.17 N16°55.12 37°7.92 N21°19.36 113°55.0 S06°2.67 13 120°012 4°14.66 2571 72°15.85 51.62 55°0.82 10.44 10.76 18°57.78 2.69 14 135°2.58 19°14.04 25.25 87°16.53 52.12 6°71.73 10.52 144°0.27 2.72 15 150°5.05 34°13.2224.78 102°17.20 5.52.62 82°13.63 10.60 159°2.76 2.76 16 165°7.51 49°12.40 24.32 117°17.88 53.12 97°15.54 10.68 174°5.24 2.76 18 195°12.44 79°10.76 N22°3.33 147°19.24 N16°54.12 127°19.34 N12°10.84 10.76 189°7.73 2.78 18 195°12.44 79°10.76 N22°3.33 147°19.24 N16°54.12 127°19.34 N12°10.84 10.76 189°7.73 2.78 19 210°14.90 94°9.94 22.91 162°19.91 54.62 142°21.55 10.92 219°12.70 2.82 12 240°19.83 124°8.30 21.97 192°2.17 55.62 172°25.06 11.08 249°17.68 2.28 12 240°19.83 124°8.30 21.97 192°2.17 55.62 172°25.06 11.08 249°17.68 2.28 12 240°19.83 124°8.30 21.97 192°2.17 55.62 172°25.06 11.08 249°17.68 2.28 12 240°19.83 124°8.30 21.97 192°2.17 55.62 187°26.96 11.16 24°20.16 2.88 15 30°3.09.09 186°5.00 N2°2.00 22°22.26 56.62 202°28.87 11.24 279°22.55 2.90 15 46.66 21.03 222°22.62 56.62 202°28.87 11.24 279°22.55 2.90 15 46.66 21.03 222°22.62 56.62 202°28.87 11.24 279°22.55 2.90 15 30°2.99 186°5.00 N2°2.00 25°2.39 7 57.62 232°32.68 11.39 24°25.14 50°2.99 15 30°3.99.90 186°5.00 N2°2.00 252°2.39 7 57.62 232°32.68 11.39 24°25.14 50°2.99 15 30°3.99.90 186°5.00 N2°2.00 252°2.39 7 57.62 232°32.68 11.39 39°3.60 2.99 15 30°3.99.90 186°5.00 N2°2.00 159.11 277°3.83 9 11.63 336°3.50 2.95 15 50°3.99 5 244°1.76 18.16 312°2.66 156°9.61 292°4.00 11.71 9°37.58 3.03 15 50°3.99 5 244°1.76 18.16 312°2.66 156°9.61 292°4.00 11.71 9°37.58 3.03 15 50°3.99 5 346°4.00 13.90 14.27 72°3.00 11.71 9°37.58 3.03 15 50°3.99 140°3.30 17.99 140°3.30 17.99 140°3.30 11.71 9°37.58 3.03 15 50°3.99 140°3.30 17.99 140°3.30 17.99 140°3.30 11.71 9°37.58 3.03 1.00 17.99 140°3.30 11.71 9°37.58 3.03 1.00 17.99 140°3.30 11.71 9°37.58 3.03 1.00 17.99 140°3.30 11.71 9°37.58 3.03 1.00 17.99 140°3.30 11											Rigil Kent.	$139^{\circ}40.61$	-60°56.43
13 120°0.12 4°14.86 25.71 72°15.85 51.62 52°9.82 10.44 128°57.78 2.69 Alphecos 121 143°0.27 2.72 Alphecos 121 15°15.52 68 10°14.04 225.5 87°16.53 52.12 67°11.73 10.52 144°0.27 2.72 Alphecos 121 15°15.55 34°13.22 · 24.78 102°17.20 · 52.62 82°13.63 · 10.60 159°2.76 · 2.74 Alphecos 121 17°17.88 53.12 97°15.54 10.68 174°5.24 2.76 Sabik 10°17 180°9.86 64°11.58 23.85 132°18.56 53.62 112°17.44 10.76 189°7.73 2.78 Alphecos 120°10.10 180°1.												137°19.15	74°3.52
14 135°2.58 10°14.04 25.25 87°16.53 52.12 67°11.73 10.52 144°0.27 2.72 Antares 112°15.05 150°5.05 34°13.22 2.478 102°17.20 5.56.2 82°13.63 10.60 159°2.76 2.74 Antares 112°16.16 165°7.51 49°12.40 24.32 117°17.88 53.12 97°15.54 10.68 174°5.24 2.76 Sabik 10°17.17 180°9.98 64°11.58 23.85 132°18.56 53.62 112°17.44 10.76 189°7.73 2.78 Shalla 96°18.15 19°14.90 94°9.94 22.91 162°19.91 54.62 142°21.25 10.92 210°12.70 2.82 Etanin 90°2 225°1.73 109°12 22.44 177°0.59 55.12 157°23.15 11.00 234°15.19 2.84 Kaus Aust 83°2 22°25°22.30 139°7.48 21.50 207°21.94 56.12 187°25.96 11.16 264°20.16 2.88 Nunki 75°2 22°25°22.30 139°7.48 21.50 207°21.94 56.12 187°25.96 11.16 264°20.16 2.88 Nunki 75°2 22°25°27.76 154°66 21.03 22°2°2.26 56.20 20°2°2.87 11.24 27°9°2.26 2.99 Altaria 10°3 Altar												136°56.31	-16°8.66
15												126°3.85	26°38.05
105 7.5 49 12.4 24.3 24.3 24.7 24.5 27 17.1 10.96 17.4 10.76 189°.7 3 2.78 18 195°12.44 79°10.76 N22°23.38 147°19.24 N16°54.12 127°19.34 N21°10.84 204°10.22 506°2.80 201°10.10 201°11.40 204°9.94 22.91 165°1.91 54.62 142°1.25 10.92 219°1.27 22.84 22.25°2.20 23.87 22.25°2.20 23.25°												112°16.05 107°10.15	-26°29.24 -69°4.41
18 195 12.44 79 10.76 N22 23.85 132 18.56 53.62 112 17.44 10.76 189 7.73 2.78 19 10.76 N22 23.85 147 19.24 177 19.24 177 19.34 177 19.34 N21 10.84 204 10.2 506 2.80 19 210 14.90 94 9.94 22.91 162 19.50 15.12 177 19.34 N21 10.84 204 12.15 19.22 219 12.70 2.82 12.24 177 20.59 55.12 157 23.15 11.00 234 15.19 2.84 12.50 202 255 22.30 139 7.48 21.50 207 21.94 56.12 187 25.60 11.16 264 20.16 2.88 Nunki 75 Altair 62 202 255 22.30 139 7.48 21.50 207 22.26 256 22.26 202 28.87 11.14 279 22.65 2.90 Nunki 75 Altair 62 202 285 27.22 169 6.84 N22 20.55 237 23.30 N16 57.12 217 30.77 N21 11.31 294 25.1 506 2.95 2.90 Nunki 75 235 23.30 N16 57.12 217 30.77 N21 11.31 294 25.1 506 2.95 2.90 Nunki 75 23.33 30.34 2.95 2.95 23.97 23.30 N16 57.12 217 30.77 N21 11.31 294 25.1 506 2.95 2.90 Nunki 75 2.33 30.34 2.95 2.			49°12.40	24.32	$117^{\circ}17.88$							107 10.15 102° 2.95	-09 4.41 -15°45.33
18 195°12.44 79°10.76 N22°23.81 147°19.24 N16°54.12 127°19.34 N21°10.84 204°10.22 506°2.80 206°2.80 202°2.87 310°9.91 204°19.83 124°8.30 21.97 192°21.27 54.62 142°21.25 10.92 219°1.68 2.84 22.94 22.94 176°2.95 55.12 157°23.15 11.00 234°15.19 2.84 2.84 22.22 255°22.30 139°7.48 21.50 207°21.94 56.12 137°26.96 11.16 264°20.16 2.88 2.86 22.25°2.20 239°7.45 21.97 207°21.94 56.12 137°26.96 11.16 264°20.16 2.88 2.86 2	17			23.85								96°10.54	-37°7.33
210 149 349 349 229 102 199 54.02 142 21.25 11.00 234°15.19 2.84												95°58.61	12°32.56
22 240°19.83 124°8.30 · · · · · · · · · · · · · · · · · ·												90°41.85	51°29.16
22 255°22.30 139°7.48 21.50 207°21.94 56.12 187°26.96 11.16 264°20.16 2.88 Nunki 75°26.96 270°22.65 2.90 Mer.pass. 05:01 ν-0.8' d-0.4' m-3.90 ν-0.7' d0.5' m0.95 ν-1.9' d0.1' m-2.04 ν-2.5' d0.0' m0.88 Peacock 55°36 200°28.87 11.24 279°22.65 2.90 Mer.pass. 05:01 ν-0.8' d-0.4' m-3.90 ν-0.7' d0.5' m0.95 ν-1.9' d0.1' m-2.04 ν-2.5' d0.0' m0.88 Peacock 55°36 265°27.22 169°5.84 N22°9.055 237°23.30 N16°57.12 217°30.77 N21°11.31 294°25.14 506°2.93 Al Na'ir 27°30.30 2315°32.15 199°4.21 19.60 267°24.65 58.11 247°34.58 11.47 324°30.11 2.97 5cheat 13°3 330°34.62 214°3.39 1.91.12 282°25.33 58.61 262°36.49 11.155 339°32.60 2.99 3436°37.08 229°2.57 18.64 297°26.01 59.11 277°38.39 11.63 354°35.09 3.01 347°34.56 15°42.01 259°0.94 N22°17.68 327°27.36 N17°0.10 307°42.20 N21°11.79 24°40.07 506°3.05 Mars 31°40.66 316°40.40 303°58.50 16.21 212°9.39 1.10 337°46.01 11.95 54°45.05 3.10 5atur 29°40.33 338°56.87 15.25 42°30.74 2.58 22°51.73 12.19 99°52.51 3.16 Mars 31°40.50 311 31°0.92.6 3.68 3.88 34°40.94 303°58.50 1.622 12°29.39 1.59 352°47.92 1.203 69°47.53 3.12 31°40.50 311 31°40.59.6 3.08 311°40.50 311°4											Kaus Aust.	83°32.66	-34°22.37
Number Sign												80°33.08	38°48.37
Mer.pars. 05:01 V-0.8' d-0.4' m-3.90 V0.7' d0.5' m0.95 V1.9' d0.1' m-2.04 V2.5' d0.0' m0.88 Peacock 55												75°47.90	-26°15.95
Sun GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec Enif 33 20° 28° 27.22 169°5.84 N22° 23° 23.30 N16°57.12 217°30.77 N21°11.31 294°25.14 506°2.93 Al Na'ir 27° 2 315°32.15 199°4.21 19.60 267°24.65 58.11 247°34.58 11.47 324°30.11 2.97 6cheat 13° 330°3.60 2.99 2.60 36.61 26°236.49 11.55 339°32.60 2.99 30°3.55 244°1.76 18.16 312°26.68 16°59.61 222°40.30 11.71 9°37.58 3.03 Venus 246° 7 30°44.47 274°0.13 17.19 342°28.04 0.60 322°241.11 11.87 39°42.56 3.08 Jupiter 29° 9 60°49.40 303°58.50 16.22 12°29.39 1.59 352°47.92 12.03 69°47.53 3.12 31												62°0.04	8°55.97
Sun GHA GHA Dec Al Na'ir 27° 0 285°27.22 169°5.84 N22°20.55 237°23.30 N16°57.12 217°30.77 N21°11.31 294°25.14 S06°2.93 Fomalhaut 15° 1 300°29.69 184°5.02 20.07 252°23.97 57.62 232°32.68 11.39 30°27.63 2.95 Fomalhaut 15° 2 315°37.08 199°4.21 19.60 267°24.65 58.11 247°34.58 11.47 324°30.11 2.97 Markab 13° 5 0°39.55 244°1.76 18.64 297°26.01 59.11 277°38.39 11.63 354°35.09 3.01 Markab 13° 6 15°42.01 259°0.94 N22°17.68 327°27.36 N17°0.10 307°46.01 11.71 9°37.58 3.03 Mars 313° 8 45°46.94 288°59.31 <td>Mer.</td> <td>pass. 05:01</td> <td>ν-0.8′ d-0</td> <td>0.4′ m-3.90</td> <td>ν0.7′ d0</td> <td>.5′ m0.95</td> <td>$\nu 1.9' d0.$</td> <td>1′ m-2.04</td> <td>$\nu^{2.5'} d0.$</td> <td>0′ m0.88</td> <td></td> <td>53°5.81 49°25.67</td> <td>-56°39.24 45°21.93</td>	Mer.	pass. 05:01	ν -0.8′ d-0	0.4′ m-3.90	ν 0.7′ d0	.5′ m0.95	$\nu 1.9' d0.$	1′ m-2.04	$\nu^{2.5'} d0.$	0′ m0.88		53°5.81 49°25.67	-56°39.24 45°21.93
Sun GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec Al Na'ir 27°C 0 285°27.22 169°5.84 N22°20.55 237°23.30 N16°57.12 217°30.77 N21°11.31 294°25.14 506°2.93 Fomalhaut 15° 1 300°29.69 184°5.02 20.07 252°23.97 57.62 232°32.68 11.39 300°27.63 2.99 Scheal 13° 3 315°32.15 199°4.21 19.60 267°24.65 58.11 247°34.58 11.47 324°30.01 2.97 4 345°37.08 229°25.57 18.64 297°26.01 59.11 277°38.39 11.63 335°35.09 3.01 Jul 05 Fri 5 5 0°39.55 244°1.76 18.16 312°26.68 16°59.61 292°40.30 11.71 9°37.58 3.03 Venus 246° 6 15°42.01 259°9.09 N22°17.36 N17°0.10 307°42.20 N21°11.79 242.60 <td></td> <td>33°38.96</td> <td>9°59.21</td>												33°38.96	9°59.21
0 285°27.22 169°5.84 N22°20.55 237°23.30 N16°57.12 217°30.77 N21°11.31 294°25.14 S06°2.93 1 300°29.69 184°5.02 20.07 252°23.97 57.62 232°32.68 11.39 309°27.63 2.95 Scheat 13°3 330°34.62 214°3.39 · 19.12 282°25.33 · .58.61 262°36.49 · .11.55 339°32.60 · .2.99 4 345°37.08 229°2.57 18.64 297°26.01 59.11 277°38.39 11.63 354°35.09 3.01 59.15 5 0°39.55 244°1.76 18.16 312°26.68 16°59.61 292°40.30 11.71 9°37.58 3.03 Venus 246°6 15°42.01 259°0.94 N22°17.68 327°27.36 N17°0.10 307°42.20 N21°11.79 24°40.07 S06°3.05 Mars 313°3 4.62 246°4.74 274°0.13 17.19 342°28.04 0.60 322°44.11 11.87 39°42.56 3.08 Jupiter 292°49.04 0.60 322°44.11 11.87 39°42.56 3.08 Jupiter 292°49.04 0.60 322°44.11 11.87 39°42.56 3.08 Jupiter 292°5 51.67 318°57.68 15.74 27°30.07 2.09 7°49.62 12.11 84°50.02 3.14 11 99°54.33 333°56.87 15.25 42°30.74 2.58 22°51.73 12.19 99°52.51 3.16 Mars 312°13 120°59.26 3°55.24 14.27 72°32.10 3.57 52°55.54 12.35 129°57.49 3.21 14 136°1.72 18°54.43 13.78 87°32.77 4.07 67°57.45 12.42 144°55.08 S06°3.19 Jupiter 292°5 51.17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311°6 110°4.17 110°4.1	Sun	GHA					GHA	Dec	GHA	Dec		27°33.10	-46°50.35
2 315° 32.15 199° 4.21 19.60 267° 24.65 58.11 247° 34.58 11.47 324° 30.11 2.97 330° 34.62 214° 3.39 · 19.12 282° 25.33 · 58.61 262° 36.49 · 11.55 339° 32.60 · 2.99 4 345° 37.08 229° 2.57 18.64 297° 26.01 59.11 277° 38.39 11.63 354° 35.09 3.01 50° 39.55 244° 1.76 18.16 312° 26.68 16° 59.61 292° 40.30 11.71 9° 37.58 3.03 50° 30.57 30° 44.47 274° 0.13 17.19 342° 28.04 0.60 322° 44.11 11.87 39° 42.56 3.08 Jupiter 292° 40.30 11.79 40.30° 38.50 · 16.22 12° 29.39 · 1.59 352° 47.92 · 12.03 69° 47.53 · 3.12 10° 75° 51.87 318° 57.68 15.74 27° 30.07 2.09 7° 49.82 12.11 84° 50.02 3.14 11 90° 54.33 333° 35.687 15.25 42° 30.74 2.58 22° 51.73 12.19 99° 52.51 3.16 12 10° 56.79 348° 56.05 N22° 14.76 57° 31.42 N17° 3.08 37° 53.64 N21° 12.27 114° 55.00 506° 3.19 13 120° 59.26 3° 55.24 14.27 72° 32.10 3.57° 52° 55.54 12.35 129° 57.49 3.21 14° 55.00 506° 3.19 13 120° 59.26 3° 55.24 14.27 72° 32.10 3.57° 52° 55.54 12.35 129° 57.49 3.21 14° 55.00 506° 3.19 14° 14.27 72° 32.10 3.57° 52° 55.54 12.35 129° 57.49 3.21 14° 55.00 506° 3.19 14° 50° 50° 50° 51.69 12.80 117° 34.13 5.05 98° 12.60 12.58 175° 4.96 3.27 17° 181° 9.12 63° 51.99 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 18° 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 18° 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 18° 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.60 190° 7.45 3.30 190° 12.30 132° 34.80 5.55 113° 3.17 12.60 1												15°14.78	-29°29.39
3 330° 34.62 214° 3.39 · 19.12 282° 25.33 · 58.61 262° 36.49 · 11.55 339° 32.60 · 2.99 4 345° 37.08 229° 2.57 18.64 297° 26.01 59.11 277° 38.39 11.63 354° 35.09 3.01 Jul 05 Fri S 0° 39.55 244° 1.76 18.16 312° 26.68 16° 59.61 270° 38.39 11.63 354° 35.09 3.01 Venus 246° 61.07 125° 0.94 N22° 17.68 327° 27.36 N17° 0.10 307° 42.20 N21° 11.79 24° 40.07 506° 3.05 Mars 313° 7 30° 44.47 274° 0.13 17.19 342° 28.04 0.60 322° 44.11 11.87 39° 42.56 3.08 Jupiter 292° 8 45° 46.94 288° 59.31 16.71 357° 28.71 1.10 337° 46.01 11.95 54° 45.05 3.10 Saturn 8° 9 60° 49.40 303° 58.50 · 16.22 12° 29.39 · 1.59 352° 47.92 · 12.03 69° 47.53 · 3.12 10 75° 51.87 318° 57.68 15.74 27° 30.07 2.09 7° 49.82 12.11 84° 50.02 3.14 Venus 244° 11 90° 54.33 333° 56.87 15.25 42° 30.74 2.58 22° 51.73 12.19 99° 52.51 3.16 Mars 312° 120° 59.26 3° 55.24 14.27 72° 32.10 3.57 52° 55.54 12.35 129° 57.49 3.21 14 136° 1.72 18° 54.43 13.78 87° 32.77 4.07 67° 57.45 12.42 144° 59.98 3.23 15 151° 4.19 33° 53.62 · 13.29 102° 33.45 · 4.56 82° 59.35 · 12.50 160° 2.47 · 3.25 140 07 Sun S 11° 318° 9.12 63° 51.99 12.30 132° 34.80 5.55 113° 3.17 12.66 190° 7.45 3.30 Mars 311° 18 196° 11.58 78° 51.18 N22° 11.81 147° 35.48 N17° 6.04 128° 5.07 N21° 12.74 205° 9.94 506° 3.32 140 18 196° 11.58 78° 51.18 N22° 11.81 147° 35.48 N17° 6.04 128° 5.07 N21° 12.74 205° 9.94 506° 3.32 140 18 11° 120° 120° 61.51 108° 49.56 10.81 177° 36.83 7.03 158° 8.89 12.90 235° 14.92 3.36 140° 120° 12.44 138° 47.94 9.82 207° 38.19 8.01 188° 12.70 13.05 265° 19.91 3.41 140° 120° 12.44 138° 47.94 9.82 207° 38.19 8.01 188° 12.70 13.05 265° 19.91 3.41												13°45.44	28°12.81
4 345°37.08 229°2.57 18.64 297°26.01 59.11 277°38.39 11.63 354°35.09 3.01 Jul 05 Fri S 0°39.55 244°1.76 18.16 312°26.68 16°59.61 292°40.30 11.71 9°37.58 3.03 Venus 246°6 15°42.01 259°0.94 N22°17.68 327°27.36 N17°0.10 307°42.20 N21°11.79 24°40.07 S06°3.05 Mars 313°6 4.47 274°0.13 17.19 342°28.04 0.60 322°44.11 11.87 39°42.56 3.08 Jupiter 292°6 60°49.40 303°58.50 · 16.22 12°29.39 · 1.59 352°47.92 · 12.03 69°47.53 · 3.12 10 75°51.87 318°57.68 15.74 27°30.07 2.09 7°49.82 12.11 84°50.02 3.14 Venus 244°6 12 105°56.79 348°56.05 N22°14.76 57°31.42 N17°3.08 37°53.64 N21°12.27 114°55.00 S06°3.19 312°55.94 14.27 72°32.10 3.57 52°55.54 12.35 129°57.49 3.21 Jupiter 292°5 Saturn 86°5 151°4.19 33°53.62 · 13.29 102°33.45 · 4.56 82°59.35 · 12.50 160°2.47 · 3.25 Jul 07 Sun S 11° 11°18°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Jupiter 292°5 Saturn 86°1 11°1.18 7°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 S06°3.32 Saturn 86°1 11°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Jupiter 292°5 Saturn 86°1 1241°18.97 123°48.75 · 10.32 192°37.51 · 7.52 173°10.79 · 12.98 250°17.42 · 3.39 Horizontal page 22°56°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41											Markab	13°30.16	15°20.16
5 0°39.55 244°1.76 18.16 312°26.68 16°59.61 292°40.30 11.71 9°37.58 3.03 Venus 246°6 15°42.01 259°0.94 N22°17.68 327°27.36 N17°0.10 307°42.20 N21°11.79 24°40.07 S06°3.05 Mars 313°3 30°44.47 274°0.13 17.19 342°28.04 0.60 322°44.11 11.87 39°42.56 3.08 Jupiter 292°6 30°49.40 303°58.50 · 16.22 12°29.39 · 1.59 352°47.92 · 12.03 69°47.53 · 3.12 10 75°51.87 318°57.68 15.74 27°30.07 2.09 7°49.82 12.11 84°50.02 3.14 11 90°54.33 333°56.87 15.25 42°30.74 2.58 22°51.73 12.19 99°52.51 3.16 12 105°56.79 348°56.05 N22°14.76 57°31.42 N17°3.08 37°53.64 N21°12.27 114°55.00 S06°3.19 13 120°59.26 3°55.24 14.27 72°32.10 3.57 52°55.54 12.35 129°57.49 3.21 14 136°1.72 18°54.43 13.78 87°32.77 4.07 67°57.45 12.42 144°59.98 3.23 15 151°4.19 33°53.62 · 13.29 102°33.45 · 4.56 82°59.35 · 12.50 160°2.47 · 3.25 14 120°59.16 166°6.65 48°52.80 12.80 117°34.13 5.05 98°1.26 12.58 175°4.96 3.27 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311°3 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 S06°3.32 14 120°59.64 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 140°2.47 · 3.25 22°51.74 124°18.97 123°48.75 · 10.32 192°37.51 · 7.52 173°10.79 · 12.98 250°17.42 · 3.39 140°20.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41											Iul 05 E-:	SHA	Mer.pass
6												246°16.58	12:42
7 30°44.47 274°0.13 17.19 342°28.04 0.60 322°44.11 11.87 39°42.56 3.08													08:12
8													09:35
9 60° 49.40 303° 58.50 · · 16.22 12° 29.39 · · 1.59 352° 47.92 · · 12.03 69° 47.53 · · 3.12 10 75° 51.87 318° 57.68 15.74 27° 30.07 2.09 7° 49.82 12.11 84° 50.02 3.14 Venus 244° 12.10 190° 54.33 333° 56.87 15.25 42° 30.74 2.58 22° 51.73 12.19 99° 52.51 3.16 Venus 244° 12.10 105° 56.79 348° 56.05 N22° 14.76 57° 31.42 N17° 3.08 37° 53.64 N21° 12.27 114° 55.00 506° 3.19 312° 31.20° 59.26 3° 55.24 14.27 72° 32.10 3.57 52° 55.54 12.35 129° 57.49 3.21 31.20° 59.26 3° 55.24 14.27 72° 32.10 3.57 52° 55.54 12.35 129° 57.49 3.21 31.20° 59.26 3° 55.24 14.27 72° 32.10 3.57 52° 55.54 12.35 129° 57.49 3.21 31.20° 59.26 15.54 19.30° 59.55 11.30° 51.72 18° 54.43 13.78 87° 32.77 4.07 67° 57.45 12.42 144° 59.98 3.23 15 151° 4.19 33° 53.62 · · 13.29 102° 33.45 · · 4.56 82° 59.35 · · 12.50 160° 2.47 · · 3.25 32.5 32.10 3.57 52° 55.54 12.35 129° 57.49 3.21 3.25 34.10 8° 311° 318° 319° 31.50°												8°56.97	04:30
10 75°51.87 318°57.68 15.74 27°30.07 2.09 7°49.82 12.11 84°50.02 3.14 11 90°54.33 333°56.87 15.25 42°30.74 2.58 22°51.73 12.19 99°52.51 3.16 12 105°56.79 348°56.05 N22°14.76 57°31.42 N17°3.08 37°53.64 N21°12.27 114°55.00 506°3.19 13 120°59.26 3°55.24 14.27 72°32.10 3.57 52°55.54 12.35 129°57.49 3.21 14 136°1.72 18°54.43 13.78 87°32.77 4.07 67°57.45 12.42 144°59.98 3.23 15 151°4.19 33°53.62 ···13.29 102°33.45 ··· 4.56 82°59.35 ··· 12.50 160°2.47 ··· 3.25 16 166°6.65 48°52.80 12.80 117°34.13 5.05 98°1.26 12.58 175°4.96 3.27 17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311° 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 506°3.22 Jupiter 292°11°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8° 20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 21 241°18.97 123°48.75 ·· 10.32 192°37.51 ·· 7.52 173°10.79 ·· 12.98 250°17.42 ·· 3.39 Horizontal page 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41	9										In the Sat	SHA	Mer.pass
11 90°54.33 333°56.87 15.25 42°30.74 2.58 22°51.73 12.19 99°52.51 3.16 12 105°56.79 348°56.05 N22°14.76 57°31.42 N17°3.08 37°53.64 N21°12.27 114°55.00 S06°3.19 13 120°59.26 3°55.24 14.27 72°32.10 3.57 52°55.54 12.35 129°57.49 3.21 14 136°1.72 18°54.43 13.78 87°32.77 4.07 67°57.45 12.42 144°59.98 3.23 15 151°4.19 33°53.62 · 13.29 102°33.45 · · 4.56 82°59.35 · · 12.50 160°2.47 · · 3.25 16 166°6.65 48°52.80 12.80 117°34.13 5.05 98°1.26 12.58 175°4.96 3.27 17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311° 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 S06°3.22 Jupiter 292°11°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8° 20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 21 241°18.97 123°48.75 · · 10.32 192°37.51 · · 7.52 173°10.79 · · 12.98 250°17.42 · · 3.39 Horizontal page 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41													12:43
12 105°50.79 348°50.05 N22°14.76 57'31.42 N17'3.08 37'53.04 N21'12.27 114°55.00 S06'3.19 13 120°59.26 3°55.24 14.27 72°32.10 3.57 52°55.54 12.35 129°57.49 3.21 14 136°1.72 18°54.43 13.78 87°32.77 4.07 67°57.45 12.42 144°59.98 3.23 15 151°4.19 33°53.62 · 13.29 102°33.45 · · 4.56 82°59.35 · · 12.50 160°2.47 · · 3.25 16 166°6.65 48°52.80 12.80 117°34.13 5.05 98°1.26 12.58 175°4.96 3.27 17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311° 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 S06°3.32 Jupiter 292°37.19 211°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8° 20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 21 241°18.97 123°48.75 · · 10.32 192°37.51 · · 7.52 173°10.79 · · 12.98 250°17.42 · · 3.39 Horizontal page 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41												312°38.96	08:11
13 120 59.26 3 55.24 14.27 72 32.10 3.57 52 55.54 12.35 129 57.49 3.21 14 136°1.72 18°54.43 13.78 87°32.77 4.07 67°57.45 12.42 144°59.98 3.23 15 151°4.19 33°53.62 13.29 102°33.45 15.05 98°1.26 12.58 175°4.96 3.27 17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 506°3.32 192°37.51 13°1.06 193°1.26 12.58 12.59 12.50 12.59 12.50 12.59 12.50 12.59 12.50 12.59 12.50 12.59 12.50 12.59 12.50 12.59 12.50 12.													09:32
15 151°4.19 33°53.62 · · 13.29 102°33.45 · · · 4.56 82°59.35 · · 12.50 160°2.47 · · · 3.25 Jul 07 Sun S 16 166°6.65 48°52.80 12.80 117°34.13 5.05 98°1.26 12.58 175°4.96 3.27 17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311° 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.4 506°3.22 Jupiter 292 19 211°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8° 20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 21 241°18.97 123°48.75 · · 10.32 192°37.51 · · 7.52 173°10.79 · · 12.98 250°17.42 · · 3.39 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41												8°57.40	04:26
16 166°6.65 48°52.80 12.80 117°34.13 5.05 98°1.26 12.58 175°4.96 3.27 Venus 243°17 17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311° 18 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 506°3.32 Jupiter 292 19 211°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8° 20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 Horizontal particular 21 241°18.97 123°48.75 · 10.32 192°37.51 · 7.52 173°10.79 · 12.98 250°17.42 · 3.39 Horizontal particular 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41 13.41											Jul 07 S	SHA	Morposs
17 181°9.12 63°51.99 12.30 132°34.80 5.55 113°3.17 12.66 190°7.45 3.30 Mars 311°3 11 196°11.58 78°51.18 N22°11.81 147°35.48 N17°6.04 128°5.07 N21°12.74 205°9.94 506°3.32 Jupiter 292 11°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8°3 11°4 20°4 20°4 20°4 20°4 20°4 20°4 20°4 20													Mer.pass 12:44
18													08:10
19 211°14.04 93°50.37 11.31 162°36.16 6.53 143°6.98 12.82 220°12.43 3.34 Saturn 8° 20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 21 241°18.97 123°48.75 · 10.32 192°37.51 · 7.52 173°10.79 · 12.98 250°17.42 · 3.39 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41												292°3.55	09:29
20 226°16.51 108°49.56 10.81 177°36.83 7.03 158°8.89 12.90 235°14.92 3.36 21 241°18.97 123°48.75 · · 10.32 192°37.51 · · 7.52 173°10.79 · · 12.98 250°17.42 · · 3.39 22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41							143°6.98					8°57.91	04:22
22 256°21.44 138°47.94 9.82 207°38.19 8.01 188°12.70 13.05 265°19.91 3.41													
200 21111 200 11151 3102 201 30125 3101 200 21170 20105 200 25151											Horizor	•	0.1
25 2/1 25.90 155*47.15 9.32 222*38.80 8.50 203*14.01 13.13 280*22.40 3.43												Venus: Mars:	0.1 0.1
	23	271 23.90	153-47.13	9.32					280 - 22.40	3.43		iviais.	0.1
Mer.pass. 04:57 ν -0.8′ d -0.5′ m-3.90 ν 0.7′ d 0.5′ m0.95 ν 1.9′ d 0.1′ m-2.04 ν 2.5′ d 0.0′ m0.88	Mer.	oass. 04:57	ν -0.8' d-0).5′ m-3.90	ν 0.7′ d0	.5′ m0.95	ν 1.9′ d0.	1' m-2.04	$\nu 2.5' \ d0.$	0′ m0.88			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.64	N22°45.38	191°30.17	5.7'	N28°22.04	-0.1'	57.1'
1	193°50.53	45.14	205°54.91	5.8'	28°21.96	-0.3'	57.1'
2	208°50.42 223°50.31	44.90	220°19.68 234°44.48	5.8'	28°21.70	-0.4'	57.1'
3 4	223°50.31 238°50.20	· · 44.66 44.42	234°44.48 249°9.32	5.8' 5.9'	28°21.28 28°20.68	-0.6' -0.8'	57.0' 57.0'
5	253°50.10	44.17	263°34.20	5.9'	28°19.91	-0.8 -0.9'	57.0'
6	268°49.99	N22°43.93	277°59.11	6.0'	N28°18.97	-1.1'	57.0'
7	283°49.88	43.69	292°24.06	6.0'	28°17.86	-1.3'	57.0'
8	298°49.77	43.44	306°49.06	6.0'	28°16.57	-1.5'	56.9'
9 10	313°49.67 328°49.56	· · 43.20 42.95	321°14.10 335°39.19	6.1' 6.1'	28°15.12 28°13.50	-1.6' -1.8'	56.9' 56.9'
11	343°49.45	42.70	350°4.33	6.2	28°11.71	-2.0'	56.9'
12	358°49.35	N22°42.45	4°29.52	6.2'	N28°9.76	-2.1'	56.8'
13	13°49.24	42.21	18°54.76	6.3'	28°7.63	-2.3'	56.8'
14	28°49.13	41.96	33°20.06	6.4'	28°5.34	-2.5'	56.8'
15 16	43°49.03 58°48.92	· · 41.71 41.46	47°45.41 62°10.83	6.4' 6.5'	28°2.89 28°0.27	-2.6' -2.8'	56.8' 56.7'
17	73°48.81	41.21	76°36.30	6.5	27°57.49	-2.9'	56.7
18	88°48.71	N22°40.96	91°1.84	6.6'	N27°54.54	-3.1'	56.7'
19	103°48.60	40.70	105°27.44	6.7'	27°51.44	-3.3'	56.7'
20	118°48.50	40.45	119°53.11	6.7'	27°48.17	-3.4'	56.7'
21 22	133°48.39 148°48.29	· · 40.20 39.94	134°18.84 148°44.65	6.8' 6.9'	27°44.74 27°41.15	-3.6' -3.7'	56.6' 56.6'
23	148 48.29 163°48.18	39.94 39.69	148 44.05 163°10.53	6.9'	27 41.15 27°37.41	-3.1 -3.9'	56.6'
	SD = 15.7'	d = -0.2'			D = 15.6'		
	JD = 13.1	u — -0.2		31	U — 13.0		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.08	N22°39.43	177°36.47	7.0'	N27°33.51	-4.1'	56.6'
1 2	193°47.97 208°47.87	39.17 38.92	192°2.50 206°28.60	7.1' 7.2'	27°29.45 27°25.24	-4.2' -4.4'	56.5' 56.5'
3	223°47.76	38.66	200° 28.00° 220° 54.77	7.2	27°20.87	-4.4 -4.5'	56.5
4	238°47.66	38.40	235°21.03	7.3'	27°16.36	-4.7'	56.5'
5	253°47.55	38.14	249°47.36	7.4'	27°11.68	-4.8'	56.4'
6	268°47.45	N22°37.88	264°13.78	7.5'	N27°6.86	-5.0'	56.4
7 8	283°47.35 298°47.24	37.62 37.36	278°40.27 293°6.86	7.6' 7.7'	27°1.89 26°56.78	-5.1' -5.3'	56.4' 56.4'
9	313°47.14	37.10	307°33.53	7.7 7.8'	26°51.51	-5.4'	56.4
10	328°47.04	36.84	322°0.28	7.8'	26°46.10	-5.6'	56.3'
11	343°46.93	36.57	$336^{\circ}27.12$	7.9'	$26^{\circ}40.54$	-5.7'	56.3'
12	358°46.83	N22°36.31	350°54.05	8.0'	N26°34.85	-5.8'	56.3'
13 14	13°46.73 28°46.62	36.04 35.78	5°21.07 19°48.19	8.1' 8.2'	26°29.00 26°23.02	-6.0' -6.1'	56.3' 56.2'
15	43°46.52	35.51	34°15.39	8.3	26°16.90	-6.3	56.2
16	58°46.42	35.25	48°42.69	8.4'	26°10.64	-6.4'	56.2'
17	73°46.32	34.98	63°10.08	8.5'	26°4.24	-6.5'	56.2'
18 19	88°46.22 103°46.11	N22°34.71 34.44	77°37.56 92°5.14	8.6' 8.7'	N25°57.71 25°51.04	-6.7'	56.1' 56.1'
20	103 46.11 118°46.01	34.44	106°32.82	o. <i>1</i> 8.8'	25 51.04 25°44 24	-6.8' -6.9'	56.1
21	133°45.91	33.90	121°0.59	8.9'	25°37.31	-7.1'	56.1'
22	148°45.81	33.63	135°28.46	9.0'	$25^{\circ}30.25$	-7.2'	56.0'
23	163°45.71	33.36	149°56.43	9.1'	25°23.06	-7.3'	56.0'
	SD = 15.7'	d = -0.3'		SI	D = 15.4'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°45.61	N22°33.09	164°24.49	9.2'	N25°15.74	-7.4'	56.0'
1	193°45.51	32.82	178°52.66	9.3'	25°8.29	-7.6'	56.0'
2	208°45.41 223°45.30	32.54	193°20.93	9.4'	25°0.72 24°53.02	-7.7'	56.0'
3 4	223°45.30 238°45.20	· · 32.27 31.99	207°49.29 222°17.76	9.5' 9.6'	24°53.02 24°45.21	-7.8' -7.9'	55.9' 55.9'
5	253°45.10	31.72	236°46.33	9.7	24° 37.27	-7.9 -8.1'	55.9'
6	268°45.00	N22°31.44	251°15.00	9.8'	N24°29.21	-8.2'	55.9'
7	283°44.90	31.16	265°43.77	9.9'	24°21.03	-8.3'	55.8'
8 9	298°44.81 313°44.71	30.89 · · 30.61	280°12.64 294°41.62	10.0' 10.1'	24°12.74 24°4.33	-8.4' -8.5'	55.8' 55.8'
10	313 44.71 328°44.61	30.33	294 41.62 309°10.70	10.1	24 4.33 23°55.80	-8.6'	55.8'
11	343°44.51	30.05	323°39.88	10.2	23°47.17	-8.7'	55.7'
12	358°44.41	N22°29.77	338°9.16	10.4'	N23°38.42	-8.9'	55.7'
13	13°44.31	29.49	352°38.55	10.5'	23°29.56	-9.0'	55.7'
14 15	28°44.21 43°44.11	29.21 •• 28.93	7°8.03 21°37.63	10.6' 10.7'	23°20.59 23°11.52	-9.1' -9.2'	55.7' 55.7'
16	58°44.01	28.64	36°7.32	10.7	23°2.34	-9.2 -9.3'	55.6'
17	73°43.92	28.36	50°37.12	10.9'	22°53.05	-9.4'	55.6'
18	88°43.82	N22°28.07	65°7.02	11.0'	N22°43.67	-9.5'	55.6'
19 20	103°43.72 118°43.62	27.79 27.50	79°37.02 94°7.13	11.1' 11.2'	22°34.17 22°24.58	-9.6' -9.7'	55.6' 55.5'
20 21	118°43.62 133°43.53	27.50 •• 27.22	94°7.13 108°37.33	11.2' 11.3'	22°24.58 22°14.89	-9.7' -9.8'	55.5' 55.5'
22	133 43.53 148°43.43	26.93	106 37.33 123°7.64	11.3 11.4'	22°5.11	-9.6 -9.9'	55.5'
23	163°43.33	26.64	137°38.05	11.5'	21°55.22	-10.0'	55.5'
	SD = 15.7'	d = -0.3'		SI	D = 15.3'		
		-					

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:55	23:10	////	////
64°	////	////	01:53	22:15	////	////
62°	////	////	02:25	21:43	////	////
60°	////	01:18	02:49	21:20	22:49	////
N 58°	////	01:58	03:08	21:01	22:11	////
56°	////	02:24	03:24	20:45	21:45	////
54°	01:12	02:45	03:37	20:32	21:24	22:56
52°	01:48	03:01	03:49	20:20	21:08	22:20
50°	02:13	03:16	03:59	20:10	20:54	21:56
45°	02:55	03:44	04:21	19:49	20:26	21:14
N 40°	03:24	04:05	04:38	19:32	20:04	20:45
35°	03:47	04:23	04:52	19:17	19:47	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:14	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:09
35°	06:09	06:40	07:08	17:02	17:30	18:01
40°	06:18	06:51	07:22	16:48	17:18	17:52
45°	06:27	07:04	07:38	16:32	17:06	17:43
S 50°	06:39	07:20	07:58	16:12	16:50	17:31
52°	06:43	07:27	08:07	16:03	16:43	17:27
54°	06:49	07:34	08:17	15:53	16:36	17:21
56°	06:55	07:43	08:29	15:41	16:27	17:15
58°	07:01	07:53	08:43	15:27	16:17	17:09
S 60°	07:08	08:04	08:59	15:11	16:06	17:02
	1			ı		

Lat.		Moonris	e		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°						
66°						
64°			02:20			00:00
62°		01:05	03:09	23:20	23:11	23:05
60°	00:42	02:01	03:39	22:24	22:39	22:45
N 58°	01:20	02:33	04:02	21:51	22:16	22:29
56°	01:47	02:57	04:21	21:27	21:57	22:15
54°	02:09	03:17	04:36	21:07	21:41	22:02
52°	02:26	03:33	04:50	20:51	21:27	21:52
50°	02:41	03:47	05:01	20:36	21:15	21:42
45°	03:12	04:16	05:26	20:07	20:50	21:22
N 40°	03:36	04:39	05:45	19:44	20:29	21:05
35°	03:55	04:57	06:01	19:25	20:12	20:51
30°	04:12	05:13	06:15	19:09	19:58	20:39
20°	04:40	05:40	06:39	18:41	19:33	20:18
N 10° 0°	05:05 05:27	06:03 06:25	06:59 07:18	18:17 17:55	19:11 18:51	20:00 19:42
1						
S 10° 20°	05:50	06:46	07:37	17:33	18:30	19:25
30°	06:14 06:43	07:09 07:36	07:57 08:20	17:09 16:41	18:08 17:43	19:06 18:45
35°	07:00	07:51	08:34	16:24	17:43	18:32
40°	07:19	08:10	08:50	16:05	17:10	18:17
45°	07:43	08:32	09:08	15:41	16:49	18:00
S 50°	08:14	08:59	09:31	15:11	16:22	17:38
52°	08:29	09:13	09:42	14:56	16:09	17:27
54°	08:47	09:28	09:55	14:38	15:53	17:15
56°	09:08	09:47	10:09	14:17	15:35	17:02
58°	09:35	10:09	10:26	13:50	15:13	16:46
S 60°	10:14	10:38	10:46	13:11	14:45	16:26

	Sun			Moon			
Day	Eqn.of	Time	Time Mer. Mer.Pass.			Age	
Day	00 ^h 12 ^h		Pass	Upper Lower		0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-1%	
05	04:37	04:43	12:05	11:41	-:-		
06	04:48	04:53	12:05	12:38	00:10		
07	04:58	05:02	12:05	13:30	01:05		

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn		Stars	
Mon	GHA		ес	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	286° 26.36		°8.81	237° 39.54	N17°8.99	218° 16.52	N21°13.21	295°24.89	S06° 3.46			
1	301°28.83	183°45.51	8.31	252°40.22	9.49	233°18.42	13.29	310°27.38	3.48	Alpheratz	357°35.12	29° 13.41
2	$316^{\circ}31.29$	198°44.71	7.81	267°40.89	9.98	248°20.33	13.37	325°29.87	3.50	Ankaa Schedar	353°7.46 349°31.47	-42°10.12 56°40.04
3	331°33.76		7.30	282°41.57	• • 10.47	263°22.24	•• 13.45	340°32.36	• • 3.53	Diphda	349° 31.47 348° 47.67	-17° 50.99
4	346°36.22	228°43.09	6.79	297° 42.25	10.96	278°24.15	13.52	355°34.86	3.55	Achernar	335°20.56	-57°6.43
5	1°38.69	243°42.29	6.29 ° E. 70	312°42.92	11.45 N17°11.94	293°26.05	13.60 N21°13.68	10°37.35	3.57 \$06°3.59	Hamal	327°51.77	23°34.61
6 7	16°41.15 31°43.61	258°41.48 N22 273°40.67	°5.78 5.27	327°43.60 342°44.28	12.43	308°27.96 323°29.87	N21 13.08 13.76	25°39.84 40°42.33	3.62	I	$314^{\circ}29.08$	89°21.75
8	46° 46.08	288°39.87	4.76	357° 44.95	12.43	338°31.78	13.84	55°44.83	3.64	Acamar	315°12.29	-40°12.14
9	61°48.54		4.25	12°45.63	• • 13.40	353°33.69	• • 13.91	70°47.32	• • 3.66	Menkar	314°6.75	4°11.18
10	$76^{\circ}51.01$	318°38.26	3.73	$27^{\circ}46.31$	13.89	8°35.59	13.99	85°49.81	3.69	Mirfak Aldebaran	308°29.15 290°40.37	49°56.70 16°33.50
11	91°53.47	333°37.45	3.22	42°46.98	14.38	23°37.50	14.07	100°52.31	3.71	Rigel	281°4.57	-8° 10.31
12	106° 55.93 121° 58.40	348°36.65 N22 3°35.85	°2.70	57° 47.66 72° 48.34	N17°14.87	38°39.41 53°41.32	N21°14.15	115°54.80 130°57.29	S06°3.74	Capella	280°22.93	46°1.27
13 14	137°0.86	3 35.05 18°35.04	2.19 1.67	72 46.34 87°49.01	15.36 15.84	68°43.23	14.23 14.30	130 57.29 145°59.79	3.76 3.78	Bellatrix	278°23.63	6°22.36
15	152°3.33		1.15	102°49.69	. 16.33	83°45.14	14.38	161°2.28	• • 3.81	Elnath	278°2.74	28°37.66
16	$167^{\circ}5.79$	48°33.44	0.63	117°50.36	16.82	98°47.05	14.46	176°4.77	3.83	Alnilam Betelgeuse	275°38.46 270°52.86	-1°11.11 7°24.75
17	182°8.26		°0.11	132°51.04	17.30	113°48.96	14.54	191°7.27	3.86	Canopus	263°53.13	-52° 42.38
18	197° 10.72	78°31.83 N21°		147°51.72	N17°17.79	128°50.86	N21°14.61	206°9.76	S06°3.88	Sirius	258°26.95	-16°44.90
19 20	212° 13.18 227° 15.65		59.06 58.54	162°52.39 177°53.07	18.27 18.76	143°52.77 158°54.68	14.69 14.77	221°12.26 236°14.75	3.90 3.93	Adhara	$255^{\circ}6.58$	-29°0.23
21	242° 18.11		58.02	192°53.75	. 19.24	173° 56.59	. 14.85	251°17.25	3.95	Procyon	244°51.60	5°9.80
22	257°20.58		57.49	207°54.42	19.73	188°58.50	14.92	266°19.74	3.98	Pollux	243°18.18	27°58.10
23	272°23.04		56.96	222°55.10	20.21	204° 0.41	15.00	281°22.24	4.00	Avior Suhail	234°15.55 222°47.03	-59°35.29 -43°31.93
Merr	pass. 04:53	ν-0.8' d-0.5' m-	-3.89	ν0 7' d0	.5′ m0.95	ν1 9' dΩ	.1′ m-2.04	$\nu 2.5' \ d0.$	0′ m0 87	Miaplacidus	222 47.03 221°39.23	-43 31.93 -69°49.15
14101.1		ν 0.0 d 0.5 lll-				VI.J UU	4.07	- 2.5 uo.		Alphard	217°48.44	-8° 45.85
т	CHA	CHA D		CHA	Doo	CHA	Doo	CHA	Daa	Regulus	$207^{\circ}35.12$	11°50.95
Tue 0	GHA 287° 25.50		ec 56.43	GHA 237°55.77	Dec N17°20.70	GHA 219°2.32	Dec N21°15.08	GHA 296°24.73	Dec \$06° 4.03	Dubhe	193°41.84	61°37.42
1	302°27.97		55.90	252°56.45	21.18	234° 4.23	15.16	311°27.23	4.05	Denebola	182°25.48	14°26.23
2	$317^{\circ}30.43$		55.37	267°57.13	21.67	249°6.14	15.23	326°29.72	4.07	Gienah Acrux	175°44.09 173°0.72	-17°40.73 -63°14.36
3	332°32.90		54.84	282°57.80	• • 22.15	264°8.05	•• 15.31	341°32.22	• • 4.10	I	171°52.22	-57° 15.27
4	347°35.36		54.31	297°58.48	22.63	279° 9.96	15.39	356°34.71	4.12	Alioth	166°13.33	55° 49.91
5 6	2°37.82 17°40.29	243°23.05 258°22.25 N21°	53.77	312°59.16 327°59.83	23.11 N17°23.60	294°11.87 309°13.78	15.46 N21°15.54	11°37.21 26°39.71	4.15 \$06° 4.17	Spica	$158^{\circ}22.71$	-11°17.38
7	32° 42.75		52.70	343°0.51	24.08	324°15.69	15.62	41°42.20	4.20	Alkaid	152°52.21	49°11.72
8	47° 45.22		52.16	358°1.18	24.56	339°17.60	15.69	56°44.70	4.22	Hadar	148°36.44 147°58.00	-60°29.72 -36°29.59
9	62°47.68		51.63	13°1.86	• • 25.04	354°19.52	•• 15.77	71°47.20	• • 4.25	I	147 38.00 145°48.18	19°3.42
10	77°50.15		51.09	28°2.54	25.52	9°21.43	15.85	86°49.69	4.27	1	139°40.63	-60° 56.43
11	92°52.61		50.55	43°3.21 58°3.89	26.00 N17°26.49	24°23.34 39°25.25	15.92 N21°16.00	101°52.19 116°54.69	4.30 \$06° 4.32	Kochab	$137^{\circ}19.20$	74°3.53
12 13	107° 55.07 122° 57.54	348°17.48 N21° 3°16.69	49.46	58 3.89 73°4.56	26.97	54°27.16	16.08	110 54.09 131°57.18	4.35	Zuben'ubi	136°56.32	-16°8.67
14	138° 0.00		48.92	88°5.24	27.45	69°29.07	16.15	146°59.68	4.37	Alphecca	126°3.86	26°38.06
15	153°2.47		48.37	103°5.92	• • 27.93	84°30.98	• • 16.23	162°2.18	• • 4.40	Antares Atria	112°16.05 107°10.16	-26°29.24 -69°4.43
16	168°4.93		47.83	118°6.59	28.40	99°32.89	16.31	177°4.68	4.43	Sabik	107 10.10 102°2.95	-15° 45.33
17	183°7.39		47.28	133°7.27	28.88	114°34.81	16.38	192°7.17	4.45	Shaula	$96^{\circ}10.54$	-37°7.34
18 19	198°9.86 213°12.32	78°12.72 N21° 93°11.93	46.73 46.18	148°7.94 163°8.62	N17°29.36 29.84	129°36.72 144°38.63	N21°16.46 16.54	207°9.67 222°12.17	\$06° 4.48 4.50	Rasalhague	$95^{\circ}58.61$	12°32.56
20	228° 14.79		45.63	178° 9.30	30.32	159°40.54	16.61	237°14.67	4.53	Eltanin	90°41.85	51°29.17
21	243° 17.25		45.08	193°9.97	• • 30.80	174°42.45	. 16.69	252°17.17	• • 4.55	Kaus Aust. Vega	83°32.65 80°33.07	-34°22.38 38°48.38
22	$258^{\circ}19.71$	138°9.56	44.53	$208^{\circ}10.65$	31.27	189°44.37	16.76	$267^{\circ}19.67$	4.58	Nunki	75°47.89	-26° 15.95
23	273°22.18	153°8.77	43.97	223°11.32	31.75	204°46.28	16.84	282°22.17	4.61	Altair	62°0.02	8°55.98
Mer.p	pass. 04:50	ν -0.8′ d-0.5′ m-	-3.89	ν 0.7′ d0.	.5′ m0.94	ν 1.9 $^{\prime}$ d0	.1′ m-2.05	ν 2.5′ d0.	0′ m0.87	Peacock	53°5.78	-56° 39.25
										Deneb	49°25.66	45°21.95
Wed	GHA	GHA D	ec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°38.94 27°33.07	9°59.22 -46°50.35
0	288° 24.64	168°7.98 N21°		238° 12.00	N17°32.23	219°48.19	N21°16.92	297°24.66	S06° 4.63	Fomalhaut	27°33.07 15°14.76	-46°50.35 -29°29.38
1	303°27.11		42.86	253°12.68	32.71	234°50.10	16.99	312°27.16	4.66	Scheat	13°45.42	28° 12.82
2	318° 29.57		42.31	268° 13.35	33.18	249°52.01	17.07	327°29.66	4.68	Markab	13°30.14	15° 20.17
3	333°32.03		41.75	283°14.03	33.66	264°53.93 279°55.84	17.14	342°32.16	· · 4.71	Jul 08 Mon	SHA	Mer.pass
4 5	348°34.50 3°36.96		41.19 40.63	298° 14.70 313° 15.38	34.13 34.61	279°55.84 294°57.75	17.22 17.30	357°34.66 12°37.16	4.74 4.76	I	242°19.96	12:46
6	18° 39.43	258°3.26 N21°		328° 16.06	N17°35.08			27°39.66	\$06° 4.79		311°13.18	08:09
7	33°41.89		39.50	343°16.73	35.56	325° 1.58	17.45	42°42.16	4.82	Jupiter	$291^{\circ}50.15$	09:26
8	48° 44.36		38.94	358° 17.41	36.03	340° 3.49	17.52	57°44.66	4.84	Saturn	8°58.52	04:18
9	63°46.82		38.38	13° 18.08	36.51	355° 5.41	•• 17.60	72°47.16	• • 4.87	Jul 09 Tue	SHA	Mer.pass
10 11	78° 49.28 93° 51.75		37.81 37.24	28° 18.76 43° 19.44	36.98 37.45	10°7.32 25°9.23	17.67 17.75	87°49.66 102°52.16	4.90 4.92	Venus	$241^{\circ}1.53$	12:47
12	93 51.75 108° 54.21	347°58.55 N21°		58° 20.11	N17°37.93	40°11.15	N21°17.83	102 52.10 117°54.66	\$06° 4.95		310°30.27	08:08
13	123° 56.68		36.11	73° 20.79	38.40	55°13.06	17.90	132°57.17	4.98		291°36.82	09:23
14	$138^{\circ}59.14$	17°56.99	35.54	88°21.46	38.87	70°14.98	17.98	$147^{\circ}59.67$	5.00	Saturn	8°59.23	04:14
15	154°1.60		34.96	103°22.14	• • 39.35	85°16.89	• • 18.05	163°2.17	5.03	Jul 10 Wed	SHA	Mer.pass
16	169°4.07		34.39	118° 22.81	39.82	100°18.80	18.13	178°4.67	5.06	I	239°43.34	12:48
17 18	184°6.53 199°9.00	62°54.64 77°53.86 N21°	33.82 33.25	133°23.49 148°24.17	40.29 N17°40.76	115°20.72 130°22.63	18.20 N21°18.28	193°7.17 208°9.67	5.09 \$06°5.11	I	309°47.36 291°23.55	08:07 09:20
19	214° 11.46		32.67	163°24.84	41.23	145°24.55	18.35	223°12.18	5.14	Saturn	9° 0.02	09:20
20	$229^\circ13.92$	107°52.30	32.09	178°25.52	41.70	160°26.46	18.43	238°14.68	5.17			
21	244°16.39		31.52	193°26.19	• • 42.17	175°28.38	• • 18.50	253°17.18	5.19	Horizor	ital parallax	0.1
22	259° 18.85		30.94	208° 26.87	42.64	190°30.29	18.58	268°19.68	5.22		Venus: Mars:	0.1 0.1
23	274°21.32		30.36	223°27.54	43.11	205°32.21	18.65	283°22.18	5.25		141013.	U.1
Mer.p	pass. 04:46	ν-0.8′ d-0.6′ m-	-3.89	ν 0.7′ d0.	.5′ m0.94	$\nu 1.9' d0$.1′ m-2.05	$\nu 2.5' d0.$	0′ m0.86			

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.23	N22°26.35	152°8.57	11.6'	$N21^{\circ}45.24$	-10.1'	55.5'
1	193°43.14	26.07	166° 39.18	11.7'	21°35.17	-10.2'	55.4'
2	208°43.04 223°42.95	25.78 •• 25.49	181°9.89 195°40.71	11.8' 11.9'	21°25.00 21°14.74	-10.3' -10.3'	55.4' 55.4'
4	238°42.85	25.19	210° 11.62	12.0'	21°4.40	-10.3 -10.4	55.4'
5	253°42.75	24.90	224° 42.64	12.1'	20°53.96	-10.5	55.4'
6	268°42.66	N22°24.61	239° 13.75	12.2'	N20°43.44	-10.6'	55.3'
7	283°42.56	24.32	253°44.96	12.3'	20° 32.83	-10.7'	55.3'
8 9	298°42.47 313°42.37	24.02 •• 23.73	268° 16.27 282° 47.68	12.4' 12.5'	20°22.13 20°11.36	-10.8' -10.9'	55.3' 55.3'
10	328°42.28	23.43	297° 19.19	12.6'	20°0.50	-10.9	55.2'
11	343°42.18	23.14	311°50.79	12.7'	19°49.56	-11.0'	55.2'
12	358°42.09	N22°22.84	326°22.49	12.8'	N19°38.54	-11.1'	55.2'
13 14	13°41.99 28°41.90	22.55 22.25	340°54.28 355°26.17	12.9' 13.0'	19°27.44 19°16.26	-11.2' -11.3'	55.2' 55.2'
14 15	43°41.80	21.95	9°58.15	13.1'	19 16.26 19°5.01	-11.3'	55.2' 55.1'
16	58°41.71	21.65	24° 30.23	13.2'	18° 53.68	-11.4'	55.1'
17	73°41.62	21.35	39°2.40	13.3'	$18^{\circ}42.28$	-11.5'	55.1'
18	88°41.52	N22°21.05	53°34.66	13.4'	N18° 30.81	-11.5'	55.1'
19 20	103°41.43 118°41.34	20.75 20.45	68°7.01 82°39.45	13.4' 13.5'	18° 19.27 18° 7.66	-11.6' -11.7'	55.1' 55.0'
21	133°41.24	. 20.14	97° 11.98	13.6'	17°55.98	-11.7'	55.0'
22	148°41.15	19.84	111°44.60	13.7'	17° 44.23	-11.8'	55.0'
23	163°41.06	19.54	$126^{\circ}17.31$	13.8'	$17^{\circ}32.41$	-11.9'	55.0'
	SD = 15.7'	d = -0.3'		SI	D = 15.1'		
_							
Tue 0	GHA 178°40.97	Dec N22°19.23	GHA 140° 50.11	u 13.9'	Dec N17° 20.53	<i>d</i> -11.9′	HP 55.0'
1	193°40.87	18.93	155° 22.99	14.0'	17°8.59	-12.0'	55.0'
2	208°40.78	18.62	169° 55.96	14.1'	16° 56.58	-12.1'	54.9'
3	223°40.69	• • 18.32	184°29.02	14.1'	16°44.51	-12.1'	54.9'
4 5	238°40.60 253°40.51	18.01 17.70	199°2.15 213°35.38	14.2' 14.3'	16°32.38 16°20.19	-12.2' -12.2'	54.9' 54.9'
6	268°40.42	N22° 17.39	228°8.68	14.4	N16°7.95	-12.2	54.9'
7	283°40.32	17.08	242°42.06	14.5'	15°55.64	-12.4'	54.8'
8	298°40.23	16.77	257° 15.53	14.5'	15°43.28	-12.4'	54.8'
9	313°40.14	• • 16.46	271°49.07	14.6'	15°30.87	-12.5'	54.8'
10 11	328°40.05 343°39.96	16.15 15.84	286°22.70 300°56.40	14.7' 14.8'	15° 18.40 15° 5.87	-12.5' -12.6'	54.8' 54.8'
12	358°39.87	N22° 15.53	315°30.17	14.9'	N14°53.30	-12.6'	54.8'
13	13°39.78	15.21	330°4.03	14.9'	$14^{\circ}40.67$	-12.7'	54.7'
14	28°39.69	14.90	344° 37.95	15.0'	14°28.00	-12.7'	54.7'
15 16	43°39.60 58°39.51	· · 14.59 14.27	359°11.96 13°46.03	15.1' 15.1'	14° 15.27 14° 2.50	-12.8' -12.8'	54.7' 54.7'
17	73°39.42	13.96	28° 20.18	15.2'	13° 49.68	-12.9'	54.7'
18	88°39.33	N22°13.64	42°54.39	15.3'	N13°36.82	-12.9'	54.7'
19	103°39.25	13.32	57°28.68	15.4'	13°23.91	-13.0'	54.6'
20	118°39.16 133°39.07	13.00 •• 12.69	72°3.03 86°37.45	15.4' 15.5'	13° 10.95 12° 57.96	-13.0' -13.0'	54.6' 54.6'
21 22	148°38.98	12.37	101°11.94	15.6'	12° 44.92	-13.0 -13.1'	54.6'
23	163°38.89	12.05	115° 46.50	15.6'	12°31.84	-13.1'	54.6'
	SD = 15.7'	d = -0.3'		SI	D = 15.0'		
Wed	GHA	Dec	GHA	.,	Dec	d	НР
oved 0	178°38.80	N22° 11.73	130° 21.12	u 15.7'	N12° 18.72	-13.2'	54.6'
1	193°38.72	11.41	144°55.80	15.7'	12°5.56	-13.2'	54.6'
2	208°38.63	11.08	159°30.54	15.8'	11°52.36	-13.2'	54.5'
3 4	223°38.54 238°38.46	· · 10.76 10.44	174°5.35 188°40.21	15.9' 15.9'	11°39.12 11°25.85	-13.3' -13.3'	54.5' 54.5'
4 5	253°38.40	10.44	203° 15.14	16.0'	11 25.85 11°12.55	-13.3'	54.5'
6	268°38.28	N22°9.79	217°50.12	16.0'	N10°59.20	-13.4'	54.5'
7	283°38.20	9.47	232°25.16	16.1'	10°45.83	-13.4'	54.5'
8	298°38.11 313°38.02	9.14	247°0.25 261°35.40	16.1' 16.2'	10° 32.42 10° 18.98	-13.4'	54.5'
9 10	313°38.02 328°37.94	· · 8.81 8.49	261°35.40 276°10.61	16.2° 16.3'	10° 18.98 10° 5.51	-13.5' -13.5'	54.5' 54.4'
11	343°37.85	8.16	290°45.86	16.3	09°52.00	-13.5'	54.4'
12	358°37.77	N22°7.83	305°21.17	16.4'	N09° 38.47	-13.6'	54.4'
13	13°37.68 28°37.60	7.50	319°56.52	16.4	09°24.91	-13.6'	54.4'
14 15	28°37.60 43°37.51	7.17 • • 6.84	334°31.93 349°7.39	16.5' 16.5'	09°11.32 08°57.71	-13.6' -13.6'	54.4' 54.4'
16	58°37.43	6.51	3°42.89	16.5	08°44.06	-13.7	54.4'
17	73°37.34	6.18	18° 18.43	16.6'	08°30.40	-13.7'	54.4'
18	88°37.26	N22°5.85	32°54.02	16.6'	N08° 16.71	-13.7'	54.4'
19 20	103°37.17 118°37.09	5.51 5.18	47°29.66 62°5.34	16.7' 16.7'	08°2.99 07°49.25	-13.7' -13.8'	54.3' 54.3'
20	118° 37.09 133° 37.01	5.18 •• 4.85	76°41.05	16.7	07°49.25 07°35.49	-13.8' -13.8'	54.3'
22	148°36.92	4.51	91° 16.81	16.8	07°21.71	-13.8'	54.3'
23	163°36.84	4.17	105°52.61	16.8'	07°7.90	-13.8'	54.3'
	SD = 15.7'	d = -0.3'		SI	D = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunnse	Sunset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:10	22:57	////	////
64°	////	////	02:00	22:08	////	////
62°	////	////	02:31	21:38	////	////
60°	////	01:27	02:54	21:16	22:41	////
N 58°	////	02:04	03:12	20:58	22:05	////
56°	////	02:29	03:27	20:43	21:41	////
54°	01:20	02:49	03:40	20:30	21:21	22:48
52°	01:54	03:05	03:52	20:18	21:05	22:15
50°	02:17	03:19	04:02	20:08	20:51	21:52
45°	02:58	03:46	04:23	19:47	20:24	21:12
N 40°	03:27	04:08	04:40	19:31	20:03	20:43
35°	03:49	04:25	04:54	19:16	19:46	20:22
30°	04:06	04:39	05:06	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:37
N 10°	04:55	05:22	05:45	18:26	18:48	19:15
0°	05:13	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:40	07:07	17:03	17:31	18:03
40°	06:17	06:51	07:21	16:50	17:20	17:54
45°	06:26	07:03	07:37	16:34	17:08	17:44
S 50°	06:37	07:18	07:56	16:15	16:53	17:34
52°	06:42	07:25	08:05	16:06	16:46	17:29
54°	06:47	07:33	08:15	15:56	16:38	17:24
56°	06:53	07:41	08:27	15:44	16:30	17:18
58°	06:59	07:50	08:40	15:31	16:21	17:12
S 60°	07:06	08:01	08:56	15:15	16:10	17:05

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°		04:26	07:09		01:19	00:06 23:25
N 70°		05:14	07:28		00:29 23:45	23:16
68°	03:05	05:45	07:42	01:01 23:57	23:29	23:08
66°	04:02	06:07	07:54	00:04 23:34	23:15	23:01
64°	04:35	06:25	08:03	23:15	23:04	22:55
62°	04:59	06:39	08:12	23:00	22:55	22:50
60°	05:18	06:51	08:19	22:47	22:47	22:46
N 58°	05:34	07:01	08:25	22:35	22:39	22:42
56°	05:47	07:10	08:30	22:26	22:33	22:39
54°	05:58	07:18	08:35	22:17	22:27	22:35
52°	06:08	07:25	08:39	22:09	22:22	22:33
50°	06:18	07:32	08:43	22:02	22:17	22:30
45°	06:37	07:46	08:52	21:47	22:07	22:24
N 40°	06:52	07:57	08:59	21:34	21:58	22:20
35°	07:05	08:06	09:05	21:24	21:51	22:15
30°	07:16	08:15	09:10	21:14	21:44	22:12
20°	07:35	08:29	09:20	20:58	21:33	22:05
N 10°	07:52	08:41	09:28	20:43	21:23	22:00
0°	08:08	08:53	09:35	20:30	21:13	21:54
S 10°	08:23	09:04	09:42	20:16	21:04	21:49
20°	08:40	09:17	09:50	20:02	20:54	21:43
30°	08:58	09:31	09:59	19:45	20:42	21:36
35°	09:09	09:39	10:04	19:35	20:35	21:33
40°	09:22	09:48	10:10	19:23	20:27	21:28
45°	09:36	09:59	10:17	19:10	20:18	21:23
S 50°	09:54	10:11	10:25	18:54	20:07	21:17
52°	10:03	10:17	10:29	18:46	20:01	21:14
54°	10:12	10:24	10:33	18:37	19:56	21:11
56°	10:23	10:31	10:37	18:27	19:49	21:07
58°	10:34	10:39	10:42	18:16	19:42	21:03
S 60°	10:48	10:49	10:48	18:03	19:34	20:59

July 11, 12, 13 UT (Thu., Fri., Sat.)

h	Aries	Venu		M	ars	Jup	oiter	Sati	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	289°23.78	167°49.18	V21°29.78	238°28.22	N17°43.58	220°34.12	N21°18.73	298°24.69	\$06°5.28	Alabauata	357°35.09	29°13.42
1	304°26.24	182°48.41	29.19	253°28.90	44.05	235°36.04	18.80	313°27.19	5.30	Alpheratz Ankaa	353° 7.44	-42°10.11
2	$319^{\circ}28.71$	197°47.63	28.61	268° 29.57	44.52	250°37.95	18.88	328°29.69	5.33	Schedar	349°31.44	56°40.05
3	334°31.17	212°46.85	• • 28.03	283°30.25	• • 44.99	265°39.87	• • 18.95	343°32.20	• • 5.36	Diphda	348°47.65	-17°50.98
4	349°33.64	227°46.07	27.44	298°30.92	45.46	280°41.78	19.03	358°34.70	5.39	Achernar	335°20.53	-57°6.42
5	4°36.10	242°45.30	26.86	313°31.60	45.93	295°43.70	19.10	13°37.20	5.42	Hamal	327°51.75	23°34.61
6	19° 38.57		N21°26.27	328° 32.27	N17°46.40	310°45.61	N21°19.18		S06°5.44	Polaris	314°27.79	89°21.74
7	34°41.03	272°43.75	25.68	343°32.95	46.86	325°47.53	19.25	43°42.21	5.47	Acamar	$315^{\circ}12.26$	-40°12.13
8 9	49°43.49 64°45.96	287° 42.97 302° 42.20	25.09 •• 24.50	358°33.62 13°34.30	47.33 •• 47.80	340°49.45 355°51.36	19.32 •• 19.40	58°44.72 73°47.22	5.50 •• 5.53	Menkar	314°6.73	4°11.19
10	79° 48.42	317°41.42	23.91	28° 34.98	48.26	10°53.28	19.47	88°49.72	5.56	Mirfak	$308^{\circ}29.13$	49°56.70
11	94° 50.89	332°40.65	23.32	43° 35.65	48.73	25°55.19	19.55	103°52.23	5.59	Aldebaran	290°40.36	16°33.51
12	109° 53.35		V21°22.72	58°36.33	N17°49.20	40°57.11	N21°19.62	118°54.73	S06° 5.61	Rigel	281°4.55	-8°10.30
13	124° 55.81	2°39.11	22.13	73°37.00	49.66	55°59.03	19.70	133°57.24	5.64	Capella	280°22.92	46°1.27
14	139°58.28	17°38.33	21.53	88° 37.68	50.13	71°0.94	19.77	148°59.74	5.67	Bellatrix	278°23.62	6°22.36
15	155°0.74		• • 20.94	103°38.35	• • 50.59	86°2.86	• • 19.84	164°2.25	• • 5.70	Elnath	278°2.72	28°37.66
16	170°3.21	47°36.79	20.34	118°39.03	51.06	101°4.78	19.92	179°4.75	5.73	Alnilam	275°38.45	-1°11.10
17	185°5.67	62°36.02	19.74	133°39.70	51.52	116° 6.70	19.99	194°7.26	5.76	Betelgeuse	270°52.85	7°24.75 -52°42.36
18	200°8.13	77°35.25	V21°19.14	148°40.38	N17°51.98	131°8.61	N21°20.07	209°9.76	S06°5.79	Canopus Sirius	263°53.12 258°26.95	-32 42.30 -16°44.88
19	$215^{\circ}10.60$	92°34.48	18.54	163°41.06	52.45	146°10.53	20.14	224°12.27	5.81	Adhara	255° 6.57	-29°0.22
20	230°13.06	107°33.71	17.94	178°41.73	52.91	161°12.45	20.21	239°14.78	5.84	Procyon	244°51.60	5°9.80
21	245° 15.53		• • 17.33	193°42.41	• • 53.38	176°14.36	• • 20.29	254°17.28	• • 5.87	Pollux	243°18.18	27°58.09
22	260° 17.99	137°32.17	16.73	208° 43.08	53.84	191°16.28	20.36	269°19.79	5.90	Avior	234°15.56	-59°35.27
23	275°20.45	152°31.41	16.12	223°43.76	54.30	206°18.20	20.43	284°22.29	5.93	Suhail	222°47.03	-43°31.92
Mer.	pass. 04:42	ν -0.8' d-0.6	5′ m-3.89	ν 0.7′ d0	.5′ m0.94	$\nu 1.9' d0$.1′ m-2.05	ν 2.5′ d0.	0′ m0.86	Miaplacidus	221°39.25	-69°49.14
										Alphard	217°48.44	-8°45.84
	6114	6114	_	6114	_	6114	_	6114	_	Regulus	207°35.12	11°50.96
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.86	61°37.41
0 1	290°22.92 305°25.38	167°30.64 N 182°29.87	V21°15.52 14.91	238°44.43 253°45.11	N17°54.76 55.22	221°20.12 236°22.04	N21°20.51 20.58	299°24.80 314°27.31	\$06° 5.96 5.99	Denebola	182°25.49	14°26.24
2	320° 27.85	197°29.10	14.91	268° 45.11	55.69	250° 22.04 251° 23.95	20.56	329°29.82		Gienah	175°44.10	-17°40.73
3	335°30.31		. 13.69	283°46.46	56.15	266° 25.87	. 20.00	344°32.32	6.02 •• 6.05	Acrux	173°0.75	-63°14.36
4	350° 32.77	227°27.57	13.09	298° 47.14	56.61	281°27.79	20.80	359°34.83	6.08	Gacrux	171°52.25	-57°15.27
5	5° 35.24	242°26.81	12.47	313°47.81	57.07	296°29.71	20.88	14°37.34	6.11	Alioth	166°13.35	55°49.91
6	20° 37.70		V21°11.86	328°48.49	N17°57.53	311°31.63	N21°20.95	29°39.84	S06°6.14	Spica	158°22.72	-11°17.37
7	35° 40.17	272°25.28	11.24	343°49.16	57.99	326°33.55	21.02	44°42.35	6.16	Alkaid	152°52.23	49°11.72
8	50° 42.63	287°24.51	10.63	358° 49.84	58.45	341°35.46	21.10	59°44.86	6.19	Hadar	148°36.46 147°58.02	-60°29.72 -36°29.59
9	65°45.10	302°23.75	• • 10.01	13°50.51	• • 58.91	356°37.38	• • 21.17	74°47.37	• • 6.22	Menkent	147 58.02 145°48.19	-30 29.59 19°3.42
10	80°47.56	317°22.99	9.39	28°51.19	59.37	11°39.30	21.24	89°49.88	6.25	Arcturus Rigil Kent.	139°40.65	-60°56.44
11	95°50.02	332°22.23	8.78	43°51.86	17°59.83	26°41.22	21.32	104°52.38	6.28	Kochab	137°19.25	74°3.53
12	$110^{\circ}52.49$	347°21.46	N21°8.16	58° 52.54	N18° 0.29	41°43.14	N21°21.39	119°54.89	506°6.31	I	136°56.33	-16°8.66
13	125°54.95	2°20.70	7.54	73°53.21	0.74	56°45.06	21.46	134°57.40	6.34	Alphecca	126°3.87	26°38.06
14	140°57.42	17° 19.94	6.92	88° 53.89	1.20	71°46.98	21.53	149°59.91	6.37	Antares	112°16.05	-26°29.24
15	155° 59.88	32°19.18	• • 6.29	103°54.56	• • 1.66	86°48.90	• • 21.61	165°2.42	• • 6.40	Atria	107°10.18	-69°4.44
16	171°2.34	47° 18.42	5.67	118°55.24	2.12	101°50.82	21.68	180°4.93	6.43	Sabik	102°2.95	-15°45.33
17	186°4.81	62°17.66	5.05	133°55.92	2.57	116°52.74	21.75 N21°21.83	195°7.44 210°9.95	6.46	Shaula	$96^{\circ}10.54$	-37°7.34
18 19	201°7.27 216°9.74	77° 16.90 92° 16.14	N21°4.42	148°56.59 163°57.27	N18° 3.03	131°54.66 146°56.58		210 9.95 225°12.46	\$06° 6.49	Rasalhague	95°58.61	12°32.57
20	231° 12.20	107° 15.38	3.80 3.17	103 57.27 178° 57.94	3.49 3.94	161°58.50	21.90 21.97	240°14.96	6.52 6.56	Eltanin	90°41.86	51°29.19
21	246° 14.66	122° 14.63	• • 2.54	193°58.62	• • 4.40	177° 0.42	22.04	255°17.47	• • 6.59	Kaus Aust.	83°32.65	-34°22.38
22	261° 17.13	137° 13.87	1.91	208° 59.29	4.85	192°2.34	22.12	270°19.98	6.62	Vega	80°33.07	38°48.40
23	276° 19.59	152° 13.11	1.28	223°59.97	5.31	207° 4.26	22.19	285°22.49	6.65	Nunki	75°47.89	-26°15.96
										Altair	62°0.02	8°55.99
Mer.	pass. 04:38	ν -0.8' d-0.6	o' m-3.89	ν 0.7' d0	.5′ m0.93	ν 1.9′ d0.	.1′ m-2.05	$\nu 2.5' d0.$	0′ m0.85	Peacock Deneb	53°5.77 49°25.65	-56°39.26 45°21.96
										Enif	33°38.93	9°59.23
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.05	-46°50.35
0	291°22.06		$N21^{\circ}0.65$	239°0.64	$N18^{\circ}5.76$		N21°22.26	300°25.00	S06° 6.68	Fomalhaut	15°14.74	-40° 30.33 -29° 29.38
1	306° 24.52	182°11.60	21°0.02	254°1.32	6.22	237°8.10	22.33	315°27.52	6.71	Scheat	13°45.40	28°12.83
2	321°26.98	197°10.84	20°59.38	269°1.99	6.67	252°10.02	22.41	330°30.03	6.74	Markab	13°30.12	15°20.18
3	336° 29.45	212°10.09	• • 58.75	284°2.67	• • 7.13	267°11.94	• • 22.48	345°32.54	• • 6.77			
4	351°31.91	227°9.33	58.11	299°3.34	7.58	282°13.86	22.55	0°35.05	6.80	Jul 11 Thu	SHA	Mer.pass
5	6°34.38	242°8.58	57.47	314°4.02	8.03	297°15.79	22.62	15°37.56	6.83	Venus Mars	238°25.40 309°4.44	12:49 08:06
6	21°36.84		V20°56.84	329°4.69	N18°8.49	312°17.71	N21°22.70	30°40.07	\$06° 6.86	Jupiter	309°4.44 291°10.34	08:06
7 8	36°39.30 51°41.77	272°7.07 287°6.32	56.20 55.56	344°5.37 359°6.04	8.94 9.39	327°19.63 342°21.55	22.77 22.84	45°42.58 60°45.09	6.89 6.93	Saturn	9° 0.91	04:06
9	66° 44.23	302°5.57	. 54.92	14°6.72	• • 9.84	342 21.55 357°23.47	22.84	75°47.60	• • 6.96	Jatuill	9 0.91	04.00
10	81°46.70	317°4.82	54.92	29°7.39	10.30	12°25.39	22.91	90°50.12	6.99	Jul 12 Fri	SHA	Mer.pass
11	96° 49.16	332°4.07	53.63	44°8.07	10.30	27°27.32	23.06	105°52.63	7.02	Venus	237°7.72	12:51
12	111°51.63	347°3.32 N		59°8.75	N18°11.20	42°29.24	N21°23.13	120°55.14	S06°7.05	Mars	308°21.51	08:05
13	126° 54.09	2°2.57	52.34	74°9.42	11.65	57°31.16	23.20	135°57.65	7.08		290°57.20	09:13
14	141° 56.55	17°1.82	51.70	89° 10.10	12.10	72°33.08	23.27	151°0.16	7.11	Saturn	9°1.88	04:02
15	$156^{\circ}59.02$	32°1.07	•• 51.05	$104^{\circ}10.77$	• • 12.55	87°35.00	• • 23.34	166°2.68	• • 7.15	Jul 13 Sat	SHA	Mer.pass
16	172°1.48	47°0.32	50.40	119°11.45	13.00	102°36.93	23.41	181°5.19	7.18	Venus		12:52
17	187°3.95	61°59.57	49.75	$134^{\circ}12.12$	13.45	117°38.85	23.49	196°7.70	7.21	Mars		08:04
18	202°6.41		<mark>√</mark> 20°49.10	149° 12.80	N18°13.90	132°40.77	N21°23.56	211°10.22			290°44.12	09:10
19	217°8.87	91°58.07	48.45	164° 13.47	14.35	147°42.70	23.63	226°12.73	7.27	Saturn	9°2.95	03:58
20	232°11.34	106°57.33	47.80	179° 14.15	14.80	162°44.62	23.70	241°15.24	7.30			
21	247° 13.80	121°56.58	• • 47.15	194° 14.82	• • 15.25	177°46.54	• • 23.77	256°17.76	• • 7.34	Horizor	ntal parallax	0.1
22	262° 16.27	136°55.83	46.49	209° 15.50	15.69	192°48.46	23.84	271°20.27	7.37		Venus: Mars:	0.1 0.1
23	277° 18.73	151°55.09	45.84	224°16.17	16.14	207°50.39	23.92	286°22.78	7.40		ividI5.	0.1
Mer.	pass. 04:34	ν -0.8′ d-0.6	5′ m-3.89	u0.7′ d 0	.5′ m0.93	ν 1.9′ d0	.1′ m-2.06	ν 2.5′ d 0.	0′ m0.85			

1	Su	n			Moon		
nu	GHA	Dec	GHA	ν	Dec	d	HP
)	178°36.76	N22°3.84	120°28.44	16.9'	N06°54.08	-13.8'	54.3
L	193°36.67	3.50	135°4.32	16.9'	06°40.23	-13.9'	54.3
2	208°36.59	3.16	149°40.22	16.9'	06°26.37	-13.9'	54.3
	223°36.51	• • 2.83	164°16.16	17.0'	06°12.49	-13.9'	54.3
	238°36.43	2.49	178°52.14	17.0'	05°58.60	-13.9'	54.3
	253°36.34	2.15	193°28.14	17.0'	05°44.68	-13.9'	54.3
	268°36.26	$N22^{\circ}1.81$	208°4.18	17.1'	N05°30.76	-13.9'	54.3
	283°36.18	1.47	222°40.25	17.1'	$05^{\circ}16.81$	-14.0'	54.2
	298°36.10	1.12	237°16.34	17.1'	05°2.85	-14.0'	54.2
)	313°36.02	• • 0.78	251°52.46	17.1'	04°48.88	-14.0'	54.2
)	328°35.94	0.44	266°28.61	17.2'	04°34.90	-14.0'	54.2
L	343°35.86	22°0.10	281°4.79	17.2'	04°20.90	-14.0'	54.2
2	358°35.78	N21°59.75	295°40.98	17.2'	N04°6.90	-14.0'	54.2
3	13°35.70	59.41	310° 17.20	17.2'	03°52.88	-14.0'	54.2
ŀ	28°35.61	59.06	324°53.45	17.3'	03°38.85	-14.0'	54.2
5	43°35.53	• • 58.72	339°29.71	17.3'	03°24.81	-14.0'	54.2
5	58°35.46	58.37	354°5.99	17.3'	03°10.77	-14.1'	54.2
7	73°35.38	58.02	8°42.29	17.3'	$02^{\circ}56.71$	-14.1'	54.2
3	88°35.30	N21°57.67	23°18.61	17.3'	N02°42.65	-14.1'	54.2
9	103°35.22	57.32	37°54.94	17.3'	02°28.58	-14.1'	54.2
)	118°35.14	56.98	52°31.28	17.4'	$02^{\circ}14.51$	-14.1'	54.2
L	133°35.06	• • 56.63	67°7.64	17.4'	02°0.43	-14.1'	54.2
2	148°34.98	56.27	81°44.02	17.4'	01°46.35	-14.1'	54.2
3	163°34.90	55.92	96°20.40	17.4'	01°32.26	-14.1'	54.2
	SD = 15.7'						
	SD = 15.7	d = -0.3'		51	D = 14.8'		
i	GHA	Dec	GHA	ν	Dec	d	HP
	178°34.82	N21°55.57	110°56.79	17.4'	N01°18.17	-14.1'	54.2
	193°34.75	55.22	125°33.19	17.4'	01°4.08	-14.1'	54.2
	208°34.67	54.87	140°9.60	17.4'	$00^{\circ}49.98$	-14.1'	54.2
	223°34.59	•• 54.51	154°46.02	17.4'	00°35.88	-14.1'	54.2
	238°34.51	54.16	169°22.44	17.4'	$00^{\circ}21.79$	-14.1'	54.2
	253°34.44	53.80	183°58.86	17.4'	N00°7.69	-14.1'	54.2
	268°34.36	N21°53.45	198°35.29	17.4'	S00°6.41	14.1'	54.2
	283°34.28	53.09	213°11.72	17.4'	00°20.50	14.1'	54.2
	298°34.21	52.73	227°48.15	17.4'	00°34.60	14.1'	54.2
	313°34.13	• • 52.37	242°24.58	17.4'	00°48.69	14.1'	54.2
)	328°34.06	52.02	257°1.00	17.4'	01°2.77	14.1'	54.2
L	343°33.98	51.66	271°37.43	17.4'	01°16.86	14.1'	54.2
2	358°33.90	N21°51.30	286° 13.84	17.4'	S01°30.94	14.1'	54.2
3	13°33.83	50.94	300°50.26	17.4'	01°45.01	14.1'	54.2
1	28°33.75	50.58	315°26.66	17.4'	01°59.08	14.1'	54.2
5	43°33.68	• • 50.21	330°3.06	17.4'	02°13.14	14.1'	54.2
5	58°33.60	49.85	344°39.45	17.4'	02°27.20	14.0'	54.2
7	73°33.53	49.49	359° 15.83	17.4'	$02^{\circ}41.24$	14.0'	54.2
3	88°33.46	N21°49.12	13°52.20	17.4'	502°55.28	14.0'	54.2
9	103°33.38	48.76	28°28.56	17.3'	03°9.31	14.0'	54.2
)	118°33.31	48.40	43°4.90	17.3'	03°23.33	14.0'	54.2
ĺ	133°33.23	• • 48.03	57°41.23	17.3'	03°37.34	14.0'	54.2
2	148°33.16	47.66	72°17.54	17.3'	03°51.34	14.0'	54.2
3	163°33.09	47.30	86°53.83	17.3'	04°5.33	14.0'	54.2
	SD = 15.7'	d = -0.4'			D = 14.8'		
t	GHA	Dec	GHA	ν	Dec	d	HP
	178°33.01	N21°46.93	101°30.11	17.3'	S04°19.30	14.0'	54.2
	193°32.94	46.56	116°6.36	17.2'	04°33.26	13.9'	54.2
	208°32.87	46.19	130°42.59	17.2'	04°47.21	13.9'	54.2
	223°32.80	• • 45.82	145° 18.81	17.2'	05°1.14	13.9'	54.2
	238°32.72	45.45	159°55.00	17.2'	05° 15.06	13.9'	54.2
	253°32.65	45.08	174°31.16	17.1'	05°28.97	13.9'	54.2
	268°32.58	N21°44.71	189°7.30	17.1'	S05°42.85	13.9'	54.2
	283°32.51	44.34	203°43.41	17.1'	05°56.72	13.9'	54.2
	298°32.44	43.97	218° 19.49	17.1'	$06^{\circ}10.57$	13.8'	54.2
	313°32.37	• • 43.59	232°55.55	17.0'	06°24.41	13.8'	54.2
)	328°32.30	43.22	247°31.57	17.0'	06°38.22	13.8'	54.3
L	343°32.23	42.84	262°7.56	17.0'	06°52.02	13.8'	54.3
2	358°32.16	N21°42.47	276°43.52	16.9'	S 07°5.79	13.8'	54.3
3	13°32.09	42.09	291°19.45	16.9'	07° 19.55	13.7'	54.3
1	28°32.02	41.72	305°55.34	16.9'	07°33.28	13.7'	54.3
5	43°31.95	• • 41.34	320°31.19	16.8'	07°46.99	13.7'	54.3
5	58°31.88	40.96	335°7.01	16.8'	08°0.67	13.7'	54.3
7	73°31.81	40.58	349° 42.79	16.7	08°14.33	13.6'	54.3
3	88°31.74	N21°40.20	4° 18.52	16.7	S08°27.97	13.6'	54.3
)	103°31.67	39.82	18°54.22	16.7	08°41.58	13.6'	54.3
)	118°31.60	39.44	33°29.87	16.6'	08°55.17	13.6'	54.3
l	133°31.53	• • 39.06	48°5.48	16.6'	08 55.17 09°8.73	13.5	54.4
2	148°31.46	38.68	62°41.05	16.5	09° 8.73	13.5	54.4
<u>^</u> 3	163°31.40	38.30	77°16.57	16.5	09°22.20	13.5'	54.4
	100 01.40		- 17 10.57			10.0	57.4
					/		
•	SD = 15.7'	d = -0.4'		SI	D = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juillise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:24	22:44	////	////
64°	////	////	02:08	22:01	////	////
62°	////	00:24	02:37	21:33	23:36	////
60°	////	01:37	02:59	21:11	22:32	////
N 58°	////	02:10	03:16	20:54	22:00	////
56°	00:22	02:34	03:31	20:39	21:36	23:38
54°	01:29	02:53	03:44	20:27	21:17	22:40
52°	02:00	03:09	03:55	20:16	21:02	22:10
50°	02:22	03:22	04:05	20:06	20:48	21:48
45°	03:02	03:49	04:25	19:46	20:22	21:09
N 40°	03:30	04:10	04:42	19:29	20:01	20:41
35°	03:51	04:27	04:56	19:15	19:45	20:20
30°	04:08	04:41	05:08	19:03	19:30	20:03
20°	04:35	05:04	05:28	18:43	19:07	19:36
N 10°	04:56	05:23	05:46	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:09	18:32	18:58
S 10°	05:30	05:56	06:18	17:53	18:16	18:42
20°	05:45	06:12	06:35	17:36	18:00	18:27
30°	06:00	06:29	06:55	17:17	17:43	18:12
35°	06:08	06:39	07:07	17:05	17:33	18:04
40°	06:16	06:50	07:20	16:52	17:22	17:56
45°	06:25	07:02	07:35	16:37	17:10	17:47
S 50°	06:36	07:16	07:54	16:18	16:55	17:36
52°	06:40	07:23	08:03	16:09	16:49	17:32
54°	06:45	07:30	08:13	15:59	16:41	17:27
56°	06:51	07:39	08:24	15:48	16:33	17:21
58°	06:57	07:48	08:37	15:35	16:24	17:15
S 60°	07:03	07:58	08:52	15:20	16:14	17:09
	1			ı		

Lat.		Moonris	e		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	09:15	11:11	13:10	22:53	22:21	21:46
N 70°	09:22	11:09	12:58	22:51	22:27	22:00
68°	09:27	11:08	12:49	22:49	22:31	22:12
66°	09:32	11:06	12:42	22:48	22:35	22:21
64°	09:36	11:05	12:35	22:47	22:38	22:29
62°	09:39	11:04	12:30	22:46	22:41	22:36
60°	09:42	11:03	12:25	22:45	22:43	22:42
N 58°	09:45	11:03	12:21	22:44	22:45	22:47
56°	09:47	11:02	12:17	22:43	22:47	22:52
54°	09:49	11:01	12:14	22:42	22:49	22:56
52°	09:51	11:01	12:11	22:42	22:51	23:00
50°	09:52	11:00	12:08	22:41	22:52	23:04
45°	09:56	10:59	12:02	22:40	22:55	23:12
N 40°	09:59	10:58	11:57	22:39	22:58	23:18
35°	10:02	10:57	11:53	22:38	23:00	23:24
30°	10:04	10:57	11:50	22:37	23:03	23:29
20°	10:08	10:56	11:43	22:36	23:06	23:37
N 10°	10:12	10:55	11:38	22:35	23:09	23:45
0°	10:15	10:54	11:33	22:34	23:12	23:52
S 10°	10:18	10:53	11:28	22:32	23:15	23:59
20°	10:22	10:52	11:22	22:31	23:19	
30°	10:26	10:51	11:16	22:30	23:22	
35°	10:28	10:50	11:13	22:29	23:24	
40°	10:30	10:50	11:09	22:28	23:27	
45°	10:33	10:49	11:04	22:27	23:30	
S 50°	10:37	10:48	10:59	22:25	23:33	
52°	10:38	10:47	10:57	22:25	23:34	
54°	10:40	10:47	10:54	22:24	23:36	
56°	10:42	10:47	10:51	22:23	23:38	
58°	10:44	10:46	10:48	22:22	23:40	
S 60°	10:47	10:45	10:44	22:21	23:42	

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
Juy	00 ^h	12 ^h	Pass	Upper	Lower	6-8
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	24-41%
11	05:33	05:37	12:06	16:24	04:05	
12	05:41	05:44	12:06	17:03	04:44	
13	05:48	05:51	12:06	17:42	05:23	

July 14, 15, 16 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	292°21.19	166°54.34 N20°45.18	239°16.85 N18°16.59	222°52.31 N21°23.99	301°25.30	
1	307°23.66	181°53.60 44.52	254° 17.52 17.04	237°54.24 24.06	316°27.81 7.46	Alpheratz 357°35.07 29°13.43
2	322°26.12	196°52.86 43.86	269° 18.20 17.48	252°56.16 24.13	331°30.33 7.50	Ankaa 353°7.41 -42°10.11
3	337°28.59	211°52.11 · · 43.20	284° 18.87 · · 17.93	267°58.08 · · 24.20	346°32.84 · · 7.53	Schedar 349°31.41 56°40.06
4	352°31.05	226°51.37 42.54	299° 19.55 18.38	283° 0.01 24.27	1°35.35 7.56	Diphda 348°47.63 -17°50.98
5	7°33.51	241°50.63 41.88	314°20.22 18.82	298° 1.93 24.34	16°37.87 7.59	Achernar 335°20.50 -57°6.42 Hamal 327°51.72 23°34.62
6	22°35.98	256°49.88 N20°41.22	329°20.90 N18°19.27	313°3.86 N21°24.41	31°40.38 S 06°7.63	Polaris 314°26.33 89°21.74
7	37°38.44	271°49.14 40.56	344°21.57 19.71	328° 5.78 24.48	46°42.90 7.66	Acamar 315°12.24 -40°12.12
8	52°40.91	286°48.40 39.89	359°22.25 20.16	343°7.70 24.56	61°45.41 7.69	Menkar 314°6.71 4°11.19
9	67° 43.37	301°47.66 · · 39.23	14°22.92 · · 20.60	358° 9.63 · · 24.63	76°47.93 · · 7.72	Mirfak 308°29.10 49°56.70
10 11	82° 45.84 97° 48.30	316°46.92 38.56 331°46.18 37.89	29°23.60 21.05 44°24.27 21.49	13°11.55 24.70 28°13.48 24.77	91°50.45 7.76 106°52.96 7.79	Aldebaran 290°40.34 16°33.51
12	112° 50.76	346°45.44 N20°37.22	59°24.95 N18°21.93	43°15.40 N21°24.84	121°55.48 S06°7.82	Rigel 281°4.54 -8°10.29
13	127°53.23	1°44.70 36.55	74°25.63 22.38	58°17.33 24.91	136°57.99 7.86	Capella 280°22.90 46°1.26
14	142°55.69	16°43.96 35.88	89°26.30 22.82	73°19.25 24.98	152°0.51 7.89	Bellatrix 278°23.60 6°22.37
15	157° 58.16	31°43.23 · · 35.21	104°26.98 · · 23.26	88°21.18 · · 25.05	167°3.02 · · 7.92	Elnath 278°2.71 28°37.66
16	173°0.62	46°42.49 34.54	119° 27.65 23.71	103°23.10 25.12	182°5.54 7.96	Alnilam 275°38.44 -1°11.09
17	188°3.08	61°41.75 33.86	134°28.33 24.15	118°25.03 25.19	197°8.06 7.99	Betelgeuse 270°52.83 7°24.76 Canopus 263°53.11 -52°42.35
18	203°5.55	76°41.02 N20°33.19	149°29.00 N18°24.59	133°26.96 N21°25.26	212°10.57 S 06°8.02	Sirius 258°26.94 -16°44.88
19	218°8.01	91°40.28 32.51	164°29.68 25.03	148°28.88 25.33	227°13.09 8.06	Adhara 255°6.57 -29°0.21
20	233° 10.48	106°39.54 31.84	179°30.35 25.47	163°30.81 25.40	242°15.61 8.09	Procyon 244°51.59 5°9.81
21 22	248° 12.94 263° 15.40	121°38.81 · · 31.16	194°31.03 · · 25.91	178°32.73 · · 25.47	257°18.13 · · 8.12	Pollux 243°18.18 27°58.09
23	203 15.40 278° 17.87	136°38.08 30.48 151°37.34 29.80	209°31.70 26.35 224°32.38 26.79	193°34.66 25.54 208°36.59 25.61	272°20.64 8.16 287°23.16 8.19	Avior 234°15.56 -59°35.26
			<u>-</u>			Suhail 222°47.04 -43°31.91
Mer.p	pass. 04:30	ν-0.7' d-0.7' m-3.89	ν0.7' d0.4' m0.93	$\nu 1.9' \ d0.1' \ \text{m-}2.06$	ν2.5′ d0.0′ m0.84	Miaplacidus 221°39.27 -69°49.12
						Alphard 217°48.45 -8°45.84 Regulus 207°35.13 11°50.96
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.88 61°37.41
0	293°20.33	166°36.61 N20°29.12	239°33.05 N18°27.23	223°38.51 N21°25.68	302°25.68 S 06°8.22	Denebola 182°25.50 14°26.24
1	308°22.80	181°35.88 28.44	254° 33.73 27.67	238°40.44 25.75	317°28.20 8.26	Gienah 175°44.11 -17°40.72
2	323°25.26	196°35.14 27.76	269°34.40 28.11	253°42.37 25.82	332°30.71 8.29	Acrux 173°0.78 -63°14.35
3 4	338°27.72	211°34.41 · · 27.07 226°33.68 26.39	284°35.08 · · 28.55 299°35.75 28.99	268°44.29 · · 25.89 283°46.22 25.96	347°33.23 · · 8.32 2°35.75 8.36	Gacrux 171°52.27 -57°15.26
5	353°30.19 8°32.65	241°32.95 25.70	299°35.75 28.99 314°36.43 29.43	283°46.22 25.96 298°48.15 26.03	2°35.75 8.36 17°38.27 8.39	Alioth 166°13.38 55°49.91
6	23°35.12	256°32.22 N20°25.01	329°37.10 N18°29.87	313°50.07 N21°26.10	32°40.79 S06°8.43	Spica 158°22.73 -11°17.37
7	38° 37.58	271°31.49 24.33	344°37.78 30.30	328°52.00 26.17	47°43.31 8.46	Alkaid 152°52.26 49°11.72
8	53°40.05	286°30.76 23.64	359° 38.45 30.74	343°53.93 26.24	62°45.82 8.49	Hadar 148°36.49 -60°29.72 Menkent 147°58.03 -36°29.58
9	68°42.51	301°30.03 · · 22.95	14°39.13 · · 31.18	358°55.86 · · 26.31	77°48.34 · · 8.53	Arcturus 145°48.20 19°3.43
10	83°44.97	316°29.30 22.26	29°39.80 31.62	13°57.78 26.38	92°50.86 8.56	Rigil Kent. 139°40.68 -60°56.44
11	98° 47.44	331°28.57 21.57	44°40.48 32.05	28°59.71 26.45	107°53.38 8.60	Kochab 137°19.30 74°3.54
12	113°49.90	346°27.85 N20°20.87	59°41.15 N18°32.49	44°1.64 N21°26.52	122°55.90	Zuben'ubi 136°56.34 -16°8.66
13 14	128° 52.37 143° 54.83	1°27.12 20.18 16°26.39 19.48	74°41.83 32.92 89°42.50 33.36	59° 3.57 26.59 74° 5.50 26.66	137°58.42 8.67 153°0.94 8.70	Alphecca 126°3.88 26°38.07
15	158° 57.29	31°25.67 · · 18.79	104°43.18 · · 33.80	89°7.42 · · 26.73	168°3.46 · · 8.74	Antares 112°16.06 -26°29.24
16	173° 59.76	46°24.94 18.09	119° 43.85 34.23	104° 9.35 26.80	183°5.98 8.77	Atria 107°10.20 -69°4.45
17	189°2.22	61°24.22 17.39	134° 44.53 34.66	119°11.28 26.87	198°8.50 8.80	Sabik 102°2.96 -15°45.33 Shaula 96°10.54 -37°7.35
18	204°4.69	76°23.49 N20°16.70	149°45.20 N18°35.10	134°13.21 N21°26.94	213°11.02 S 06°8.84	Rasalhague 95°58.62 12°32.58
19	219°7.15	91°22.77 16.00		149°15.14 27.01	228°13.54 8.87	Eltanin 90°41.87 51°29.20
20	234°9.61	106°22.04 15.29	179° 46.55 35.97	164°17.07 27.08	243°16.06 8.91	Kaus Aust. 83°32.65 -34°22.39
21	249° 12.08	121°21.32 · · 14.59	194°47.23 · · 36.40	179°19.00 · · 27.15	258°18.58 · · 8.94	Vega 80°33.08 38°48.41
22	264° 14.54	136°20.60 13.89	209°47.90 36.83	194°20.93 27.21	273°21.10 8.98	Nunki 75°47.88 -26°15.96
23	279° 17.01	151°19.88 13.19	224°48.58 37.27	209°22.85 27.28	288°23.63 9.01	Altair 62°0.01 8°56.00
Mer.p	pass. 04:26	ν -0.7′ d-0.7′ m-3.89	$ u 0.7' \ d0.4' \ m0.92$	$ u 1.9' \; d0.1' \; ext{m-} 2.06$	$ u 2.5' \ d0.0' \ \text{m}0.84$	Peacock 53°5.76 -56°39.27
						Deneb 49°25.64 45°21.98
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.92 9°59.24
0	294° 19.47	166°19.15 N20°12.48	239°49.25 N18°37.70	224°24.78 N21°27.35	303°26.15	Al Na'ir 27°33.03 -46°50.35 Fomalhaut 15°14.72 -29°29.38
1	309°21.94	181°18.43 11.78	254°49.93 38.13	239°26.71 27.42	318°28.67 9.08	Scheat 13°45.38 28°12.85
2	324°24.40	196° 17.71 11.07	269°50.60 38.56	254°28.64 27.49	333°31.19 9.12	Markab 13°30.10 15°20.19
3	339°26.86	211°16.99 · · 10.36	284°51.28 · · 38.99	269°30.57 · · 27.56	348°33.71 · · 9.15	
4	354°29.33	226°16.27 9.65	299°51.95 39.42	284°32.50 27.63	3°36.23 9.19	Jul 14 Sun SHA Mer.pass
5 6	9°31.79	241°15.55 8.94	314°52.63 39.86 329°53.30 N18°40.29	299°34.43 27.70 314°36.36 N21°27.77	18°38.76 9.23	Venus 234°33.15 12:53 Mars 306°55.65 08:03
7	24°34.26 39°36.72	256°14.84 N20°8.23 271°14.12 7.52	344°53.98 40.72	314°36.36 N21°27.77 329°38.29 27.83	33°41.28	Jupiter 290°31.12 09:07
8	54°39.18	286°13.40 6.81	359°54.65 41.15	344°40.22 27.90	63°46.32 9.33	Saturn 9°4.10 03:54
9	69°41.65	301°12.68 · · 6.09	14°55.33 · · 41.58	359°42.15 · · 27.97	78°48.84 · · 9.37	
10	84°44.11	316°11.97 5.38	29° 56.01 42.01	14°44.08 28.04	93°51.37 9.40	Jul 15 Mon SHA Mer.pass
11	99°46.58	331°11.25 4.66	44°56.68 42.43	29°46.02 28.11	108°53.89 9.44	Venus 233°16.28 12:54 Mars 306°12.72 08:01
12	114°49.04	346°10.54 N20°3.95	59°57.36 N18°42.86	44°47.95 N21°28.18	123°56.41	Jupiter 290°18.18 09:04
13	129°51.51	1°9.82 3.23	74°58.03 43.29	59°49.88 28.25	138°58.94 9.51	Saturn 9°5.35 03:50
14 15	144° 53.97 159° 56.43	16°9.11 2.51 31°8.39 · · 1.79	89°58.71 43.72 104°59.38 •• 44.15	74°51.81 28.31 89°53.74 · · 28.38	154°1.46 9.55 169°3.98 · · 9.58	
15 16	159°56.43 174°58.90	46°7.68 1.07	104°59.38 · · 44.15 120°0.06 44.57	104°55.67 28.45	184°6.51 9.62	Jul 16 Tue SHA Mer.pass Venus 231°59.68 12:55
17	190°1.36	61°6.97 20°0.35	135°0.73 45.00	119°57.60 28.52	199° 9.03 9.66	Mars 305°29.78 08:00
18	205°3.83	76°6.25 N19°59.63	150°1.41 N18°45.43	134°59.53 N21°28.59	214°11.56 S06°9.69	Jupiter 290°5.31 09:01
19	220°6.29	91°5.54 58.90	165°2.08 45.85	150°1.47 28.65	229°14.08 9.73	Saturn 9°6.68 03:46
20	235°8.75	106°4.83 58.18	180°2.76 46.28	165° 3.40 28.72	244°16.60 9.76	
21	250°11.22	121°4.12 · · 57.45	195°3.43 · · 46.71	180°5.33 · · 28.79	259°19.13 · · 9.80	Horizontal parallax Venus: 0.1
22 23	265° 13.68 280° 16.15	136°3.41 56.73 151°2.70 56.00	210°4.11 47.13 225°4.78 47.56	195° 7.26 28.86 210° 9.20 28.93	274°21.65 9.84 289°24.18 9.87	Mars: 0.1
Mer.p	pass. 04:22	ν -0.7′ <i>d</i> -0.7′ m-3.88	$ u 0.7' \ d0.4' \ m0.92$	$ u 1.9' \ d 0.1' \ \text{m-} 2.06$	$ u 2.5' \ d0.0' \ m0.83$	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°31.33	N21°37.91	$91^{\circ}52.04$	16.4'	S 09°49.24	13.4'	54.4'
1	193°31.26	37.53	106° 27.46	16.4'	10°2.68	13.4'	54.4'
2	208°31.19 223°31.13	37.15 •• 36.76	121°2.84 135°38.16	16.3' 16.3'	10° 16.10 10° 29.48	13.4' 13.3'	54.4' 54.4'
4	238°31.06	36.38	150° 13.43	16.2'	10°42.83	13.3'	54.4'
5	253°30.99	35.99	164°48.65	16.2'	$10^{\circ}56.14$	13.3'	54.4'
6	268°30.93	N21°35.60	179°23.82	16.1'	\$11°9.43	13.2'	54.5'
7 8	283°30.86 298°30.80	35.22 34.83	193°58.93 208°33.98	16.1' 16.0'	11°22.68 11°35.89	13.2' 13.2'	54.5' 54.5'
9	313°30.73	• • 34.44	223°8.97	15.9'	11°49.07	13.1'	54.5'
10	328°30.66	34.05	$237^{\circ}43.91$	15.9'	$12^{\circ}2.21$	13.1'	54.5'
11	343°30.60 358°30.53	33.66 N21°33.27	252° 18.79 266° 53.60	15.8'	12° 15.31	13.1'	54.5'
12 13	13°30.53	N21 33.27 32.88	200°53.00 281°28.35	15.8' 15.7'	\$12°28.37 12°41.40	13.0' 13.0'	54.5' 54.6'
14	28°30.40	32.49	296°3.04	15.6'	12°54.38	12.9'	54.6'
15	43°30.34	• • 32.09	310° 37.67	15.6'	13°7.32	12.9'	54.6'
16	58°30.28 73°30.21	31.70	325°12.22 339°46.72	15.5'	13°20.22 13°33.08	12.9'	54.6'
17 18	73°30.21 88°30.15	31.31 N21°30.91	354°21.14	15.4' 15.4'	13° 33.08 \$13° 45.89	12.8' 12.8'	54.6' 54.6'
19	103°30.09	30.52	8°55.49	15.3'	13°58.66	12.7'	54.7'
20	118°30.02	30.12	$23^{\circ}29.77$	15.2'	$14^{\circ}11.38$	12.7'	54.7'
21	133°29.96	• • 29.73	38°3.99	15.1'	14°24.06	12.6'	54.7'
22 23	148°29.90 163°29.83	29.33 28.93	52°38.13 67°12.19	15.1' 15.0'	14° 36.69 14° 49.27	12.6' 12.5'	54.7' 54.7'
23	SD = 15.7'		- 12.19		0 = 14.8'	14.5	J 7.1
	3D = 15.1′	d = -0.4'		SL	ν = 14.8′		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.77	N21°28.53	81°46.18	14.9'	\$15°1.80	12.5'	54.8'
1 2	193°29.71 208°29.65	28.13 27.73	96°20.09 110°53.93	14.8' 14.8'	15° 14.28 15° 26.71	12.4' 12.4'	54.8' 54.8'
3	208 29.65 223°29.59	27.73	110°53.93 125°27.69	14.8 14.7'	15° 26.71 15° 39.09	12.4	54.8'
4	238°29.52	26.93	140°1.37	14.6'	15°51.41	12.3'	54.8'
5	253°29.46	26.53	154° 34.97	14.5'	16°3.68	12.2'	54.8'
6	268°29.40 283°29.34	N21°26.13	169°8.49 183°41.92	14.4'	\$16° 15.89 16° 28.05	12.2'	54.9'
7 8	283°29.34 298°29.28	25.73 25.32	183°41.92 198°15.27	14.4' 14.3'	16° 28.05 16° 40.15	12.1' 12.0'	54.9' 54.9'
9	313°29.22	• • 24.92	212°48.54	14.2'	16°52.19	12.0'	54.9'
10	328°29.16	24.52	$227^{\circ}21.72$	14.1'	$17^{\circ}4.17$	11.9'	55.0'
11	343°29.10 358°29.04	24.11 N21°23.70	241°54.82 256°27.82	14.0'	17°16.09 \$17°27.95	11.9'	55.0'
12 13	13°28.98	23.70	256° 27.82 271° 0.74	13.9' 13.8'	17° 39.75	11.8' 11.7'	55.0' 55.0'
14	28°28.92	22.89	285°33.57	13.7'	17°51.48	11.7'	55.0'
15	43°28.86	• • 22.48	300°6.31	13.6'	18°3.15	11.6'	55.1'
16	58°28.81 73°28.75	22.07	314°38.95 329°11.51	13.6'	18° 14.75 18° 26.29	11.5'	55.1'
17 18	73 28.75 88°28.69	21.67 N21°21.26	329 11.51 343°43.97	13.5' 13.4'	18 26.29 \$18°37.76	11.5' 11.4'	55.1' 55.1'
19	103°28.63	20.85	358° 16.33	13.3'	18°49.15	11.3'	55.2'
20	118°28.57	20.44	12°48.61		19°0.48		55.2'
21	133°28.52	• • 20.02	27°20.78	13.1'	19° 11.74 19° 22.92	11.2'	55.2'
22 23	148°28.46 163°28.40	19.61 19.20	41°52.86 56°24.84	13.0' 12.9'	19° 22.92 19° 34.03	11.1' 11.0'	55.2' 55.2'
20	SD = 15.7'	d = -0.4'			0 = 14.9'	11.0	
	3D = 15.7	<u>u = -0.4</u>		JL	7 — 14.9		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.35	N21°18.79	70°56.72	12.8'	\$19°45.06	11.0'	55.3'
1 2	193°28.29 208°28.23	18.37 17.96	85°28.50 100°0.18	12.7' 12.6'	19°56.02 20°6.90	10.9' 10.8'	55.3' 55.3'
3	200° 28.23° 28.18	•• 17.54	114° 31.76	12.5'	20° 17.70	10.7	55.3'
4	238°28.12	17.13	129°3.24	12.4'	20°28.41	10.6'	55.4'
5	253°28.07	16.71 N21°16.29	143°34.61	12.3'	20°39.05	10.6'	55.4'
6 7	268°28.01 283°27.96	N21°16.29 15.87	158°5.88 172°37.05	12.2' 12.1'	\$20°49.61 21°0.08	10.5' 10.4'	55.4' 55.5'
8	298°27.90	15.46	187°8.11	12.0'	21°10.47	10.4	55.5'
9	313°27.85	•• 15.04	$201^{\circ}39.07$	11.9'	21°20.77	10.2'	55.5'
10	328°27.79	14.62	216°9.92	11.7'	21°30.98	10.1'	55.5'
11 12	343°27.74 358°27.68	14.20 N21°13.78	230° 40.67 245° 11.30	11.6' 11.5'	21°41.10 \$21°51.13	10.0' 9.9'	55.6' 55.6'
13	13°27.63	13.35	259°41.83	11.4'	22°1.07	9.8'	55.6'
14	28°27.58	12.93	274° 12.25	11.3'	22°10.92	9.8'	55.6'
15	43°27.52	12.51	288° 42.57	11.2'	22°20.67	9.7'	55.7'
16 17	58°27.47 73°27.42	12.09 11.66	303°12.77 317°42.86	11.1' 11.0'	22°30.33 22°39.89	9.6' 9.5'	55.7' 55.7'
18	88°27.36	N21°11.24	332° 12.85	10.9'	\$22°49.35	9.4'	55.8'
19	103°27.31	10.81	346° 42.72	10.8'	22°58.71	9.3'	55.8'
20	118°27.26	10.39	1°12.48	10.6'	23°7.97	9.2'	55.8'
21 22	133°27.21 148°27.16	· · 9.96 9.53	15°42.13 30°11.67	10.5' 10.4'	23° 17.13 23° 26.18	9.1' 8.9'	55.8' 55.9'
23	163°27.11	9.11	44°41.09	10.4	23°35.12	8.8'	55.9'
	SD = 15.7'	d = -0.4'		SE	0 = 15.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:37	22:31	////	////
64°	////	////	02:17	21:53	////	////
62°	////	00:53	02:44	21:27	23:13	////
60°	////	01:46	03:04	21:06	22:23	////
N 58°	////	02:17	03:21	20:50	21:53	////
56°	00:49	02:40	03:36	20:36	21:31	23:18
54°	01:38	02:58	03:48	20:23	21:13	22:32
52°	02:06	03:13	03:59	20:13	20:58	22:04
50°	02:27	03:26	04:08	20:03	20:45	21:43
45°	03:05	03:52	04:28	19:44	20:19	21:06
N 40°	03:32	04:12	04:44	19:28	19:59	20:39
35°	03:53	04:29	04:58	19:14	19:43	20:18
30°	04:10	04:43	05:09	19:02	19:29	20:02
20°	04:37	05:05	05:29	18:43	19:07	19:35
N 10°	04:57	05:24	05:47	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:16	18:42
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:18	17:44	18:13
35°	06:07	06:38	07:05	17:07	17:35	18:06
40°	06:15	06:48	07:18	16:54	17:24	17:58
45°	06:24	07:00	07:33	16:39	17:12	17:49
S 50°	06:34	07:14	07:51	16:21	16:58	17:39
52°	06:38	07:21	08:00	16:13	16:52	17:34
54°	06:43	07:28	08:10	16:03	16:45	17:30
56°	06:48	07:36	08:21	15:52	16:37	17:24
58°	06:54	07:44	08:33	15:40	16:28	17:19
S 60°	07:00	07:54	08:48	15:25	16:18	17:13

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	15:25			20:57		
N 70°	14:58	17:37		21:26	20:18	
68°	14:38	16:46		21:48	21:10	
66°	14:22	16:15	18:44	22:05	21:42	20:52
64°	14:09	15:52	17:51	22:19	22:06	21:46
62°	13:59	15:34	17:19	22:31	22:25	22:19
60°	13:50	15:19	16:56	22:41	22:41	22:43
N 58°	13:42	15:07	16:37	22:50	22:55	23:03
56°	13:35	14:56	16:21	22:58	23:06	23:19
54°	13:28	14:46	16:08	23:05	23:16	23:33
52°	13:23	14:38	15:56	23:11	23:26	23:45
50°	13:18	14:30	15:46	23:17	23:34	23:56
45°	13:07	14:14	15:24	23:30	23:51	
N 40°	12:58	14:01	15:07	23:40		00:06
35°	12:51	13:50	14:52	23:49		00:18
30°	12:44	13:40	14:40	23:57		00:29
20°	12:32	13:24	14:19		00:10	00:47
N 10°	12:22	13:10	14:00		00:22	01:03
0°	12:13	12:56	13:43		00:33	01:18
S 10°	12:04	12:43	13:26		00:45	01:33
20°	11:54	12:29	13:08	00:07	00:57	01:50
30°	11:43	12:13	12:47	00:16	01:11	02:09
35°	11:37	12:04	12:35	00:21	01:19	02:20
40°	11:30	11:53	12:22	00:27	01:28	02:32
45°	11:21	11:41	12:05	00:33	01:39	02:47
S 50°	11:11	11:26	11:46	00:41	01:52	03:06
52°	11:07	11:19	11:36	00:45	01:58	03:15
54°	11:02	11:12	11:26	00:49	02:05	03:25
56°	10:56	11:03	11:14	00:54	02:13	03:36
58°	10:50	10:54	11:00	00:59	02:22	03:49
S 60°	10:43	10:43	10:44	01:05	02:32	04:04

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	51-69%	
14	05:55	05:58	12:06	18:23	06:02		
15	06:01	06:04	12:06	19:07	06:45		
16	06:07	06:09	12:06	19:55	07:31		

July 17, 18, 19 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	295° 18.61	166°1.99 N19°55.27	240°5.46 N18°47.98	225°11.13 N21°28.99	304°26.70 S06°9.91	
1	310°21.08	181°1.28 54.54	255°6.13 48.41	240°13.06 29.06	319°29.23 9.95	Alpheratz 357°35.05 29°13.44
2	325°23.54	196°0.57 53.81	270°6.81 48.83	255°14.99 29.13	334°31.75 9.98	Ankaa 353°7.38 -42°10.10
3	340°26.00	210°59.86 · · 53.08	285°7.48 · · 49.26	270°16.93 · · 29.20	349°34.28 · · 10.02	Schedar 349°31.37 56°40.07
4	355°28.47	225°59.15 52.35	300°8.16 49.68	285°18.86 29.27	4°36.80 10.06	Diphda 348°47.61 -17°50.97
5	10°30.93	240°58.45 51.62	315°8.83 50.10	300°20.79 29.33	19°39.33 10.09	Achernar 335°20.46 -57°6.41 Hamal 327°51.70 23°34.63
6	25°33.40	255°57.74 N19°50.88	330°9.51 N18°50.53	315°22.73 N21°29.40	34°41.85 S 06°10.13	Hamal 327°51.70 23°34.63 Polaris 314°24.62 89°21.74
7	40°35.86	270°57.04 50.15	345°10.18 50.95	330°24.66 29.47	49°44.38 10.17	Acamar 315°12.22 -40°12.11
8	55°38.32	285°56.33 49.41	0°10.86 51.37	345°26.59 29.54	64°46.91 10.20	Menkar 314°6.68 4°11.20
9	70°40.79	300°55.62 · · 48.67	15°11.53 · · 51.79	$0^{\circ}28.53$ · · 29.60	79°49.43 · · 10.24	Mirfak 308°29.07 49°56.70
10	85°43.25	315°54.92 47.94	30° 12.21 52.21	15°30.46 29.67	94°51.96 10.28	Aldebaran 290°40.32 16°33.51
11	100°45.72	330°54.22 47.20	45°12.88 52.64	30°32.39 29.74	109°54.49 10.32	Rigel 281°4.52 -8°10.28
12	115°48.18	345°53.51 N19°46.46	60°13.56 N18°53.06	45°34.33 N21°29.80	124°57.01 \$06°10.35	Capella 280°22.87 46°1.26
13	130° 50.65 145° 53.11	0°52.81 45.72	75°14.23 53.48	60°36.26 29.87	139°59.54 10.39	Bellatrix 278°23.59 6°22.37
14 15	145 53.11 160°55.57	15°52.11 44.97 30°51.41 • 44.23	90°14.91 53.90 105°15.58 · · 54.32	75°38.20 29.94 90°40.13 · · 30.01	$155^{\circ}2.07$ 10.43 $170^{\circ}4.59$ · · 10.47	Elnath 278°2.69 28°37.66
16	175° 58.04	45°50.70 43.49	120°16.26 54.74	105°42.06 30.07	185°7.12 10.50	Alnilam 275°38.42 -1°11.09
17	191°0.50	60°50.00 42.74	135°16.93 55.16	120°44.00 30.14	200°9.65 10.54	Betelgeuse 270°52.82 7°24.76
18	206°2.97	75°49.30 N19°42.00	150°17.61 N18°55.58	135°45.93 N21°30.21	215°12.18 \$06°10.58	Canopus 263°53.10 -52°42.33
19	221°5.43	90°48.60 41.25	165°18.29 56.00	150°47.87 30.27	230°14.70 10.62	Sirius 258°26.93 -16°44.87
20	236°7.90	105° 47.90 40.50	180° 18.96 56.41	165°49.80 30.34	245°17.23 10.65	Adhara 255°6.56 -29°0.20
21	251° 10.36	120°47.20 · · 39.76	195°19.64 · · 56.83	180°51.74 · · · 30.41	260°19.76 · · 10.69	Procyon 244°51.58 5°9.81
22	266° 12.82	135°46.51 39.01	210°20.31 57.25	195°53.67 30.47	275°22.29 10.73	Pollux 243°18.17 27°58.09
23	281°15.29	150°45.81 38.26	225°20.99 57.67	210°55.61 30.54	290°24.82 10.77	Avior 234°15.56 -59°35.25
			ν0.7' d0.4' m0.92			Suhail 222°47.04 -43°31.89
ıvıer.p	pass. 04:18	ν-0.7' d-0.7' m-3.88	νυ.τ αυ.4 mυ.92	ν1.9' d0.1' m-2.07	ν2.5′ d0.0′ m0.83	Miaplacidus 221°39.28 -69°49.11 Alphard 217°48.45 -8°45.83
						Alphard 217°48.45 -8°45.83 Regulus 207°35.13 11°50.96
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.90 61°37.40
0	$296^{\circ}17.75$	165°45.11 N19°37.50	240°21.66 N18°58.09	225°57.55 N21°30.61	305°27.34 S 06°10.81	Dubne 193 41.90 61 37.40 Denebola 182°25.51 14°26.24
1	311°20.22	180°44.41 36.75	255°22.34 58.50	240°59.48 30.68	320°29.87 10.84	Gienah 175°44.12 -17°40.72
2	$326^{\circ}22.68$	195°43.72 36.00	270°23.01 58.92	256° 1.42 30.74	335°32.40 10.88	Acrux 173°0.80 -63°14.35
3	341°25.14	210°43.02 · · 35.24	285°23.69 · · 59.34	271°3.35 · · 30.81	350°34.93 · · 10.92	Gacrux 171°52.29 -57°15.26
4	356° 27.61	225°42.33 34.49	300°24.36 18°59.75	286° 5.29 30.87	5°37.46 10.96	Alioth 166°13.40 55°49.90
5	11°30.07	240°41.63 33.73	315°25.04 19°0.17	301°7.23 30.94	20°39.99 11.00	Spica 158°22.74 -11°17.37
6	26°32.54	255°40.94 N19°32.98	330°25.71 N19°0.58	316°9.16 N21°31.01	35°42.52 S06°11.03	Alkaid 152°52.27 49°11.72
7	41°35.00	270°40.24 32.22	345°26.39 1.00	331°11.10 31.07	50°45.05 11.07	Hadar 148°36.51 -60°29.72
8	56° 37.47	285°39.55 31.46	0°27.06 1.41	346°13.04 31.14	65°47.58 11.11	Menkent 147°58.04 -36°29.58
9 10	71°39.93 86°42.39	300°38.86 · · 30.70 315°38.17 29.94	15°27.74 · · 1.83 30°28.41 2.24	1°14.97 · · 31.21 16°16.91 31.27	80°50.11 · · 11.15 95°52.64	Arcturus 145°48.21 19°3.43
11	101°44.86	330°37.47 29.18	45°29.09 2.65	31°18.85 31.34	95°52.64 11.19 110°55.17 11.23	Rigil Kent. 139°40.70 -60°56.44
12	116° 47.32	345°36.78 N19°28.41	60°29.76 N19°3.07	46°20.78 N21°31.41	125°57.70 S06°11.27	Kochab 137°19.36 74°3.54
13	131°49.79	0°36.09 27.65	75°30.44 3.48	61°22.72 31.47	141°0.23 11.30	Zuben'ubi 136°56.35 -16°8.66
14	146° 52.25	15°35.40 26.88	90°31.11 3.89	76°24.66 31.54	156°2.76 11.34	Alphecca 126°3.89 26°38.08
15	161°54.71	30°34.71 · · 26.12	105°31.79 · · 4.31	91°26.60 · · 31.60	171°5.29 · · 11.38	Antares 112°16.06 -26°29.24
16	176° 57.18	45°34.02 25.35	120°32.47 4.72	106°28.53 31.67	186°7.82 11.42	Atria 107°10.21 -69°4.46 Sabik 102°2.96 -15°45.32
17	191°59.64	60°33.33 24.58	135° 33.14 5.13	121°30.47 31.74	201°10.35 11.46	Sabik 102°2.96 -15°45.32 Shaula 96°10.54 -37°7.35
18	$207^{\circ}2.11$	75°32.65 N19°23.82	150°33.82 N19°5.54	136°32.41 N21°31.80	216°12.88 S 06°11.50	Rasalhague 95°58.62 12°32.59
19	222°4.57	90°31.96 23.05	165°34.49 5.95	151°34.35 31.87	231°15.41 11.54	Eltanin 90°41.88 51°29.22
20	237°7.04	105°31.27 22.28	180°35.17 6.37	166°36.29 31.93	246°17.95 11.58	Kaus Aust. 83°32.65 -34°22.39
21	252°9.50	120°30.59 · · 21.51	195°35.84 · · 6.78	181°38.22 · · 32.00	261°20.48 · · 11.62	Vega 80°33.08 38°48.43
22	267° 11.96	135°29.90 20.73	210°36.52 7.19	196°40.16 32.06	276°23.01 11.66	Nunki 75°47.88 -26°15.95
23	282° 14.43	150°29.21 19.96	225°37.19 7.60	211°42.10 32.13	291°25.54 11.70	Altair 62°0.00 8°56.01
Mer	pass. 04:14	ν-0.7' d-0.8' m-3.88	ν 0.7' d0.4' m0.91	$\nu 1.9' \ d0.1' \ \text{m-}2.07$	$\nu 2.5' \ d0.0' \ m0.82$	Peacock 53°5.74 -56°39.28
						Deneb 49°25.63 45°22.00
- ·	CIIA	CUA	CUA	CUA	CUA	Enif 33°38.90 9°59.25
Fri	GHA 297° 16.89	GHA Dec 165°28.53 N19°19.19	GHA Dec 240°37.87 N 19°8.01	GHA Dec 226°44.04 N21°32.20	GHA Dec 306°28.07 S 06°11.74	Al Na'ir 27°33.01 -46°50.35
0 1	312° 19.36	180°27.84 18.41	240°37.87 N19°8.01 255°38.54 8.42	241°45.98 32.26	306 28.07 506 11.74 321°30.60 11.77	Fomalhaut 15°14.70 -29°29.37
2	312 19.30 327°21.82	195°27.16 17.64	270°39.22 8.82	256°47.92 32.33	336°33.14 11.81	Scheat 13°45.36 28°12.86
3	342°24.29	210°26.48 · · 16.86	285°39.89 · · 9.23	271°49.86 · · 32.39	351°35.67 · · 11.85	Markab 13°30.08 15°20.20
4	357°26.75	225°25.79 16.08	300° 40.57 9.64	286°51.80 32.46	6°38.20 11.89	Jul 17 Wed SHA Mer.pass
5	12°29.21	240°25.11 15.30	315°41.25 10.05	301°53.74 32.52	21°40.73 11.93	Venus 230°43.38 12:56
6	27°31.68	255°24.43 N19°14.52	330°41.92 N19°10.46	316°55.67 N21°32.59	36°43.27 S 06°11.97	Mars 304°46.85 07:59
7	42°34.14	270°23.75 13.74	345°42.60 10.87	331°57.61 32.65	51°45.80 12.01	Jupiter 289°52.52 08:58
8	57°36.61	285°23.07 12.96	0°43.27 11.27	346°59.55 32.72	66°48.33 12.05	Saturn 9°8.09 03:42
9	$72^{\circ}39.07$	300°22.39 · · 12.18	15°43.95 · · 11.68	2°1.49 · · 32.78	81°50.87 · · 12.09	Jul 18 Thu SHA Mer.pass
10	87°41.54	315°21.71 11.39	30°44.62 12.09	17° 3.43 32.85	96°53.40 12.13	Venus 229°27.36 12:58
11	102°44.00	330°21.03 10.61	45°45.30 12.49	32°5.37 32.91	111°55.93 12.17	Mars 304°3.91 07:58
12	117° 46.46	345°20.35 N19°9.82	60°45.97 N19°12.90	47°7.32 N21°32.98	126°58.47 \$06°12.21	Jupiter 289°39.79 08:55
13	132°48.93	0°19.67 9.04	75°46.65 13.30	62°9.26 33.04	142°1.00 12.25	Saturn 9°9.59 03:38
14	147°51.39	15°18.99 8.25	90°47.32 13.71	77°11.20 33.11	157°3.54 12.29	
15 16	162° 53.86 177° 56.32	30°18.31 · · 7.46 45°17.64 6.67	105°48.00 · · 14.11 120°48.67 14.52	92°13.14 · · 33.17 107°15.08 33.24	172°6.07 · · 12.33 187°8.61 12.37	Jul 19 Fri SHA Mer.pass
16 17	177 50.32 192°58.78	45 17.04 6.07 60°16.96 5.88	120 48.67 14.52 135°49.35 14.92	107 15.08 33.24 122°17.02 33.30	202°11.14 12.41	Venus 228°11.64 12:59
18	208°1.25	75°16.29 N19°5.09	150°50.03 N19°15.33	137°18.96 N21°33.37	202 11.14 12.41 217°13.67 \$06°12.45	Mars 303°20.98 07:57 Jupiter 289°27.15 08:52
19	223°3.71	90°15.61 4.30	165°50.70 15.73	152°20.90 33.43	232°16.21 12.50	Saturn 9°11.18 03:34
20	238°6.18	105°14.94 3.51	180°51.38 16.13	167°22.84 33.50	247°18.74 12.54	Jacum 9 11.10 05:34
21	253°8.64	120°14.26 · · 2.72	195°52.05 · · 16.54	182°24.78 · · 33.56	262°21.28 · · 12.58	Horizontal parallax
22	268°11.11	135° 13.59 1.92	210°52.73 16.94	197°26.73 33.63	277°23.81 12.62	Venus: 0.1
23	283° 13.57	150°12.92 1.13	225°53.40 17.34	212°28.67 33.69	292°26.35 12.66	Mars: 0.1
Merr	pass. 04:10	ν-0.7' d-0.8' m-3.88	ν0.7' d0.4' m0.91	ν1.9' d0.1' m-2.07	$\nu 2.5' \ d0.0' \ m0.82$	
14161.			ν σ., ασ. , πισ.στ	ν 1.5 GO.1 ΠΓ-2.01	ν 2.5 d 0.0 Hi0.02	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.05	N21°8.68	59°10.41	10.2'	S 23°43.96	8.7'	55.9'
1	193°27.00	8.25	73°39.61	10.1'	23°52.70	8.6'	56.0'
2	208°26.95 223°26.90	7.82 • • 7.39	88°8.70 102°37.68	10.0' 9.9'	24°1.32 24°9.83	8.5' 8.4'	56.0' 56.0'
4	238°26.85	6.96	117°6.54	9.8'	24°18.22	8.3'	56.0'
5	253°26.80	6.53	131°35.29	9.6'	24°26.51	8.2'	56.1'
6 7	268°26.75 283°26.70	N21°6.09 5.66	146°3.93 160°32.46	9.5' 9.4'	\$24° 34.67 24° 42.72	8.1' 7.9'	56.1' 56.1'
8	298°26.65	5.23	175° 0.88	9.4	24° 50.66	7.8'	56.2
9	313°26.61	• • 4.80	189°29.18	9.2'	24°58.47	7.7'	56.2'
10	328°26.56 343°26.51	4.36	203°57.37 218°25.45	9.1' 9.0'	25°6.16 25°13.72	7.6'	56.2'
11 12	358°26.46	3.93 N21°3.49	232°53.41	9.0 8.9'	S25°21.17	7.4' 7.3'	56.3' 56.3'
13	13°26.41	3.05	247°21.27	8.7'	25°28.48	7.2'	56.3'
14	28°26.36	2.62	261°49.01	8.6'	25°35.67	7.1'	56.4
15 16	43°26.32 58°26.27	· · 2.18 1.74	276°16.65 290°44.17	8.5' 8.4'	25° 42.73 25° 49.66	6.9' 6.8'	56.4' 56.4'
17	73°26.22	1.30	305°11.58	8.3'	25°56.46	6.7'	56.5'
18	88°26.18	N21°0.86	319°38.88	8.2'	S26°3.13	6.5'	56.5'
19 20	103°26.13 118°26.08	0.42 20°59.98	334°6.08 348°33.17	8.1' 8.0'	26° 9.66 26° 16.05	6.4' 6.3'	56.5' 56.5'
21	133°26.04	20°59.54	3°0.15	7.9'	26°22.31	6.1	56.6'
22	148°25.99	59.10	17°27.02	7.8'	26°28.43	6.0'	56.6'
23	163°25.95	58.66	31°53.78	7.7'	26°34.41	5.8'	56.6'
	SD = 15.7'	d = -0.4'		SD	0 = 15.3'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.90	N20° 58.21	46°20.45	7.6'	S26°40.24	5.7'	56.7'
1	193°25.86	57.77	60°47.00	7.5'	26°45.93	5.5'	56.7'
2	208°25.81 223°25.77	57.33 •• 56.88	75°13.46 89°39.81	7.4' 7.2'	26°51.48 26°56.88	5.4' 5.3'	56.7' 56.8'
3 4	238°25.72	56.43	104°6.06	7.2 7.1'	20 50.66 27°2.14	5.1'	56.8'
5	253°25.68	55.99	118°32.20	7.0'	27°7.25	5.0'	56.8'
6	268°25.63	N20°55.54	132°58.25	7.0'	\$27°12.20	4.8'	56.9'
7 8	283°25.59 298°25.55	55.09 54.65	147°24.21 161°50.06	6.9' 6.8'	27°17.00 27°21.66	4.7' 4.5'	56.9' 56.9'
9	313°25.50	• • 54.20	176° 15.82	6.7'	27°26.15	4.3'	57.0'
10	328°25.46	53.75	190°41.48	6.6'	27°30.49	4.2'	57.0'
11 12	343°25.42 358°25.37	53.30 N20° 52.85	205°7.05 219°32.53	6.5' 6.4'	27°34.68 \$27°38.71	4.0' 3.9'	57.0' 57.1'
13	13°25.33	52.40	219 32.33 233°57.92	6.3'	27°42.57	3.9 3.7'	57.1'
14	28°25.29	51.95	248°23.22	6.2'	27°46.28	3.5'	57.1'
15	43°25.25 58°25.21	• • 51.49	262°48.43 277°13.56	6.1' 6.0'	27°49.82 27°53.20	3.4' 3.2'	57.2' 57.2'
16 17	73°25.21	51.04 50.59	277 13.50 291°38.60	6.0'	27 55.20 27°56.42	3.2 3.1'	57.2'
18	88°25.13	N20° 50.13	306°3.56	5.9'	S27°59.47	2.9'	57.3'
19	103°25.08	49.68	320°28.44	5.8'	28°2.36	2.7'	57.3'
20 21	118°25.04 133°25.00	49.22 •• 48.77	334°53.24 349°17.97	5.7' 5.6'	28°5.07 28°7.62	2.5' 2.4'	57.3' 57.4'
22	148°24.96	48.31	3°42.62	5.6'	28° 10.00	2.2'	57.4
23	163°24.92	47.85	18°7.19	5.5'	28° 12.21	2.0'	57.4'
	SD = 15.7'	d = -0.4'		SD	0 = 15.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.88	N20° 47.40	32°31.69	5.4'	S28°14.24	1.9'	57.5'
1 2	193°24.85 208°24.81	46.94 46.48	46°56.13 61°20.49	5.4' 5.3'	28° 16.11 28° 17.80	1.7' 1.5'	57.5' 57.5'
3	208 24.81 223°24.77	46.48 •• 46.02	75°44.79	5.3 5.2'	28 17.80 28°19.31	1.3'	57.5' 57.6'
4	238°24.73	45.56	90°9.03	5.2'	$28^{\circ}20.65$	1.2'	57.6'
5	253°24.69	45.10 N20° 44.64	104°33.21 118°57.33	5.1' 5.1'	28°21.81 \$28°22.79	1.0'	57.6'
6 7	268°24.65 283°24.61	N20° 44.64 44.18	118°57.33 133°21.39	5.1	28° 22.79 28° 23.59	0.8' 0.6'	57.7' 57.7'
8	298°24.58	43.71	147°45.39	5.0'	28°24.22	0.4'	57.7'
9	313°24.54	43.25	162°9.35	4.9'	28°24.67	0.3'	57.8'
10 11	328°24.50 343°24.47	42.79 42.32	176°33.25 190°57.10	4.9' 4.8'	28°24.93 28°25.01	0.1' -0.1'	57.8' 57.8'
12	358°24.43	N20° 41.86	205°20.91	4.8	\$28°24.92	-0.1	57.9
13	13°24.39	41.39	219°44.68	4.7'	28°24.63	-0.5'	57.9'
14 15	28°24.36 43°24.32	40.92 •• 40.46	234°8.40 248°32.09	4.7' 4.7'	28° 24.17 28° 23.52	-0.6' -0.8'	57.9' 58.0'
15 16	43°24.32 58°24.29	39.99	248 32.09 262°55.74	4.7	28° 23.52 28° 22.69	-0.8° -1.0'	58.0'
17	73°24.25	39.52	277°19.36	4.6'	$28^{\circ}21.67$	-1.2'	58.0'
18	88°24.21	N20°39.05	291°42.94	4.6'	\$28°20.47	-1.4'	58.1'
19 20	103°24.18 118°24.15	38.59 38.12	306°6.50 320°30.03	4.5' 4.5'	28° 19.08 28° 17.50	-1.6' -1.8'	58.1' 58.1'
21	133°24.11	37.65	334°53.54	4.5'	28° 15.74	-1.6 -1.9'	58.2'
22	148°24.08	37.17	349°17.02	4.5'	28° 13.79	-2.1'	58.2'
23	163°24.04	36.70	3°40.49	4.4'	28°11.66	-2.3'	58.2'
	SD = 15.7'	d = -0.5'		SD	0 = 15.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:39	23:22	////	////
66°	////	////	01:50	22:19	////	////
64°	////	////	02:26	21:44	////	////
62°	////	01:12	02:51	21:20	22:55	////
60°	////	01:56	03:10	21:01	22:14	////
N 58°	////	02:24	03:27	20:45	21:46	////
56°	01:06	02:46	03:40	20:31	21:25	23:02
54°	01:47	03:03	03:52	20:20	21:08	22:24
52°	02:13	03:18	04:02	20:09	20:54	21:58
50°	02:33	03:30	04:11	20:00	20:42	21:38
45°	03:09	03:55	04:31	19:41	20:17	21:02
N 40°	03:35	04:15	04:46	19:26	19:57	20:36
35°	03:56	04:31	05:00	19:13	19:41	20:16
30°	04:12	04:44	05:11	19:01	19:28	20:00
20°	04:38	05:06	05:30	18:42	19:06	19:34
N 10°	04:58	05:25	05:47	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:44	06:11	06:34	17:38	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:04	17:09	17:36	18:07
40°	06:13	06:47	07:16	16:57	17:26	18:00
45°	06:22	06:58	07:31	16:42	17:15	17:51
S 50°	06:31	07:12	07:48	16:25	17:01	17:42
52°	06:36	07:18	07:57	16:16	16:55	17:37
54°	06:40	07:25	08:06	16:07	16:48	17:33
56°	06:45	07:32	08:17	15:56	16:41	17:28
58°	06:51	07:41	08:29	15:44	16:32	17:23
S 60°	06:56	07:50	08:43	15:30	16:23	17:17
Lat.		Moonris	e		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
NI 70°				l		

Lat.		Moonris	e		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°				_		
N 70°						
68°						
66°						
64°						
62°	19:18			22:09		
60°	18:37	20:15	21:19	22:50	23:12	
N 58°	18:09	19:36	20:40	23:18	23:50	
56°	17:48	19:09	20:12	23:40		00:18
54°	17:30	18:48	19:50	23:58		00:39
52°	17:15	18:30	19:33		00:14	00:57
50°	17:02	18:15	19:17		00:27	01:12
45°	16:35	17:44	18:47	00:19	00:55	01:43
N 40°	16:14	17:21	18:23	00:37	01:16	02:07
35°	15:57	17:01	18:03	00:52	01:35	02:26
30°	15:42	16:45	17:46	01:06	01:50	02:43
20°	15:16	16:17	17:17	01:29	02:17	03:12
N 10°	14:55	15:53	16:53	01:49	02:39	03:36
0°	14:34	15:31	16:30	02:07	03:01	03:59
S 10°	14:14	15:08	16:07	02:26	03:22	04:21
20°	13:53	14:45	15:43	02:46	03:45	04:46
30°	13:28	14:17	15:14	03:09	04:12	05:14
35°	13:14	14:01	14:58	03:23	04:28	05:31
40°	12:57	13:42	14:38	03:39	04:46	05:51
45°	12:37	13:19	14:14	03:58	05:09	06:15
S 50°	12:12	12:50	13:44	04:22	05:37	06:45
52°	12:00	12:36	13:28	04:34	05:51	07:00
54°	11:47	12:19	13:11	04:47	06:07	07:18
56°	11:31	12:00	12:49	05:02	06:27	07:40
58°	11:12	11:35	12:22	05:20	06:51	08:07
S 60°	10:49	11:03	11:43	05:43	07:23	08:46

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	78-93%
17	06:12	06:14	12:06	20:48	08:21	
18	06:16	06:19	12:06	21:45	09:16	
19	06:20	06:22	12:06	22:45	10:14	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	298° 16.03	165°12.24 N19°0.33	240°54.08 N19°17.74	227°30.61 N21°33.76	307°28.89 S 06°12.70	
1	$313^{\circ}18.50$	180°11.57 18°59.53	255°54.75 18.15	242°32.55 33.82	322°31.42 12.74	Alpheratz 357°35.02 29°13.46 Ankaa 353°7.35 -42°10.10
2	328°20.96	195°10.90 58.73	270°55.43 18.55	257°34.49 33.88	337°33.96 12.78	Schedar 349°31.33 56°40.08
3	343°23.43	210°10.23 · · 57.94	285°56.11 · · 18.95	272°36.44 · · 33.95	352°36.49 · · 12.82	Diphda 348°47.58 -17°50.96
4 5	358° 25.89 13° 28.36	225°9.56 57.14 240°8.89 56.33	300° 56.78 19.35 315° 57.46 19.75	287°38.38 34.01 302°40.32 34.08	7°39.03 12.86 22°41.57 12.90	Achernar 335°20.42 -57°6.40
6	28°30.82	255°8.22 N18°55.53	330°58.13 N19°20.15	317°42.26 N21°34.14	37°44.10 S06°12.95	Hamal 327°51.66 23°34.64
7	43°33.28	270°7.55 54.73	345°58.81 20.55	332°44.21 34.21	52°46.64 12.99	Polaris 314°22.92 89°21.74
8	58°35.75	285°6.88 53.93	0°59.48 20.95	347°46.15 34.27	67°49.18 13.03	Acamar 315°12.18 -40°12.09 Menkar 314°6.66 4°11.21
9	73°38.21	300°6.21 · · 53.12	16°0.16 · · 21.35	2°48.09 · · 34.33	82°51.71 · · 13.07	Mirfak 308°29.02 49°56.70
10	88° 40.68	315°5.54 52.32	31°0.83 21.75	17°50.04 34.40	97°54.25 13.11	Aldebaran 290°40.29 16°33.52
11 12	103° 43.14 118° 45.61	330°4.88 51.51 345°4.21 N18°50.70	46°1.51 22.15 61°2.19 N19°22.54	32°51.98 34.46 47°53.92 N21°34.53	112°56.79 13.15 127°59.32 \$06°13.19	Rigel 281°4.50 -8°10.27
13	133°48.07	0°3.55 49.90	76°2.86 22.94	62°55.87 34.59	143°1.86 13.24	Capella 280°22.84 46°1.25
14	148°50.53	15°2.88 49.09	91°3.54 23.34	77°57.81 34.65	158°4.40 13.28	Bellatrix 278°23.56 6°22.38
15	163°53.00	30°2.21 · · 48.28	106°4.21 · · 23.74	92°59.76 · · 34.72	173°6.94 · · 13.32	Elnath 278°2.66 28°37.66 Alnilam 275°38.40 -1°11.08
16	178°55.46	45°1.55 47.47	121°4.89 24.13	108° 1.70 34.78	188°9.47 13.36	Betelgeuse 270°52.80 7°24.76
17 18	193°57.93	60°0.89 46.65 75°0.22 N18°45.84	136°5.56 24.53 151°6.24 N19°24.93	123°3.64 34.84 138°5.59 N21°34.91	203°12.01 13.40 218°14.55 \$06°13.44	Canopus 263°53.08 -52°42.32
19	209°0.39 224°2.85	75°0.22 N18°45.84 89°59.56 45.03	151°6.24 N19°24.93 166°6.92 25.32	138°5.59 N21°34.91 153°7.53 34.97	233°17.09 13.49	Sirius 258°26.91 -16°44.86
20	239°5.32	104°58.90 44.21	181°7.59 25.72	168° 9.48 35.04	248°19.63 13.53	Adhara 255°6.54 -29°0.18
21	254°7.78	119°58.24 · · 43.40	196°8.27 · · 26.11	183°11.42 · · 35.10	263°22.17 · · 13.57	Procyon 244°51.57 5°9.81 Pollux 243°18.15 27°58.08
22	$269^{\circ}10.25$	134°57.58 42.58	211°8.94 26.51	198°13.37 35.16	278°24.70 13.61	Pollux 243°18.15 27°58.08 Avior 234°15.56 -59°35.23
23	284° 12.71	149°56.91 41.76	226°9.62 26.90	213°15.31 35.23	293°27.24 13.65	Suhail 222°47.04 -43°31.88
Mer.	pass. 04:06	ν -0.7' d-0.8' m-3.88	$ u 0.7' \ d0.4' \ m0.91$	$\nu 1.9'~d0.1'~\text{m-}2.07$	$\nu 2.5' \ d0.0' \ m0.81$	Miaplacidus 221°39.30 -69°49.10
						Alphard 217°48.44 -8°45.83
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.12 11°50.96
0	299° 15.18	164°56.25 N18°40.95	241°10.29 N19°27.30	228°17.26 N21°35.29	308°29.78 S 06°13.70	Dubhe 193°41.90 61°37.38 Denebola 182°25.51 14°26.24
1	314° 17.64	179°55.59 40.13	256° 10.97 27.69	243°19.20 35.35	323°32.32 13.74	Gienah 175°44.12 -17°40.72
2	329°20.10	194°54.94 39.31	271°11.65 28.09	258°21.15 35.42	338°34.86 13.78	Acrux 173°0.82 -63°14.35
3 4	344° 22.57 359° 25.03	209° 54.28 · · · 38.49 224° 53.62	286°12.32 · · 28.48 301°13.00 28.87	273°23.10 · · 35.48 288°25.04 35.54	353°37.40 · · 13.82 8°39.94 13.87	Gacrux 171°52.30 -57°15.26
5	14°27.50	239°52.96 36.84	316° 13.67 29.27	303°26.99 35.61	23°42.48 13.91	Alioth 166°13.42 55°49.90
6	29°29.96	254°52.30 N18°36.02	331°14.35 N19°29.66	318°28.93 N21°35.67	38°45.02 S 06°13.95	Spica 158°22.74 -11°17.37 Alkaid 152°52.29 49°11.72
7	44°32.43	269°51.65 35.19	346°15.03 30.05	333°30.88 35.73	53°47.56 13.99	Hadar 148°36.52 -60°29.73
8	59°34.89	284°50.99 34.37	1°15.70 30.44	348°32.83 35.79	68°50.10 14.04	Menkent 147°58.04 -36°29.58
9	74°37.35	299°50.34 · · 33.54 314°49.68 32.72	16°16.38 · · 30.83	3°34.77 · · 35.86	83°52.64 · · 14.08	Arcturus 145°48.21 19°3.43
10 11	89° 39.82 104° 42.28	314°49.68 32.72 329°49.03 31.89	31°17.05 31.23 46°17.73 31.62	18°36.72 35.92 33°38.67 35.98	98°55.18 14.12 113°57.72 14.17	Rigil Kent. 139°40.71 -60°56.45
12	119° 44.75	344°48.37 N18°31.06	61°18.41 N19°32.01	48°40.61 N21°36.05	129°0.26	Kochab 137°19.42 74°3.54 Zuben'ubi 136°56.35 -16°8.66
13	$134^{\circ}47.21$	359°47.72 30.23	76°19.08 32.40	63°42.56 36.11	144°2.80 14.25	Zuben'ubi 136°56.35 -16°8.66 Alphecca 126°3.89 26°38.08
14	149°49.67	14°47.07 29.40	91°19.76 32.79	78°44.51 36.17	159°5.34 14.29	Antares 112°16.06 -26°29.24
15	164°52.14	29°46.41 · · 28.57	106°20.43 · · 33.18	93°46.45 · · 36.23	174°7.89 · · 14.34	Atria 107°10.21 -69°4.47
16 17	179° 54.60 194° 57.07	44°45.76 27.74 59°45.11 26.90	121°21.11 33.57 136°21.79 33.96	108°48.40 36.30 123°50.35 36.36	189°10.43 14.38 204°12.97 14.42	Sabik 102°2.95 -15°45.32
18	209°59.53	74°44.46 N18°26.07	151°22.46 N19°34.34	138°52.30 N21°36.42	219°15.51 S06°14.47	Shaula 96°10.54 -37°7.35
19	225°2.00	89°43.81 25.23	166° 23.14 34.73	153°54.25 36.48	234°18.05 14.51	Rasalhague 95°58.62 12°32.60 Eltanin 90°41.88 51°29.23
20	240°4.46	104°43.16 24.40	181°23.81 35.12	168°56.19 36.55	249°20.59 14.55	Kaus Aust. 83°32.64 -34°22.39
21	255°6.92	119°42.51 · · 23.56	196°24.49 · · 35.51	183°58.14 · · 36.61	264°23.14 · · 14.60	Vega 80°33.08 38°48.44
22 23	270°9.39 285°11.85	134°41.86 22.72 149°41.21 21.89	211°25.17 35.90 226°25.84 36.28	199° 0.09 36.67 214° 2.04 36.73	279°25.68 14.64 294°28.22 14.68	Nunki 75°47.87 -26°15.96
						Altair 61°59.99 8°56.02
Mer.	pass. 04:02	ν-0.7' d-0.8' m-3.88	ν 0.7′ d 0.4′ m 0.90	ν1.9' d0.1' m-2.08	$\nu 2.5' \ d0.0' \ m0.81$	Peacock 53°5.71 -56°39.28 Deneb 49°25.61 45°22.02
						Enif 33°38.88 9°59.26
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.98 -46°50.35
0	300°14.32	164°40.57 N18°21.05	241°26.52 N19°36.67	229°3.99 N21°36.80	309°30.76	Fomalhaut 15°14.67 -29°29.37
1 2	315° 16.78 330° 19.24	179°39.92 20.21 194°39.27 19.36	256°27.19 37.06 271°27.87 37.44	244° 5.94 36.86 259° 7.89 36.92	324°33.31 14.77 339°35.85 14.82	Scheat 13°45.33 28°12.88
3	345°21.71	209°38.63 · · 18.52	286°28.55 · · 37.83	274° 9.83 · · 36.98	354°38.39 · · 14.86	Markab 13°30.06 15°20.22
4	0°24.17	224°37.98 17.68	301°29.22 38.21	289°11.78 37.04	9°40.94 14.90	Jul 20 Sat SHA Mer.pass
5	$15^{\circ}26.64$	239° 37.34 16.84	316°29.90 38.60	304°13.73 37.11	24°43.48 14.95	Venus 226°56.21 13:00
6	30°29.10	254°36.69 N18°15.99	331°30.57 N19°38.98	319°15.68 N21°37.17	39°46.02 S06°14.99	Mars 302°38.04 07:56
7	45°31.57	269°36.05 15.15	346°31.25 39.37	334°17.63 37.23	54°48.57 15.04	Jupiter 289°14.58 08:49 Saturn 9°12.85 03:29
8 9	60° 34.03 75° 36.49	284°35.40 14.30 299°34.76 · · 13.45	1°31.93 39.75 16°32.60 · · 40.14	349°19.58 37.29 4°21.53 · · 37.35	69°51.11 15.08 84°53.65 · 15.12	3atum 9 12.05 03.29
10	90°38.96	314°34.12 12.60	31°33.28 40.52	19°23.48 37.42	99°56.20 15.17	Jul 21 Sun SHA Mer.pass
11	$105^{\circ}41.42$	329°33.48 11.76	46°33.96 40.90	34°25.43 37.48	114°58.74 15.21	Venus 225°41.08 13:01
12	120°43.89	344°32.83 N18°10.91	61°34.63 N19°41.29	49°27.38 N21°37.54	130°1.29	Mars 301°55.12 07:55 Jupiter 289°2.08 08:46
13	135° 46.35	359°32.19 10.05	76°35.31 41.67	64°29.33 37.60	145°3.83 15.30	Saturn 9°14.61 03:25
14 15	150° 48.81 165° 51.28	14°31.55 9.20 29°30.91 · · 8.35	91°35.98 42.05 106°36.66 •• 42.43	79°31.28 37.66 94°33.23 · · 37.72	160°6.37 15.35 175°8.92 · · 15.39	
15 16	105 51.28 180°53.74	44°30.27 7.50	100 30.00 · · 42.43 121°37.34 42.81	109°35.19 37.79	175 8.92 · · 15.39 190°11.46 15.43	Jul 22 Mon SHA Mer.pass Venus 224°26.25 13:02
17	195° 56.21	59°29.63 6.64	136°38.01 43.19	124°37.14 37.85	205°14.01 15.48	Mars 301°12.20 07:54
18	210°58.67	74°29.00 N18°5.79	151°38.69 N19°43.58	139°39.09 N21°37.91	220°16.55 S06°15.52	Jupiter 288°49.67 08:43
19	226°1.14	89°28.36 4.93	166°39.37 43.96	154°41.04 37.97	235°19.10 15.57	Saturn 9°16.45 03:21
20 21	241°3.60 256°6.06	104°27.72 4.08 119°27.08 · · 3.22	181° 40.04 44.34 196° 40.72 • • 44.72	169°42.99 38.03 184°44.94 · · 38.09	250°21.64 15.61 265°24.19 •• 15.66	Horizontal parallax
22	271°8.53	134°26.45 2.36	211°41.40 45.10	199°46.89 38.15	280°26.74 15.70	Venus: 0.1
23	286° 10.99	149°25.81 1.50	226°42.07 45.48	214°48.85 38.22	295°29.28 15.75	Mars: 0.1
Mer	pass. 03:58	ν-0.6' d-0.8' m-3.88	ν0.7' d0.4' m0.90	ν1.9' d0.1' m-2.08	$\nu 2.5' \ d0.0' \ m0.80$	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.01	N20°36.23	18°3.94	4.4'	\$28°9.34	-2.5'	58.2'
1	193°23.98	35.76	32°27.38	4.4'	28°6.83	-2.7'	58.3'
2	208°23.94	35.28	46°50.80	4.4'	28°4.13	-2.9'	58.3'
3	223°23.91	• • 34.81	61°14.22	4.4'	28°1.24	-3.1'	58.3'
4 5	238° 23.88 253° 23.84	34.34 33.86	75°37.62 90°1.03	4.4' 4.4'	27°58.17 27°54.91	-3.3' -3.4'	58.4' 58.4'
6	268° 23.81	N20°33.39	104° 24.43	4.4	\$27°51.46	-3.4	58.4
7	283°23.78	32.91	118° 47.84	4.4'	27°47.83	-3.8'	58.5'
8	298°23.75	32.43	133° 11.25	4.4'	27°44.01	-4.0'	58.5'
9	313°23.72	• • 31.95	147° 34.66	4.4'	27°40.00	-4.2'	58.5'
10	328°23.69	31.48	161°58.08	4.4'	27°35.80	-4.4'	58.6'
11 12	343°23.66 358°23.62	31.00 N20°30.52	176°21.51 190°44.96	4.4' 4.5'	27°31.42 \$27°26.85	-4.6' -4.8'	58.6' 58.6'
13	13° 23.59	30.04	205°8.42	4.5'	27°22.09	-4.8 -4.9'	58.6'
14	28° 23.56	29.56	219° 31.89	4.5'	27°17.15	-5.1'	58.7'
15	43°23.53	• • 29.08	233°55.39	4.5'	27°12.02	-5.3	58.7'
16	58°23.50	28.59	$248^{\circ}18.91$	4.5'	27°6.71	-5.5'	58.7'
17	73°23.48	28.11	262°42.46	4.6'	27°1.21	-5.7'	58.8'
18	88°23.45	N20°27.63	277°6.03	4.6'	\$26°55.53	-5.9'	58.8'
19 20	103°23.42 118°23.39	27.15 26.66	291°29.63 305°53.26	4.6' 4.7'	26°49.66 26°43.62	-6.0' -6.2'	58.8' 58.8'
21	118 23.39 133°23.36	26.00	305 53.26 320°16.92	4.7'	26°37.39	-6.4'	58.9'
22	148°23.33	25.69	334° 40.62	4.7'	26°30.97	-6.6'	58.9'
23	163°23.30	25.21	349°4.36	4.8'	26°24.38	-6.8	58.9'
	SD = 15.7'	d = -0.5'		ς	D = 15.9'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°23.28 193°23.25	N20°24.72 24.23	3°28.14 17°51.95	4.8' 4.9'	\$26°17.61 26°10.66	-7.0' -7.1'	58.9' 59.0'
2	208° 23.22	24.23	32° 15.81	4.9'	26°3.53	-7.1 -7.3'	59.0'
3	223°23.19	• • 23.26	46°39.72	5.0'	25°56.22	-7.5	59.0'
4	238°23.17	22.77	61°3.67	5.0'	25°48.73	-7.7'	59.0'
5	253°23.14	22.28	75°27.68	5.1'	25°41.07	-7.8'	59.1'
6	268°23.12 283°23.09	N20°21.79	89°51.73 104°15.83	5.1'	\$25°33.24 25°25.23	-8.0'	59.1'
7 8	283°23.09 298°23.06	21.30 20.81	104° 15.83 118° 39.99	5.2' 5.2'	25° 25.23 25° 17.04	-8.2' -8.4'	59.1' 59.1'
9	313°23.04	. 20.32	133°4.21	5.3'	25°8.69	-8.5	59.2'
10	328°23.01	19.82	147° 28.48	5.3'	25°0.16	-8.7'	59.2'
11	343°22.99	19.33	161°52.81	5.4'	24°51.47	-8.9'	59.2'
12	358°22.96	N20°18.84	176° 17.20	5.5'	\$24°42.61	-9.0'	59.2'
13 14	13°22.94 28°22.91	18.34 17.85	190°41.66 205°6.17	5.5' 5.6'	24°33.58 24°24.38	-9.2' -9.4'	59.3' 59.3'
15	43°22.89	. 17.35	219° 30.75	5.6'	24°24.36	-9.4 -9.5'	59.3'
16	58°22.87	16.86	233°55.40	5.7'	24°5.50	-9.7'	59.3'
17	73°22.84	16.36	$248^{\circ}20.11$	5.8'	$23^{\circ}55.81$	-9.8'	59.4'
18	88° 22.82	N20°15.86	262°44.89	5.9'	\$23°45.96	-10.0'	59.4'
19	103°22.80	15.37	277°9.75	5.9'	23°35.96	-10.2'	59.4'
20	118°22.77 133°22.75	14.87 •• 14.37	291°34.67 305°59.66	6.0' 6.1'	23°25.79 23°15.47	-10.3' -10.5'	59.4'
21 22	133 22.75 148°22.73	13.87	305 59.00 320°24.73	6.1	23 15.47 23°5.00	-10.5 -10.6'	59.4' 59.5'
23	163°22.71	13.37	334° 49.87	6.2	23°54.37	-10.8	59.5
	SD = 15.7'	d = -0.5'			D = 16.1'		
	<u> </u>	<u>u = 0.5</u>			D = 10.1		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°22.69 193°22.66	N20°12.87 12.37	349°15.08 3°40.37	6.3' 6.4'	\$22°43.58 22°32.65	-10.9' -11.1'	59.5' 59.5'
2	193°22.66 208°22.64	12.37 11.87	3° 40.37 18° 5.73	6.4	22° 32.65 22° 21.57	-11.1 -11.2'	59.5' 59.5'
3	223°22.62	• • 11.36	32° 31.18	6.5	22°10.34	-11.4	59.6'
4	238°22.60	10.86	46°56.70	6.6'	21°58.96	-11.5'	59.6'
5	253°22.58	10.36	61°22.29	6.7'	21°47.44	-11.7'	59.6'
6	268°22.56	N20° 9.85	75° 47.97	6.8'	\$21°35.78	-11.8'	59.6'
7 8	283°22.54 298°22.52	9.35 8.84	90° 13.72 104° 39.56	6.8' 6.9'	21°23.97 21°12.03	-11.9' -12.1'	59.6' 59.6'
9	313° 22.50	8.84 •• 8.34	104 39.56 119°5.47	6.9 7.0'	21 12.03 20°59.95	-12.1 -12.2'	59.6 59.7'
10	328° 22.48	7.83	133°31.47	7.1'	20°47.73	-12.4'	59.7'
11	343°22.46	7.32	147°57.55	7.2'	20°35.37	-12.5'	59.7'
12	358° 22.44	N20° 6.82	162°23.70	7.2'	S20°22.89	-12.6'	59.7'
13 14	13°22.43 28°22.41	6.31 5.80	176° 49.94 191° 16.26	7.3' 7.4'	20°10.27 19°57.52	-12.7' -12.9'	59.7' 59.7'
14 15	43°22.41	5.80 •• 5.29	191° 16.26 205° 42.66	7.4° 7.5'	19°57.52 19°44.65	-12.9° -13.0'	59.7' 59.7'
16	58° 22.37	4.78	205 42.00 220°9.15	7.6'	19° 44.05	-13.1'	59.7 59.8'
17	73°22.35	4.27	234° 35.71	7.6'	19°18.52	-13.2'	59.8'
18	88°22.34	N20° 3.76	249°2.36	7.7'	S19°5.28	-13.4'	59.8'
19	103°22.32	3.25	263°29.09	7.8'	18°51.91	-13.5'	59.8'
20 21	118°22.30 133°22.29	2.74 •• 2.22	277°55.90 292°22.80	7.9' 8.0'	18°38.42 18°24.82	-13.6' -13.7'	59.8' 59.8'
22	133°22.29 148°22.27	1.71	292°22.80 306°49.77	8.0	18° 24.82 18° 11.10	-13. <i>1</i> '	59.8'
23	163°22.25	1.20	321°16.83	8.1'	17°57.27	-13.9	59.8'
	SD = 15.7'	d = -0.5'		S	D = 16.2'		
					-2		

1 -4	Twi	light	C	C	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:10	22:56	////	////
66°	////	////	02:03	22:06	////	////
64°	////	////	02:35	21:36	////	////
62°	////	01:28	02:58	21:13	22:40	////
60°	////	02:06	03:17	20:55	22:04	////
N 58°	////	02:32	03:32	20:40	21:39	////
56°	01:21	02:52	03:45	20:27	21:19	22:48
54°	01:55	03:08	03:56	20:16	21:03	22:15
52°	02:20	03:22	04:06	20:06	20:50	21:52
50°	02:38	03:34	04:15	19:57	20:38	21:33
45°	03:13	03:59	04:34	19:38	20:14	20:58
N 40°	03:39	04:18	04:49	19:24	19:55	20:34
35°	03:58	04:33	05:02	19:11	19:39	20:14
30°	04:14	04:46	05:13	19:00	19:26	19:58
20°	04:39	05:08	05:32	18:41	19:05	19:33
$N 10^{\circ}$	04:59	05:25	05:48	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:43	06:10	06:34	17:39	18:03	18:30
30°	05:57	06:26	06:52	17:21	17:47	18:16
35°	06:04	06:35	07:02	17:11	17:38	18:09
40°	06:11	06:45	07:14	16:59	17:29	18:02
45°	06:20	06:56	07:28	16:45	17:18	17:54
S 50°	06:29	07:09	07:45	16:28	17:05	17:45
52°	06:33	07:15	07:53	16:20	16:59	17:41
54°	06:37	07:21	08:02	16:11	16:52	17:36
56°	06:42	07:29	08:12	16:01	16:45	17:32
58°	06:47	07:37	08:24	15:50	16:37	17:27
S 60°	06:52	07:46	08:37	15:36	16:28	17:21
Lat		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon

Lat.		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°			23:48			
68°			23:11			
66°		23:31	22:44			02:15
64°		22:44	22:24			03:01
62°	22:24	22:14	22:07		01:16	03:30
60°	21:43	21:51	21:53	00:13	01:57	03:52
N 58°	21:15	21:32	21:41	00:52	02:25	04:10
56°	20:52	21:16	21:30	01:20	02:46	04:25
54°	20:34	21:03	21:21	01:41	03:04	04:38
52°	20:19	20:51	21:13	01:59	03:19	04:50
50°	20:05	20:40	21:05	02:14	03:32	04:59
45°	19:38	20:18	20:49	02:45	03:59	05:20
N 40°	19:16	20:00	20:36	03:08	04:20	05:37
35°	18:58	19:45	20:24	03:28	04:38	05:51
30°	18:42	19:32	20:14	03:45	04:53	06:03
20°	18:16	19:09	19:57	04:13	05:18	06:24
N 10°	17:53	18:49	19:42	04:37	05:40	06:42
0°	17:31	18:31	19:28	04:59	06:00	06:58
S 10°	17:10	18:12	19:13	05:22	06:20	07:15
20°	16:47	17:53	18:58	05:45	06:41	07:32
30°	16:20	17:29	18:40	06:13	07:06	07:52
35°	16:04	17:16	18:30	06:30	07:20	08:04
40°	15:45	17:00	18:18	06:48	07:37	08:17
45°	15:23	16:41	18:04	07:11	07:57	08:32
S 50°	14:54	16:18	17:47	07:41	08:22	08:51
52°	14:40	16:06	17:39	07:55	08:34	09:00
54°	14:24	15:53	17:29	08:11	08:47	09:10
56°	14:04	15:38	17:19	08:31	09:03	09:21
58°	13:40	15:21	17:07	08:56	09:21	09:34
S 60°	13:08	14:59	16:53	09:28	09:43	09:49

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-99%	
20	06:24	06:26	12:06	23:46	11:15		
21	06:27	06:28	12:06	-:-	12:15		
22	06.20	06.30	12.07	00.45	12.12		

July 23, 24, 25 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	301°13.46	164°25.18 N18°0.64	241° 42.75 N19° 45.85	229°50.80 N21°38.28	310°31.83 \$06°15.79	
1	316° 15.92	179°24.54 17°59.78	256° 43.42 46.23	244°52.75 38.34	325°34.37 15.84	Alpheratz 357°34.99 29°13.47
2	331°18.38	194°23.91 58.92	271°44.10 46.61	259°54.70 38.40	340°36.92 15.88	Ankaa 353°7.32 -42°10.09
3	346°20.85	209°23.27 · · 58.05	286°44.78 •• 46.99	274°56.66 · · 38.46	355°39.47 · · 15.93	Schedar 349°31.30 56°40.09 Diphda 348°47.55 -17°50.95
4	1°23.31	224°22.64 57.19	301°45.45 47.37	289°58.61 38.52	10°42.01 15.97	Diphda 348°47.55 -17°50.95 Achernar 335°20.38 -57°6.40
5	16°25.78	239°22.01 56.33	316°46.13 47.74	305°0.56 38.58	25°44.56 16.02	Hamal 327°51.64 23°34.65
6	31°28.24	254°21.38 N17°55.46	331°46.81 N19°48.12	320°2.51 N21°38.64	40°47.11 S 06°16.06	Polaris 314°21.51 89°21.74
7	46°30.70	269°20.75 54.59	346° 47.48 48.50	335° 4.47 38.70	55°49.65 16.11	Acamar 315°12.16 -40°12.08
8	61°33.17	284°20.11 53.73	1°48.16 48.88	350°6.42 38.76	70°52.20 16.16	Menkar 314°6.63 4°11.22
9	76°35.63	299°19.48 · · 52.86	16°48.84 · · 49.25	5°8.37 · · 38.82	85°54.75 · · 16.20	Mirfak 308°28.99 49°56.71
10	91°38.10	314°18.85 51.99	31°49.51 49.63	20°10.33 38.88	100°57.30 16.25	Aldebaran 290°40.27 16°33.53
11 12	106° 40.56 121° 43.03	329°18.22 51.12 344°17.60 N17°50.25	46°50.19 50.00 61°50.87 N19°50.38	35°12.28 38.95 50°14.23 N21°39.01	115°59.84 16.29 131°2.39 \$06°16.34	Rigel 281°4.48 -8°10.26
13	136° 45.49	359°16.97 49.38	76°51.54 50.75	65°16.19 39.07	146°4.94 16.38	Capella 280°22.81 46°1.25
14	151° 47.95	14°16.34 48.51	91°52.22 51.13	80°18.14 39.13	161°7.49 16.43	Bellatrix 278°23.54 6°22.39
15	166° 50.42	29°15.71 · · 47.63	106°52.90 · · 51.50	95°20.10 · · 39.19	176°10.03 · · 16.48	Elnath 278°2.64 28°37.66
16	181°52.88	44°15.08 46.76	121°53.57 51.87	110°22.05 39.25	191°12.58 16.52	Alnilam 275°38.38 -1°11.07
17	196°55.35	59°14.46 45.89	136° 54.25 52.25	125°24.01 39.31	206°15.13 16.57	Betelgeuse 270°52.78 7°24.77
18	211°57.81	74°13.83 N17°45.01	151°54.93 N19°52.62	140°25.96 N21°39.37	221°17.68 S 06°16.61	Canopus 263°53.07 -52°42.30 Sirius 258°26.90 -16°44.85
19	227°0.27	89° 13.21 44.13	166°55.60 52.99	155°27.92 39.43	236°20.23 16.66	Adhara 255°6.53 -29°0.17
20	242°2.74	104°12.58 43.26	181°56.28 53.37	170°29.87 39.49	251°22.78 16.71	Procyon 244°51.56 5°9.82
21	257°5.20	119°11.96 · · 42.38	196° 56.96 · · 53.74	185°31.83 · · 39.55	266°25.33 · · 16.75	Pollux 243°18.14 27°58.08
22	272°7.67	134°11.33 41.50	211°57.64 54.11	200°33.78 39.61	281°27.88 16.80	Avior 234°15.56 -59°35.21
23	287° 10.13	149°10.71 40.62	226°58.31 54.48	215°35.74 39.67	296°30.42 16.84	Suhail 222°47.04 -43°31.87
Mer	pass. 03:54	ν-0.6' d-0.9' m-3.88	ν0.7' d0.4' m0.90	$\nu 2.0' \ d0.1' \ \text{m-}2.08$	$\nu 2.5' \ d0.0' \ m0.80$	Miaplacidus 221°39.31 -69°49.08
						Alphard 217°48.44 -8°45.82
المرامة	CUA	CHV Dee	CHA Dec	CHA Dec	CHA Dee	Regulus 207°35.12 11°50.96
Wed 0	GHA 302°12.59	GHA Dec 164°10.09 N17°39.74	GHA Dec 241°58.99 N 19°54.85	GHA Dec 230°37.69 N21°39.73	GHA Dec 311°32.97 S 06°16.89	Dubhe 193°41.91 61°37.37
1	317° 15.06	179°9.47 38.86	256° 59.67 55.22	245°39.65 39.79	326°35.52 16.94	Denebola 182°25.51 14°26.24
2	332° 17.52	194°8.84 37.98	272°0.34 55.60	260°41.60 39.85	341°38.07 16.98	Gienah 175°44.13 -17°40.71
3	347° 19.99	209°8.22 · · 37.09	287°1.02 · · 55.97	275°43.56 · · 39.91	356°40.62 · · 17.03	Acrux 173°0.85 -63°14.34
4	2°22.45	224°7.60 36.21	302°1.70 56.34	290°45.52 39.97	11°43.17 17.08	Gacrux 171°52.32 -57°15.25 Alioth 166°13.43 55°49.89
5	17°24.92	239°6.98 35.32	317°2.37 56.70	305°47.47 40.03	26°45.72 17.12	Alioth 166°13.43 55°49.89 Spica 158°22.75 -11°17.37
6	32°27.38	254°6.36 N17°34.44	332°3.05 N19°57.07	320°49.43 N21°40.09	41°48.27 S06°17.17	Alkaid 152°52.30 49°11.72
7	47° 29.84	269°5.74 33.55	347°3.73 57.44	335°51.38 40.15	56°50.82 17.22	Hadar 148°36.55 -60°29.73
8	62°32.31	284°5.12 32.67	2°4.40 57.81	350°53.34 40.21	71°53.37 17.26	Menkent 147°58.06 -36°29.58
9	77°34.77	299°4.51 · · 31.78	17°5.08 · · 58.18	5°55.30 · · 40.27	86°55.92 · · 17.31	Arcturus 145°48.22 19°3.43
10	92°37.24	314°3.89 30.89	32°5.76 58.55	20°57.26 40.33	101°58.48 17.36	Rigil Kent. 139°40.74 -60°56.45
11 12	107°39.70 122°42.16	329°3.27 30.00 344°2.66 N17°29.11	47°6.44 58.92 62°7.11 N19°59.28	35°59.21 40.39 51°1.17 N21°40.45	117°1.03 17.40 132°3.58 \$06°17.45	Kochab 137°19.47 74°3.54
13	137° 44.63	359°2.04 28.22	77°7.79 19°59.65	66° 3.13 40.50	147°6.13 17.50	Zuben'ubi 136° 56.36 -16° 8.66
14	152° 47.09	14°1.42 27.32	92°8.47 20°0.02	81°5.09 40.56	162°8.68 17.55	Alphecca 126°3.90 26°38.09
15	167° 49.56	29°0.81 · · 26.43	107°9.15 · · 0.38	96°7.04 · · 40.62	177°11.23 · · 17.59	Antares 112°16.07 -26°29.25
16	182°52.02	44°0.19 25.54	122°9.82 0.75	111° 9.00 40.68	192°13.78 17.64	Atria 107°10.23 -69°4.48 Sabik 102°2.95 -15°45.32
17	197°54.48	58°59.58 24.64	137° 10.50 1.11	126°10.96 40.74	207°16.34 17.69	Shaula 96°10.54 -37°7.36
18	212°56.95	73°58.97 N17°23.75	152°11.18 N20°1.48	141°12.92 N21°40.80	222°18.89 S 06°17.74	Rasalhague 95°58.62 12°32.60
19	227°59.41	88° 58.35 22.85	167° 11.85 1.85	156°14.88 40.86	237°21.44 17.78	Eltanin 90°41.89 51°29.24
20	243°1.88	103°57.74 21.95	182°12.53 2.21	171°16.83 40.92	252°23.99 17.83	Kaus Aust. 83°32.64 -34°22.40
21	258°4.34	118°57.13 · · 21.05	197°13.21 · · 2.57	186°18.79 · · 40.98	267°26.54 · · 17.88	Vega 80°33.08 38°48.45
22 23	273°6.80 288°9.27	133°56.52 20.16 148°55.91 19.26	212°13.89 2.94 227°14.56 3.30	201°20.75 41.04 216°22.71 41.10	282°29.10 17.93 297°31.65 17.97	Nunki 75°47.86 -26°15.96
23	200 9.21	-				Altair 61°59.99 8°56.03
Mer.	pass. 03:51	ν -0.6 $'$ d-0.9 $'$ m-3.88	$ u 0.7' \ d0.4' \ { m m} 0.89$	$\nu 2.0' \ d0.1' \ \text{m-}2.09$	$ u 2.5' \ d0.0' \ m0.79$	Peacock 53°5.69 -56°39.29
						Deneb 49°25.61 45°22.03
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.86 9°59.27
0	303°11.73	163°55.30 N17°18.36	242°15.24 N20°3.67	231°24.67 N21°41.16	312°34.20	Al Na'ir 27°32.95 -46°50.36 Fomalhaut 15°14.64 -29°29.37
1	318° 14.20	178°54.69 17.45	257°15.92 4.03	246°26.63 41.21	327°36.75 18.07	Scheat 13°45.32 28°12.89
2	$333^{\circ}16.66$	193°54.08 16.55	272°16.60 4.39	261°28.59 41.27	342°39.31 18.12	Markab 13°30.04 15°20.23
3	348° 19.12	208°53.47 · · 15.65	287° 17.27 · · 4.75	276°30.55 · · 41.33	357°41.86 · · 18.16	
4	3°21.59	223°52.86 14.75	302°17.95 5.12	291°32.51 41.39	12°44.41 18.21	Jul 23 Tue SHA Mer.pass
5	18°24.05	238°52.25 13.84	317°18.63 5.48	306°34.47 41.45	27°46.97 18.26	Venus 223°11.72 13:03
6	33°26.52	253°51.65 N17°12.94	332°19.31 N20°5.84	321°36.43 N21°41.51	42°49.52 \$06°18.31	Mars 300°29.29 07:53
7	48°28.98	268°51.04 12.03	347°19.98 6.20	336°38.39 41.57	57°52.07 18.36	Jupiter 288° 37.34 08:39 Saturn 9° 18.37 03:17
8 9	63°31.44 78°33.91	283°50.43 11.12 298°49.83 · · 10.21	2°20.66 6.56 17°21.34 · · 6.92	351°40.35 41.62 6°42.31 • 41.68	72°54.63 18.40 87°57.18 •• 18.45	Saturn 9°18.37 03:17
10	78 33.91 93°36.37	313°49.22 9.31	32°22.02 7.28	21°44.27 41.74	102°59.74 18.50	Jul 24 Wed SHA Mer.pass
11	93 30.37 108°38.84	328°48.62 8.40	47° 22.70 7.64	36°46.23 41.80	118°2.29 18.55	Venus 221°57.49 13:04
12	123°41.30	343°48.01 N17°7.49	62°23.37 N20°8.00	51°48.19 N21°41.86	133°4.85 S06°18.60	Mars 299°46.39 07:52
13	138° 43.77	358° 47.41 6.57	77° 24.05 8.36	66°50.15 41.92	148°7.40 18.65	Jupiter 288°25.10 08:36
14	153°46.23	13°46.81 5.66	92°24.73 8.72	81°52.11 41.97	163°9.95 18.69	Saturn 9°20.38 03:13
15	168° 48.69	28°46.21 · · 4.75	107°25.41 · · 9.08	96°54.07 · · 42.03	178°12.51 · · 18.74	Jul 25 Thu SHA Mer.pass
16	183°51.16	43°45.60 3.84	122°26.08 9.44	111°56.04 42.09	193°15.06 18.79	Venus 220°43.57 13:05
17	198°53.62	58° 45.00 2.92	137°26.76 9.79	126°58.00 42.15	208°17.62 18.84	Mars 299°3.51 07:51
18	213°56.09	73°44.40 N17°2.01	152°27.44 N20°10.15	141°59.96 N21°42.21	223°20.18	Jupiter 288°12.94 08:33
19	228°58.55 244°1.01	88°43.80 1.09	167°28.12 10.51	157° 1.92 42.26	238°22.73 18.94	Saturn 9°22.47 03:09
20 21	244°1.01 259°3.48	103°43.20 17°0.17 118°42.60 16°59.26	182°28.80 10.87 197°29.47 •• 11.22	172° 3.88 42.32 187° 5.85 • 42.38	253°25.29 18.99 268°27.84 • 19.04	Horizontal parallax
22	259 5.46 274°5.94	133°42.00 10 59.20 133°42.00 58.34	212°30.15 11.58	202°7.81 42.44	283°30.40 19.08	Venus: 0.1
23	289°8.41	148°41.40 57.42	227°30.83 11.93	217° 9.77 42.50	298°32.95 19.13	Mars: 0.1
		ν -0.6' d-0.9' m-3.87	ν0.7' d0.4' m0.89	ν 2.0' d0.1' m-2.09	$\nu 2.6' \ d0.0' \ m0.79$	
ivier.	pass. 03:47	ν -0.0 u -0.9 III-3.0/	νυ.ι αυ.4 IIIU.09	ν 2.0 a0.1 iii-2.09	v∠.0 a0.0 iii0.19	

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.24	N20°0.68	$335^{\circ}43.97$	8.2'	S 17°43.32	-14.1'	59.9'
1	193°22.22	20°0.17	350°11.19	8.3'	17°29.27	-14.2'	59.9'
2	208°22.21 223°22.19	19°59.65 •• 59.13	4°38.48 19°5.86	8.4' 8.5'	17°15.11 17°0.84	-14.3' -14.4'	59.9' 59.9'
4	238°22.18	58.62	33°33.32	8.5'	16°46.47	-14.5'	59.9'
5	253°22.16	58.10	48°0.86	8.6'	16°31.99	-14.6'	59.9'
6	268°22.15	N19°57.58	62°28.48	8.7'	S16°17.42	-14.7'	59.9'
7	283°22.14 298°22.12	57.06	76°56.18 91°23.95	8.8'	16°2.74	-14.8'	59.9'
8 9	298 22.12 313°22.11	56.54 •• 56.02	91°23.95 105°51.80	8.9' 8.9'	15°47.97 15°33.11	-14.9' -15.0'	59.9' 59.9'
10	328°22.09	55.50	100° 19.73	9.0'	15° 18.15	-15.0'	59.9'
11	343°22.08	54.98	$134^{\circ}47.74$	9.1'	$15^{\circ}3.10$	-15.1'	60.0'
12	358°22.07	N19°54.46	149°15.82	9.2'	\$14°47.96	-15.2'	60.0'
13 14	13°22.06 28°22.04	53.94 53.42	163°43.97 178°12.20	9.2' 9.3'	14°32.73 14°17.42	-15.3' -15.4'	60.0' 60.0'
15	43°22.03	52.89	176 12.20 192°40.51	9.3 9.4'	14 17.42 14°2.03	-15.4 -15.5'	60.0'
16	58°22.02	52.37	207°8.88	9.4'	13°46.55	-15.6'	60.0'
17	73°22.01	51.85	221°37.33	9.5'	13°30.99	-15.6'	60.0'
18	88°22.00 103°21.99	N19°51.32 50.80	236°5.85 250°34.44	9.6'	\$13°15.36 12°59.64	-15.7'	60.0' 60.0'
19 20	103°21.99 118°21.98	50.80 50.27	265°34.44	9.7' 9.7'	12°59.64 12°43.86	-15.8' -15.9'	60.0'
21	133°21.97	49.74	279°31.83	9.8'	12° 28.00	-15.9'	60.0'
22	148°21.95	49.22	294°0.63	9.9'	12°12.07	-16.0'	60.0'
23	163°21.94	48.69	308°29.49	9.9'	11°56.07	-16.1'	60.0'
	SD = 15.7'	d = -0.5'		SI	O = 16.3'		
Wed	GHA	Doc	GHA	••	Dec	d	НР
vvea 0	GHA 178°21.94	Dec N19°48.16	322°58.42	u 10.0'	S11°40.01	-16.1'	60.0'
1	193°21.93	47.63	337°27.41	10.1	11°23.88	-16.2	60.0'
2	208°21.92	47.10	351°56.47	10.1'	11°7.69	-16.3'	60.0'
3	223°21.91	• • 46.57	6°25.59	10.2'	10°51.43	-16.3'	60.0'
4 5	238°21.90 253°21.89	46.04 45.51	20°54.77 35°24.01	10.2' 10.3'	10°35.12 10°18.75	-16.4' -16.4'	60.0' 60.0'
6	268°21.88	N19°44.98	49°53.31	10.4	\$10°2.32	-16.5	60.0'
7	283°21.87	44.45	64°22.68	10.4'	09°45.84	-16.5'	60.0'
8	298°21.87	43.91	78°52.09	10.5'	09°29.31	-16.6'	60.0'
9	313°21.86 328°21.85	· · 43.38 42.84	93°21.57 107°51.10	10.5' 10.6'	09°12.73 08°56.09	-16.6' -16.7'	60.0' 60.0'
10 11	328 21.85 343°21.84	42.84 42.31	107 51.10 122°20.68	10.6	08°39.42	-16.7'	60.0
12	358°21.84	N19°41.78	136°50.32	10.7'	S08°22.69	-16.8'	60.0'
13	13°21.83	41.24	$151^{\circ}20.01$	10.7'	$08^{\circ}5.93$	-16.8'	60.0'
14	28°21.82	40.70	165°49.75	10.8'	07°49.12	-16.8'	60.0'
15 16	43°21.82 58°21.81	· · 40.17 39.63	180°19.54 194°49.38	10.8' 10.9'	07°32.27 07°15.39	-16.9' -16.9'	60.0' 60.0'
17	73°21.81	39.09	209°19.26	10.9'	06°58.47	-17.0'	60.0'
18	88°21.80	N19°38.55	223°49.19	11.0'	S06°41.51	-17.0'	60.0'
19	103°21.80	38.01	238°19.16	11.0'	06°24.53	-17.0'	60.0'
20 21	118°21.79 133°21.79	37.47 •• 36.93	252°49.18 267°19.24	11.1' 11.1'	06°7.51 05°50.46	-17.0' -17.1'	60.0' 60.0'
22	148°21.78	36.39	281°49.34	11.1	05°33.39	-17.1'	60.0'
23	163°21.78	35.85	296°19.48	11.2'	05°16.29	-17.1'	60.0'
	SD = 15.7'	d = -0.5'		SI	O = 16.4'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.78	$N19^{\circ}35.31$	$310^{\circ}49.66$	11.2'	S04°59.17	-17.1'	60.0'
1	193°21.77 208°21.77	34.77	325°19.87	11.3'	04°42.03	-17.2'	60.0'
2	208°21.77 223°21.77	34.22 •• 33.68	339°50.12 354°20.41	11.3' 11.3'	04°24.86 04°7.68	-17.2' -17.2'	59.9' 59.9'
4	238°21.76	33.14	8°50.73	11.3'	04 7.08 03°50.48	-17.2'	59.9'
5	253°21.76	32.59	23°21.08	11.4'	03°33.26	-17.2'	59.9'
6	268°21.76	N19°32.04	37°51.46	11.4'	\$03°16.04	-17.2'	59.9'
7 8	283°21.76 298°21.76	31.50 30.95	52°21.86 66°52.30	11.4' 11.5'	02°58.80 02°41.55	-17.2' -17.3'	59.9' 59.9'
9	313°21.75	30.95	81°22.76	11.5'	02 41.55 02°24.29	-17.3'	59.9'
10	328°21.75	29.86	$95^{\circ}53.25$	11.5'	02°7.03	-17.3'	59.9'
11	343°21.75	29.31	110°23.76	11.5'	01°49.76	-17.3'	59.9'
12 13	358°21.75 13°21.75	N19°28.76 28.21	124°54.29 139°24.85	11.6' 11.6'	\$01°32.49 01°15.21	-17.3' -17.3'	59.9' 59.9'
13 14	13°21.75 28°21.75	28.21 27.66	139°24.85 153°55.42	11.6'	01°15.21 00°57.94	-17.3' -17.3'	59.9° 59.8'
15	43°21.75	27.11	168°26.01	11.6'	00°40.67	-17.3'	59.8'
16	58°21.75	26.56	182°56.62	11.6'	00°23.40	-17.3'	59.8'
17	73°21.75	26.01	197°27.25	11.6'	500°6.13	-17.3'	59.8'
18 19	88°21.75 103°21.75	N19°25.46 24.90	211°57.88 226°28.54	11.7' 11.7'	N00°11.12 00°28.37	17.2' 17.2'	59.8' 59.8'
20	118°21.75	24.90	240°59.20	11.7'	00°25.57	17.2'	59.8'
21	133°21.76	• • 23.80	255°29.87	11.7'	$01^{\circ}2.84$	17.2'	59.8'
22	148°21.76	23.24	270°0.55	11.7'	01°20.05	17.2'	59.8'
23	163°21.76	22.69	284°31.24	11.7'	01°37.25	17.2'	59.7'
	SD = 15.7'	d = -0.5'		SI	O = 16.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:32	22:36	////	////
66°	////	////	02:16	21:54	////	////
64°	////	00:37	02:44	21:26	23:24	////
62°	////	01:43	03:06	21:05	22:26	////
60°	////	02:16	03:23	20:48	21:55	////
N 58°	00:34	02:40	03:38	20:34	21:31	23:28
56°	01:34	02:58	03:50	20:22	21:13	22:36
54°	02:04	03:14	04:01	20:11	20:58	22:06
52°	02:27	03:27	04:10	20:02	20:45	21:45
50°	02:44	03:39	04:19	19:53	20:33	21:27
45°	03:18	04:02	04:37	19:35	20:10	20:54
N 40°	03:42	04:20	04:52	19:21	19:52	20:30
35°	04:01	04:35	05:04	19:09	19:37	20:12
30°	04:16	04:48	05:14	18:58	19:25	19:56
20°	04:41	05:09	05:33	18:40	19:04	19:32
N 10°	05:00	05:26	05:48	18:25	18:47	19:13
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:43	06:09	06:33	17:40	18:04	18:31
30°	05:56	06:25	06:50	17:23	17:49	18:18
35°	06:02	06:33	07:00	17:13	17:40	18:11
40°	06:10	06:42	07:12	17:02	17:31	18:04
45°	06:17	06:53	07:25	16:48	17:20	17:56
S 50°	06:26	07:06	07:42	16:32	17:08	17:48
52°	06:30	07:11	07:49	16:24	17:02	17:44
54°	06:34	07:18	07:58	16:16	16:56	17:40
56°	06:38	07:24	80:80	16:06	16:49	17:36
58°	06:43	07:32	08:19	15:55	16:42	17:31
S 60°	06:48	07:41	08:31	15:42	16:33	17:26

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	00:54 23:11	22:24	21:46	02:54	06:29	09:03
N 70°	22:51	22:16	21:47	03:58	06:46	09:07
68°	22:35	22:10	21:49	04:34	07:00	09:10
66°	22:22	22:05	21:50	04:58	07:11	09:12
64°	22:11	22:00	21:51	05:18	07:20	09:14
62°	22:01	21:56	21:51	05:33	07:27	09:16
60°	21:53	21:53	21:52	05:46	07:34	09:18
N 58°	21:46	21:50	21:53	05:57	07:40	09:19
56°	21:40	21:47	21:53	06:07	07:45	09:20
54°	21:34	21:44	21:54	06:15	07:50	09:21
52°	21:29	21:42	21:54	06:22	07:54	09:22
50°	21:24	21:40	21:55	06:29	07:57	09:23
45°	21:14	21:36	21:55	06:44	08:05	09:25
N 40°	21:06	21:32	21:56	06:55	08:12	09:27
35°	20:58	21:28	21:57	07:05	08:18	09:28
30°	20:52	21:26	21:58	07:14	08:23	09:29
20°	20:41	21:20	21:59	07:29	08:31	09:32
N 10°	20:31	21:16	22:00	07:42	08:39	09:33
0°	20:21	21:12	22:01	07:54	08:45	09:35
S 10°	20:12	21:08	22:02	08:05	08:52	09:37
20°	20:02	21:03	22:03	08:18	08:59	09:38
30°	19:50	20:58	22:04	08:32	09:07	09:40
35°	19:43	20:55	22:05	08:40	09:12	09:41
40°	19:36	20:51	22:06	08:49	09:17	09:42
45°	19:27	20:47	22:07	09:00	09:23	09:44
S 50°	19:16	20:43	22:08	09:13	09:30	09:45
52°	19:11	20:41	22:08	09:19	09:34	09:46
54°	19:05	20:38	22:09	09:26	09:37	09:47
56°	18:59	20:35	22:10	09:33	09:41	09:48
58°	18:52	20:32	22:10	09:41	09:46	09:49
S 60°	18:44	20:29	22:11	09:50	09:50	09:50

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-83%	
23	06:31	06:32	12:07	01:41	14:07		
24	06:32	06:33	12:07	02:33	14:59		
25	06:33	06:33	12:07	03:23	15:48		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	304° 10.87	163°40.81	N16°56.50	242°31.51	N20°12.29	232°11.73	N21°42.55	313°35.51	S06° 19.18	Alpheratz	357°34.98	29°13.48
1 2	319° 13.33 334° 15.80	178°40.21 193°39.61	55.58 54.66	257°32.19 272°32.86	12.64 13.00	247°13.70 262°15.66	42.61 42.67	328°38.07 343°40.62	19.23 19.28	Ankaa	353°7.30	-42°10.09
3	349° 18.26	208°39.02	• • 53.73	287° 33.54	• • 13.35	202 13.00 277°17.62	• 42.73	358°43.18	• • 19.33	Schedar	349°31.27	56°40.10
4	4°20.73	223°38.42	52.81	302°34.22	13.71	292°19.59	42.78	13°45.74	19.38	Diphda	348° 47.53	-17°50.95
5	19°23.19	238°37.82	51.89	317°34.90	14.06	307°21.55	42.84	28°48.29	19.43	Achernar	335°20.35	-57°6.39 23°34.65
6	34°25.65	253°37.23	N16°50.96	332°35.58	N20°14.42	322°23.51	N21°42.90	43°50.85	S06°19.48	Hamal Polaris	327°51.62 314°20.09	23 34.05 89°21.74
7	49°28.12	268°36.63	50.04	347°36.26	14.77	337°25.48	42.96	58°53.41	19.53	Acamar	315°12.13	-40°12.08
8	64° 30.58	283°36.04	49.11	2°36.93	15.12	352°27.44	43.01	73°55.96	19.58	Menkar	314°6.61	4°11.23
9 10	79°33.05 94°35.51	298°35.45 313°34.85	• • 48.18 47.25	17°37.61 32°38.29	· · 15.48 15.83	7°29.41 22°31.37	· · 43.07 43.13	88°58.52 104°1.08	· · 19.63 19.68	Mirfak	308°28.96	$49^{\circ}56.71$
11	94 35.51 109°37.97	313 34.05 328°34.26	46.33	32 36.29 47°38.97	16.18	37°33.33	43.13	104 1.08 119°3.64	19.00	Aldebaran	290°40.25	$16^{\circ}33.53$
12	124° 40.44	343°33.67	N16°45.40	62°39.65	N20°16.53	52°35.30	N21°43.24	134°6.19	S06° 19.78	Rigel	281°4.46	-8°10.25
13	139° 42.90	358°33.08	44.47	77°40.33	16.88	67°37.26	43.30	149°8.75	19.82	Capella	280°22.79 278°23.53	46°1.25 6°22.39
14	154° 45.37	13°32.49	43.54	92°41.00	17.23	82°39.23	43.36	164°11.31	19.87	Bellatrix Elnath	278°2.62	28°37.66
15	169° 47.83	28°31.90	• • 42.60	107°41.68	• • 17.58	97°41.19	• • 43.41	179°13.87	• • 19.92	Alnilam	275°38.37	-1°11.06
16	184° 50.29	43°31.31	41.67	122° 42.36	17.93	112°43.16	43.47	194°16.43	19.97	Betelgeuse	270°52.77	7°24.78
17 18	199° 52.76 214° 55.22	58°30.72 73°30.13	40.74 N16°39.80	137° 43.04 152° 43.72	18.28 N20°18.63	127°45.12 142°47.09	43.53 N21°43.59	209°18.99 224°21.54	20.02 \$06°20.07	Canopus	263°53.05	-52°42.29
19	214 55.22 229° 57.69	75 30.13 88°29.54	38.87	167° 44.40	18.98	142 47.09 157°49.06	43.64	239°24.10	20.12	Sirius	258° 26.89	-16°44.84
20	245°0.15	103°28.96	37.93	182°45.08	19.33	172°51.02	43.70	254°26.66	20.17	Adhara	255°6.52	-29°0.16
21	260°2.62	118°28.37	• • 37.00	197° 45.75	• • 19.68	187°52.99	• • 43.76	269°29.22	20.22	Procyon	244°51.55	5°9.82
22	275°5.08	133°27.78	36.06	212°46.43	20.03	202°54.95	43.81	284°31.78	20.27	Pollux Avior	243°18.13 234°15.57	27°58.08 -59°35.20
23	290°7.54	148°27.20	35.12	227°47.11	20.38	217°56.92	43.87	299°34.34	20.33	Suhail	234 15.57 222° 47.04	-39 35.20 -43°31.85
Mer	pass. 03:43	v-0.6′ d-0	0.9′ m-3.87	$\nu 0.7' d0$.4′ m0.89	v2 0′ d0	.1′ m-2.09	v2 6′ d0	.0′ m0.78	Miaplacidus	221°39.33	-69°49.07
	pubs. 05.15	- V 0.0 G C								Alphard	217°48.44	-8°45.81
٠.	CIIA	CIIA	Б	CHA		CIIA		CIIA		Regulus	207°35.13	$11^{\circ}50.96$
Sat 0	GHA 305°10.01	GHA 163°26.61	Dec N16°34.18	GHA 242° 47.79	Dec N20°20.73	GHA 232° 58.89	Dec N21°43.93	GHA 314°36.90	Dec \$06° 20.38	Dubhe	193°41.93	61°37.36
1	320° 12.47	178° 26.02	33.24	257° 48.47	21.07	248° 0.85	43.98	329°39.46	20.43	Denebola	182°25.52	14°26.24
2	335° 14.94	193°25.44	32.30	272°49.15	21.42	263° 2.82	44.04	344°42.02	20.48	Gienah	175°44.14	-17°40.70
3	350° 17.40	208°24.86	• • 31.36	287°49.83	• • 21.77	278° 4.79	• • 44.10	359°44.58	• • 20.53	Acrux Gacrux	173°0.88 171°52.35	-63°14.33 -57°15.25
4	5° 19.86	223°24.27	30.42	$302^{\circ}50.51$	22.11	293° 6.75	44.15	14°47.14	20.58	Alioth	166° 13.45	55°49.89
5	20°22.33	238°23.69	29.47	317°51.19	22.46	308°8.72	44.21	29°49.70	20.63	Spica	158° 22.76	-11°17.36
6	35° 24.79	253°23.11	N16°28.53	332°51.87	N20°22.80	323°10.69	N21°44.27	44°52.26	S06°20.68	Alkaid	152°52.32	49°11.72
7 8	50° 27.26 65° 29.72	268°22.52 283°21.94	27.59 26.64	347°52.54 2°53.22	23.15 23.50	338°12.66 353°14.62	44.32 44.38	59°54.82 74°57.38	20.73 20.78	Hadar	148°36.58	-60°29.73
9	80°32.18	203 21.94 298°21.36	. 25.69	2 53.22 17°53.90	. 23.84	8°16.59	• • 44.43	89°59.94	. 20.78	Menkent	147°58.07	-36°29.58
10	95° 34.65	313°20.78	24.75	32°54.58	24.18	23°18.56	44.49	105°2.50	20.88	Arcturus	145°48.24	19°3.43
11	110°37.11	328°20.20	23.80	47° 55.26	24.53	38°20.53	44.55	120°5.06	20.93	Rigil Kent. Kochab	139° 40.77 137° 19.52	-60°56.45 74°3.54
12	125°39.58	343°19.62	N16°22.85	62°55.94	N20°24.87	53°22.50	N21°44.60	135°7.62	S06°20.98	Zuben'ubi	136° 56.37	-16°8.65
13	$140^{\circ}42.04$	358° 19.04	21.90	77°56.62	25.22	68°24.46	44.66	150°10.18	21.03	Alphecca	126°3.91	26°38.09
14	155° 44.50	13° 18.46	20.95	92°57.30	25.56	83°26.43	44.71	165°12.74	21.09	Antares	112°16.08	-26°29.25
15	170° 46.97	28° 17.89	• • 20.00	107° 57.98	• • 25.90	98°28.40	• • 44.77	180°15.31	• • 21.14	Atria	$107^{\circ}10.26$	-69°4.49
16 17	185° 49.43 200° 51.90	43°17.31 58°16.73	19.05 18.10	122°58.66 137°59.34	26.24 26.59	113°30.37 128°32.34	44.83 44.88	195°17.87 210°20.43	21.19 21.24	Sabik	102°2.96	-15°45.32
18	215° 54.36	73°16.16	N16°17.15	153°0.02	N20°26.93	143°34.31	N21°44.94	225°22.99	S06°21.29	Shaula	96° 10.55	-37°7.36
19	230° 56.83	88° 15.58	16.19	168°0.70	27.27	158°36.28	44.99	240°25.55	21.34	Rasalhague	95°58.63	12°32.61 51°29.25
20	245°59.29	103°15.00	15.24	183°1.38	27.61	173°38.25	45.05	255°28.12	21.39	Eltanin Kaus Aust.	90°41.91 83°32.64	-34°22.40
21	261°1.75	118° 14.43	• • 14.28	198°2.06	• • 27.95	188°40.22	• • 45.10	270°30.68	• • 21.44	Vega	80°33.09	38°48.46
22	276°4.22	133°13.85	13.33	213°2.73	28.29	203°42.19	45.16	285°33.24	21.50	Nunki	75° 47.86	-26°15.96
23	291°6.68	148°13.28	12.37	228°3.41	28.63	218°44.16	45.22	300°35.80	21.55	Altair	61°59.99	$8^{\circ}56.03$
Mer.	pass. 03:39	ν -0.6' d-0).9′ m-3.87	ν 0.7 $^{\prime}$ d0	.3′ m0.88	ν 2.0′ d0	.1′ m-2.10	ν 2.6′ d0	.1′ m0.78	Peacock	53°5.69	-56°39.30
										Deneb	49°25.60	45°22.05
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.86	9°59.28
0	306°9.15		N16°11.41	243°4.09	N20°28.97	233°46.13	N21°45.27	315°38.37	S06°21.60	Al Na'ir Fomalhaut	27°32.94 15°14.63	-46°50.37 -29°29.37
1	321°11.61	$178^{\circ}12.13$	10.45	258°4.77	29.31	248°48.10	45.33	330°40.93	21.65	Scheat	13°45.30	28°12.90
2	336° 14.07	193°11.56	9.49	273°5.45	29.65	263°50.07	45.38	345°43.49	21.70	Markab	13°30.03	15°20.24
3	351° 16.54	208°10.99	• • 8.53	288°6.13	• • 29.99	278°52.04	• • 45.44	0°46.05	• • 21.75			
4	6°19.00	223°10.42	7.57	303°6.81	30.33	293°54.01	45.49	15°48.62	21.81	Jul 26 Fri	SHA 219°29.94	Mer.pass
5 6	21°21.47 36°23.93	238°9.85 253°9.28	6.61 N16° 5.65	318°7.49 333°8.17	30.67 N20°31.00	308°55.98 323°57.95	45.55 N21°45.60	30°51.18 45°53.75	21.86 S06°21.91	Venus Mars	219°29.94 298°20.64	13:06 07:50
6 7	51°26.39	253°9.28 268°8.71	N16 5.65 4.69	333°8.17 348°8.85	31.34	323°57.95 338°59.92	N21 45.60 45.66	45°53.75 60°56.31	21.96	Jupiter	298 20.04 288° 0.86	08:30
8	66° 28.86	283°8.14	3.72	3°9.53	31.68	354° 1.90	45.71	75°58.87	22.01	Saturn	9°24.64	03:05
9	81°31.32	298°7.57	2.76	18° 10.21	• • 32.02	9° 3.87	• • 45.77	91°1.44	• • 22.07			
10	96°33.79	313°7.00	1.79	33°10.89	32.35	24°5.84	45.82	106°4.00	22.12	Jul 27 Sat	SHA 218° 16.60	Mer.pass
11	111° 36.25	328°6.43	16° 0.83	48° 11.57	32.69	39°7.81	45.88	121°6.56	22.17	Venus Mars	218 16.60 297°37.78	13:07 07:48
12	126° 38.72	343°5.87	N15°59.86	63°12.25	N20°33.02	54° 9.78	N21°45.93	136°9.13	506°22.22	Jupiter	297 37.76 287°48.88	08:27
13	141°41.18	358°5.30	58.90	78°12.93	33.36	69°11.76	45.99	151°11.69	22.27	Saturn	9°26.89	03:01
14 15	156° 43.64 171° 46.11	13°4.73 28°4.17	57.93 •• 56.96	93° 13.61 108° 14.29	33.69 · · 34.03	84°13.73 99°15.70	46.04 •• 46.10	166°14.26 181°16.82	22.33 •• 22.38			
16	171 40.11 186° 48.57	43°3.60	55.99	106 14.29 123°14.98	34.36	114°17.67	46.15	196°19.39	22.43	Jul 28 Sun Venus	SHA 217°3.56	Mer.pass 13:08
17	201°51.04	58°3.04	55.02	138° 15.66	34.70	129°19.65	46.21	211°21.95	22.43	Mars	217 3.50 296° 54.95	07:47
18	216° 53.50	73°2.47	N15°54.05	153° 16.34	N20°35.03	144°21.62	N21°46.26	226°24.52	S06°22.54	Jupiter		08:24
19	231°55.96	88°1.91	53.08	$168^{\circ}17.02$	35.37	159°23.59	46.32	241°27.08	22.59	Saturn	9°29.22	02:57
20	246°58.43	103°1.35	52.10	183°17.70	35.70	174°25.57	46.37	256°29.65	22.64			
21	262°0.89	118°0.78	• • 51.13	198° 18.38	• • 36.03	189°27.54	• • 46.43	271°32.21	• • 22.69	Horizoi	ntal parallax	0.1
22	277°3.36	133°0.22	50.16	213°19.06	36.36	204°29.51	46.48	286°34.78	22.75		Venus: Mars:	0.1 0.1
23	292°5.82	147°59.66	49.18	228° 19.74	36.70	219°31.49	46.54	301°37.35	22.80			V. <u>-</u>
Mer.	pass. 03:35	ν -0.6′ d-1	l.0′ m-3.87	$ u$ 0.7 $^{\prime}$ d0	.3′ m0.88	ν 2.0′ d0.	.1′ m-2.10	$\nu 2.6' \ d0$.1' m 0.77			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.76	N19°22.13	299°1.94	11.7'	N01°54.44	17.2'	59.7'
1	193°21.76	21.58	313°32.64	11.7'	02°11.60	17.1'	59.7'
2	208°21.77	21.02	328°3.34	11.7'	02°28.75	17.1'	59.7'
3	223°21.77	• • 20.46	342°34.04	11.7'	02°45.87	17.1	59.7'
4 5	238°21.77 253°21.78	19.90 19.35	357°4.75 11°35.45	11.7' 11.7'	03°2.98 03°20.06	17.1' 17.1'	59.7' 59.7'
6	268°21.78	19.35 N19°18.79	26°6.15	11.7'	N03°37.11	17.1	59.7'
7	283°21.78	18.23	40°36.85	11.7	03°54.14	17.0'	59.6'
8	298°21.79	17.67	55°7.55	11.7'	04°11.13	17.0'	59.6'
9	313°21.79	• • 17.11	69°38.24	11.7'	04°28.10	16.9'	59.6'
10	328°21.80	16.55	84°8.92	11.7'	04°45.04	16.9'	59.6'
11	343°21.80	15.98	98°39.59	11.7'	05°1.94	16.9'	59.6'
12	358°21.81	N19°15.42	113°10.25 127°40.90	11.7'	N05°18.81 05°35.64	16.8'	59.6'
13 14	13°21.81 28°21.82	14.86 14.30	127°40.90 142°11.54	11.6' 11.6'	05°52.43	16.8' 16.8'	59.6' 59.5'
15	43°21.83	. 13.73	156° 42.16	11.6'	05° 52.43	16.7	59.5'
16	58°21.83	13.17	171°12.77	11.6'	06°25.90	16.7'	59.5'
17	73°21.84	12.60	185°43.37	11.6'	06°42.57	16.6'	59.5'
18	88°21.85	N19°12.04	200°13.94	11.6'	N06°59.20	16.6'	59.5'
19	103°21.85	11.47	214°44.50	11.5'	07°15.78	16.5'	59.5'
20	118°21.86	10.91	229°15.03	11.5'	07°32.32	16.5	59.4'
21 22	133°21.87 148°21.88	· · 10.34 9.77	243°45.55 258°16.04	11.5' 11.5'	07°48.80 08°5.24	16.4' 16.4'	59.4' 59.4'
22	148°21.88 163°21.88	9.77 9.20	258° 16.04 272° 46.50	11.5	08°5.24 08°21.63	16.4	59.4° 59.4'
23						10.5	JJ.7
	SD = 15.7'	d = -0.6'		SL	0 = 16.3'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.89	$N19^{\circ}8.63$	287°16.94	11.4'	N08°37.96	16.3'	59.4'
1	193°21.90	8.06	301°47.36	11.4'	08°54.24	16.2'	59.4'
2	208°21.91	7.49	316°17.75	11.4'	09°10.46 09°26.63	16.2'	59.3'
3 4	223°21.92 238°21.93	· · 6.92 6.35	330°48.11 345°18.43	11.3' 11.3'	09°26.63 09°42.73	16.1' 16.0'	59.3' 59.3'
5	253°21.94	5.78	359°48.73	11.3'	09° 58.78	16.0'	59.3'
6	268°21.95	N19°5.21	14°19.00	11.2'	N10°14.77	15.9'	59.3'
7	283°21.96	4.64	28°49.23	11.2'	10°30.69	15.9'	59.3'
8	298°21.97	4.06	43°19.43	11.2'	10°46.55	15.8'	59.2'
9	313°21.98	• • 3.49	57°49.59	11.1'	11°2.34	15.7'	59.2'
10	328°21.99	2.92	72°19.71	11.1'	11°18.07	15.7'	59.2'
11	343°22.00	2.34	86°49.80	11.0'	11°33.72	15.6'	59.2'
12 13	358°22.01 13°22.02	N19°1.77 1.19	101°19.84 115°49.85	11.0' 11.0'	N11°49.31 12°4.83	15.5' 15.4'	59.2' 59.1'
14	28°22.04	0.61	130°19.82	10.9'	12 4.63 12°20.27	15.4	59.1'
15	43°22.05	19°0.04	144°49.74	10.9'	12°35.64	15.3'	59.1'
16	58°22.06	18°59.46	159°19.62	10.8'	12°50.93	15.2'	59.1'
17	73°22.07	58.88	173°49.46	10.8'	$13^{\circ}6.14$	15.1'	59.1'
18	88°22.09	N18°58.30	188°19.25	10.7'	N13°21.28	15.1'	59.0'
19	103°22.10	57.72	202°48.99	10.7'	13°36.34	15.0'	59.0'
20 21	118°22.11 133°22.13	57.14 •• 56.56	217°18.69 231°48.34	10.6' 10.6'	13°51.31 14°6.20	14.9' 14.8'	59.0' 59.0'
22	133 22.13 148°22.14	55.98	231 46.34 246°17.94	10.6'	14 0.20 14°21.01	14.6	59.0'
23	163°22.15	55.40	260°47.49	10.5'	14°35.73	14.6'	58.9'
	SD = 15.7'	d = -0.6'		SE	0 = 16.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°22.17 193°22.18	N18°54.82 54.24	275°16.99 289°46.44	10.4' 10.4'	N14°50.37 15°4.92	14.5' 14.5'	58.9' 58.9'
2	193°22.18 208°22.20	54.24 53.65	289°46.44 304°15.83	10.4	15°4.92 15°19.37	14.5 14.4'	58.9' 58.9'
3	223°22.21	• • 53.07	318°45.17	10.3'	15°33.74	14.3'	58.9'
4	238°22.23	52.48	333°14.46	10.2'	15°48.01	14.2'	58.8'
5	253°22.24	51.90	347°43.70	10.2'	16°2.20	14.1'	58.8'
6	268°22.26	N18°51.31	2°12.87	10.1'	N16°16.28	14.0'	58.8'
7	283°22.28	50.73	16°42.00	10.1'	16°30.27	13.9'	58.8'
8 9	298°22.29 313°22.31	50.14 •• 49.56	31°11.06 45°40.07	10.0' 9.9'	16°44.16 16°57.95	13.8' 13.7'	58.8' 58.7'
10	328°22.33	48.97	60°9.02	9.9'	10 57.95 17°11.64	13.6'	58.7'
11	343°22.34	48.38	74°37.91	9.8'	17°25.23	13.5'	58.7
12	358°22.36	N18°47.79	89°6.74	9.8'	N17°38.71	13.4'	58.7'
13	13°22.38	47.20	103°35.51	9.7'	17°52.09	13.3'	58.7'
14	28°22.40	46.61	118°4.22	9.6'	18°5.37	13.2'	58.6'
15	43°22.41	• • 46.02	132°32.86	9.6'	18°18.54	13.1'	58.6'
16 17	58°22.43 73°22.45	45.43 44.84	147°1.45 161°29.98	9.5' 9.5'	18°31.59 18°44.54	12.9' 12.8'	58.6' 58.6'
18	73 22.45 88°22.47	44.84 N18°44.25	101 29.98 175°58.44	9.5 9.4'	N18°57.38	12.8	58.6
19	103°22.49	43.66	190°26.84	9.3'	19°10.10	12.6'	58.5
20	118°22.51	43.07	204°55.17	9.3'	19°22.71	12.5'	58.5'
21	133°22.53	• • 42.47	219°23.44	9.2'	19°35.21	12.4'	58.5'
22	148°22.55	41.88	233°51.65	9.1'	19°47.59	12.3'	58.5'
23	163°22.57	41.28	248°19.80	9.1'	19°59.85	12.1'	58.4'
	SD = 15.7'	d = -0.6'		SE	0 = 16.1'		
	_						

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°						
N 70°	////	////	00:19	23:29	////	////
68°	////	////	01:50	22:18	////	////
66°	////	////	02:28	21:42	////	////
64°	////	01:09	02:54	21:17	22:57	////
62°	////	01:56	03:14	20:57	22:13	////
60°	////	02:26	03:30	20:41	21:45	////
N 58°	01:02	02:47	03:44	20:28	21:24	23:04
56°	01:46	03:05	03:56	20:16	21:06	22:24
54°	02:13	03:20	04:06	20:06	20:52	21:58
52°	02:34	03:32	04:15	19:57	20:39	21:38
50°	02:50	03:43	04:23	19:49	20:29	21:21
45°	03:22	04:06	04:40	19:32	20:06	20:50
N 40°	03:45	04:23	04:54	19:18	19:49	20:27
35°	04:04	04:38	05:06	19:07	19:35	20:09
30°	04:19	04:50	05:16	18:56	19:23	19:54
20°	04:42	05:10	05:34	18:39	19:03	19:31
N 10°	05:00	05:27	05:49	18:24	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:08	06:32	17:42	18:05	18:32
30°	05:54	06:23	06:48	17:25	17:50	18:19
35°	06:01	06:31	06:58	17:15	17:42	18:13
40°	06:07	06:40	07:09	17:04	17:33	18:06
45°	06:15	06:50	07:22	16:51	17:23	17:59
S 50°	06:23	07:02	07:38	16:36	17:11	17:51
52°	06:26	07:08	07:45	16:28	17:06	17:47
54°	06:30	07:13	07:53	16:20	17:00	17:44
56°	06:34	07:20	08:03	16:11	16:54	17:40
58°	06:38	07:27	08:13	16:01	16:47	17:35
S 60°	06:43	07:35	08:25	15:49	16:38	17:31

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	21:07	20:15		11:29	14:06	
N 70°	21:18	20:41	19:30	11:21	13:43	16:42
68°	21:27	21:01	20:21	11:15	13:25	15:52
66°	21:34	21:17	20:53	11:10	13:11	15:22
64°	21:41	21:30	21:17	11:06	12:59	14:59
62°	21:46	21:41	21:36	11:02	12:49	14:41
60°	21:51	21:51	21:52	10:59	12:41	14:26
N 58°	21:56	21:59	22:05	10:56	12:34	14:13
56°	21:59	22:07	22:17	10:54	12:28	14:03
54°	22:03	22:14	22:27	10:52	12:22	13:53
52°	22:06	22:20	22:36	10:50	12:17	13:45
50°	22:09	22:25	22:45	10:48	12:12	13:37
45°	22:15	22:37	23:02	10:44	12:02	13:21
N 40°	22:21	22:47	23:17	10:41	11:54	13:08
35°	22:25	22:55	23:29	10:38	11:47	12:57
30°	22:29	23:03	23:40	10:35	11:41	12:47
20°	22:37	23:16	23:59	10:31	11:30	12:31
N 10°	22:43	23:28		10:27	11:21	12:16
0°	22:49	23:39		10:24	11:12	12:03
S 10°	22:55	23:50		10:20	11:04	11:50
20°	23:02	•• ••	00:02	10:16	10:55	11:36
30°	23:09		00:15	10:12	10:44	11:19
35°	23:14		00:23	10:09	10:39	11:10
40°	23:19		00:33	10:07	10:32	11:00
45°	23:25		00:43	10:04	10:24	10:47
S 50°	23:32		00:57	10:00	10:15	10:32
52°	23:35		01:03	09:58	10:10	10:25
54°	23:39		01:10	09:56	10:06	10:18
56°	23:43		01:17	09:54	10:01	10:09
58°	23:48		01:26	09:52	09:55	09:59
S 60°	23:53		01:36	09:49	09:48	09:48

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	74-51%	
26	06:33	06:33	12:07	04:12	16:36		
27	06:32	06:32	12:07	05:01	17:26		
28	06:31	06:31	12:07	05:51	18:17		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	307°8.28	162°59.10 N15°48.21	243°20.42 N20°37.03	234°33.46 N21°46.59	316°39.91	
1	$322^{\circ}10.75$	177°58.54 47.23	258°21.10 37.36	249°35.44 46.65	331°42.48 22.91	Alpheratz 357°34.95 29°13.49 Ankaa 353°7.27 -42°10.09
2	$337^{\circ}13.21$	192°57.98 46.25	273°21.78 37.69	264°37.41 46.70	346°45.04 22.96	Ankaa 353°7.27 -42°10.09 Schedar 349°31.23 56°40.12
3	352° 15.68	207°57.42 · · 45.27	288°22.46 · · 38.02	279°39.38 · · 46.75	1°47.61 · · 23.01	Diphda 348°47.51 -17°50.94
4	7°18.14	222°56.86 44.30	303°23.14 38.35	294°41.36 46.81	16°50.18 23.06	Achernar 335°20.32 -57°6.39
5 6	22°20.61 37°23.07	237°56.30 43.32 252°55.74 N15°42.34	318°23.82 38.68 333°24.51 N20°39.01	309°43.33 46.86 324°45.31 N21°46.92	31°52.74 23.12 46°55.31 \$06°23.17	Hamal 327°51.59 23°34.66
7	52°25.53	267°55.18 41.36	348°25.19 39.34	339°47.28 46.97	61°57.88 23.22	Polaris 314°18.34 89°21.74
8	67°28.00	282°54.62 40.37	3°25.87 39.67	354°49.26 47.02	77°0.44 23.28	Acamar 315°12.11 -40°12.07
9	82°30.46	297°54.07 · · 39.39	18°26.55 · · 40.00	9°51.24 · · 47.08	92°3.01 · · 23.33	Menkar 314°6.59 4°11.24 Mirfak 308°28.93 49°56.71
10	97°32.93	312°53.51 38.41	33°27.23 40.33	24°53.21 47.13	107°5.58 23.38	Aldebaran 290°40.23 16°33.54
11	112°35.39	327°52.96 37.43	48°27.91 40.66	39°55.19 47.19	122°8.15 23.44	Rigel 281°4.45 -8°10.25
12 13	127° 37.85 142° 40.32	342°52.40 N15°36.44 357°51.85 35.46	63°28.59 N20°40.99 78°29.27 41.31	54°57.16 N21°47.24 69°59.14 47.29	137°10.71 S06°23.49 152°13.28 23.54	Capella 280°22.76 46°1.24
14	142 40.32 157° 42.78	12°51.29 34.47	93°29.95 41.64	85°1.12 47.35	167°15.85 23.60	Bellatrix 278°23.51 6°22.40
15	172° 45.25	27°50.74 · · 33.48	108°30.64 · · 41.97	100°3.09 · · 47.40	182°18.42 · · 23.65	Elnath 278°2.60 28°37.66
16	$187^{\circ}47.71$	42°50.18 32.50	123°31.32 42.30	115°5.07 47.46	197°20.99 23.70	Alnilam 275°38.35 -1°11.06 Betelgeuse 270°52.75 7°24.78
17	202°50.18	57°49.63 31.51	138°32.00 42.62	130°7.05 47.51	212°23.55 23.76	Canopus 263°53.03 -52°42.27
18	217°52.64	72°49.08 N15°30.52	153°32.68 N20°42.95	145° 9.02 N21° 47.56	227°26.12	Sirius 258°26.87 -16°44.83
19 20	232°55.10 247°57.57	87° 48.53 29.53 102° 47.98 28.54	168°33.36 43.27 183°34.04 43.60	160°11.00 47.62 175°12.98 47.67	242°28.69 23.87 257°31.26 23.92	Adhara 255°6.51 -29°0.15
21	263°0.03	117°47.42 · · 27.55	198°34.73 · · 43.92	175 12.96 47.07 190°14.96 •• 47.72	272°33.83 · · 23.97	Procyon 244°51.54 5°9.82
22	278°2.50	132°46.87 26.56	213°35.41 44.25	205°16.93 47.78	287°36.40 24.03	Pollux 243°18.12 27°58.07
23	293°4.96	147°46.32 25.56	228°36.09 44.57	220°18.91 47.83	302°38.97 24.08	Avior 234°15.56 -59°35.18 Suhail 222°47.04 -43°31.84
Merr	pass. 03:31	ν-0.6' d-1.0' m-3.87	ν0.7' d0.3' m0.87	ν2.0' d0.1' m-2.10	ν2.6' d0.1' m0.77	Suhail 222°47.04 -43°31.84 Miaplacidus 221°39.33 -69°49.05
	Dass. 03.31	ν-0.0 α-1.0 III-3.07		ν2.0 d0.1 III-2.10		Alphard 217°48.44 -8°45.81
_	6114	6114 B	CUA D	CUA D	6114 B	Regulus 207°35.13 11°50.96
Tue 0	GHA 308°7.42	GHA Dec 162° 45.78 N15° 24.57	GHA Dec 243°36.77 N20°44.90	GHA Dec 235°20.89 N21°47.88	GHA Dec 317°41.53 S 06°24.14	Dubhe 193°41.94 61°37.35
1	306 7.42 323°9.89	177°45.23 23.58	258° 37.45 45.22	250°22.87 47.94	332°44.10 24.19	Denebola 182°25.53 14°26.24
2	338° 12.35	192°44.68 22.58	273°38.14 45.54	265°24.85 47.99	347°46.67 24.24	Gienah 175°44.15 -17°40.70
3	353° 14.82	207°44.13 · · 21.59	288°38.82 · · 45.87	280°26.82 · · 48.04	2°49.24 · · 24.30	Acrux 173°0.90 -63°14.33 Gacrux 171°52.36 -57°15.24
4	8° 17.28	222°43.58 20.59	303°39.50 46.19	295°28.80 48.10	17°51.81 24.35	Alioth 166°13.48 55°49.88
5	23° 19.75	237°43.04 19.60	318° 40.18 46.51	310°30.78 48.15	32°54.38 24.41	Spica 158°22.77 -11°17.36
6	38°22.21	252°42.49 N15°18.60 267°41.94 17.60	333°40.86 N20°46.83	325°32.76 N21°48.20	47°56.95 \$06°24.46	Alkaid 152°52.34 49°11.72
7 8	53°24.67 68°27.14	267° 41.94 17.60 282° 41.40 16.60	348° 41.55 47.16 3° 42.23 47.48	340°34.74 48.26 355°36.72 48.31	62°59.52 24.52 78°2.09 24.57	Hadar 148°36.60 -60°29.72
9	83°29.60	297°40.85 · · 15.60	18°42.91 · · 47.80	10°38.70 · · 48.36	93°4.66 · · 24.62	Menkent 147°58.09 -36°29.58
10	98°32.07	312°40.31 14.60	33°43.59 48.12	25°40.68 48.42	108°7.23 24.68	Arcturus 145°48.25 19°3.44 Rigil Kent. 139°40.79 -60°56.45
11	113°34.53	327°39.76 13.60	48°44.28 48.44	40°42.66 48.47	123°9.80 24.73	Kochab 137°19.58 74°3.54
12	128° 36.99	342°39.22 N15°12.60	63°44.96 N20°48.76	55°44.64 N21°48.52	138°12.37 S 06°24.79	Zuben'ubi 136°56.38 -16°8.65
13	143°39.46	357°38.68 11.60	78° 45.64 49.08	70°46.62 48.57	153°14.95 24.84	Alphecca 126°3.93 26°38.10
14 15	158° 41.92 173° 44.39	12°38.14 10.59 27°37.59 · · 9.59	93°46.32 49.40 108°47.01 • 49.72	85°48.60 48.63 100°50.58 •• 48.68	168°17.52 24.90 183°20.09 •• 24.95	Antares 112°16.09 -26°29.25
16	173 44.39 188° 46.85	42°37.05 8.59	123° 47.69 50.04	115°52.56 48.73	183°20.09 · · 24.95 198°22.66 25.01	Atria 107°10.28 -69°4.49
17	203°49.32	57°36.51 7.58	138° 48.37 50.35	130°54.54 48.78	213°25.23 25.06	Sabik 102°2.97 -15°45.32
18	218°51.78	72°35.97 N15°6.57	153°49.05 N20°50.67	145°56.52 N21°48.84	228°27.80 S 06°25.12	Shaula 96°10.55 -37°7.36 Rasalhague 95°58.63 12°32.62
19	233° 54.24	87° 35.43 5.57	168°49.74 50.99	160°58.50 48.89	243°30.37 25.17	Eltanin 90°41.92 51°29.27
20	248° 56.71	102°34.89 4.56	183°50.42 51.31	176°0.49 48.94	258°32.95 25.23	Kaus Aust. 83°32.64 -34°22.40
21	263°59.17 279°1.64	117°34.35 · · 3.55 132°33.81	198°51.10 · · 51.63 213°51.79 51.94	191°2.47 · · 48.99 206°4.45 49.05	273°35.52 · · 25.28 288°38.09 25.34	Vega 80°33.09 38°48.48
22 23	279 1.04 294°4.10	132°33.81 2.54 147°33.28 1.53	213°51.79 51.94 228°52.47 52.26	206° 4.45 49.05 221° 6.43 49.10	288°38.09 25.34 303°40.66 25.39	Nunki 75°47.86 -26°15.96
						Altair 61°59.98 8°56.05
Mer.p	pass. 03:27	ν-0.5' d-1.0' m-3.87	ν0.7' d0.3' m0.87	$\nu 2.0' \ d0.1' \ \text{m-}2.11$	$\nu 2.6' \ d0.1' \ m0.76$	Peacock 53°5.68 -56°39.31 Deneb 49°25.60 45°22.07
						Enif 33°38.84 9°59.29
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.92 -46°50.37
0	309°6.57	162°32.74 N15°0.52	243°53.15 N20°52.57	236°8.41 N21°49.15	318°43.23	Fomalhaut 15°14.61 -29°29.37
1 2	324°9.03 339°11.49	177°32.20 14°59.51 192°31.67 58.50	258°53.84 52.89 273°54.52 53.21	251°10.39 49.20 266°12.38 49.26	333°45.81 25.50 348°48.38 25.56	Scheat 13°45.28 28°12.92
3	354° 13.96	207°31.13 · · 57.49	273 54.52 53.21 288°55.20 · · 53.52	281°14.36 · · 49.31	3°50.95 · · 25.61	Markab 13°30.01 15°20.25
4	9°16.42	222°30.59 56.48	303°55.89 53.84	296°16.34 49.36	18°53.52 25.67	Jul 29 Mon SHA Mer.pass
5	24° 18.89	237°30.06 55.46	318° 56.57 54.15	311°18.33 49.41	33°56.10 25.72	Venus 215°50.81 13:09
6	39°21.35	252°29.52 N14°54.45	333°57.25 N20°54.46	326°20.31 N21°49.46	48°58.67 S06°25.78	Mars 296°12.14 07:46
7	54°23.81	267°28.99 53.43	348°57.94 54.78	341°22.29 49.52	64°1.24 25.84	Jupiter 287°25.18 08:21 Saturn 9°31.63 02:53
8 9	69°26.28 84°28.74	282°28.46 52.42 297°27.92 · · 51.40	3°58.62 55.09 18°59.30 •• 55.40	356°24.28 49.57 11°26.26 • 49.62	79°3.82 25.89 94°6.39 · · 25.95	
10	99°31.21	312°27.39 50.38	33°59.99 55.72	26°28.24 49.67	109°8.96 26.00	Jul 30 Tue SHA Mer.pass
11	114°33.67	327°26.86 49.37	49°0.67 56.03	41°30.23 49.72	124°11.54 26.06	Venus 214°38.35 13:09
12	129°36.14	342°26.33 N14°48.35	64°1.35 N20°56.34	56°32.21 N21°49.78	139°14.11 S 06°26.11	Mars 295°29.35 07:45 Jupiter 287°13.46 08:18
13	144°38.60	357°25.80 47.33	79°2.04 56.65	71°34.19 49.83	154°16.69 26.17	Saturn 9°34.11 02:49
14 15	159°41.06	12°25.27 46.31	94°2.72 56.97	86°36.18 49.88	169°19.26 26.23	
15 16	174° 43.53 189° 45.99	27°24.73 · · 45.29 42°24.21 44.27	109°3.41 · · 57.28 124°4.09 57.59	101°38.16 · · 49.93 116°40.15 49.98	184°21.83 · · 26.28 199°24.41 26.34	Jul 31 Wed SHA Mer.pass Venus 213°26.17 13:10
17	204° 48.46	57°23.68 43.25	139°4.77 57.90	131°42.13 50.03	214°26.98 26.39	Mars 294°46.59 07:44
18	219° 50.92	72°23.15 N14°42.22	154°5.46 N20°58.21	146°44.12 N21°50.09	229°29.56 S06°26.45	Jupiter 287° 1.85 08:14
19	234°53.39	87°22.62 41.20	169°6.14 58.52	161°46.10 50.14	244°32.13 26.51	Saturn 9°36.67 02:45
20	249°55.85	102°22.09 40.18	184°6.83 58.83	176°48.09 50.19	259°34.71 26.56	Horizontal parallax
21	264°58.31	117°21.56 · · 39.15	199°7.51 · · 59.14	191°50.08 · · 50.24	274°37.28 · · 26.62	Venus: 0.1
22 23	280°0.78 295°3.24	132°21.04 38.13 147°20.51 37.10	214°8.20 59.45 229°8.88 59.75	206°52.06 50.29 221°54.05 50.34	289°39.86 26.68 304°42.43 26.73	Mars: 0.1
ivier.p	pass. 03:23	ν-0.5' d-1.0' m-3.87	ν0.7' d0.3' m0.87	ν2.0′ d0.1′ m-2.11	ν2.6' d0.1' m0.76	

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.59	N18°40.69	262°47.88	9.0'	N20°11.99	12.0'	58.4'
1	193°22.61	40.09	277°15.89	9.0'	20°24.01	11.9'	58.4'
2	208°22.63 223°22.65	39.50 •• 38.90	291°43.84 306°11.73	8.9' 8.8'	20°35.91 20°47.69	11.8' 11.7'	58.4' 58.4'
4	238°22.67	38.30	320°39.55	8.8'	20°59.35	11.5'	58.3'
5	253°22.70	37.71	335°7.30	8.7'	$21^{\circ}10.87$	11.4'	58.3'
6	268°22.72	N18°37.11	349°34.99	8.6'	N21°22.28	11.3'	58.3'
7 8	283°22.74 298°22.76	36.51 35.91	4°2.61 18°30.17	8.6' 8.5'	21°33.55 21°44.70	11.1' 11.0'	58.3' 58.3'
9	313°22.79	• • 35.31	32°57.67	8.4	21°55.71	10.9'	58.2'
10	328°22.81	34.71	47°25.10	8.4'	$22^{\circ}6.59$	10.8'	58.2'
11	343°22.83 358°22.86	34.11 N18°33.51	61°52.46 76°19.76	8.3'	22°17.35 N22°27.96	10.6'	58.2'
12 13	13°22.88	32.91	76°19.76 90°47.00	8.2' 8.2'	22° 38.45	10.5' 10.3'	58.2' 58.1'
14	28°22.90	32.30	105°14.17	8.1'	22°48.79	10.2	58.1'
15	43°22.93	• • 31.70	119°41.28	8.0'	22°59.00	10.1'	58.1'
16	58°22.95 73°22.98	31.10	134°8.32 148°35.30	8.0'	23°9.07 23°19.00	9.9'	58.1'
17 18	73°22.98 88°23.00	30.49 N18°29.89	148° 35.30 163° 2.22	7.9' 7.9'	N23° 28.80	9.8' 9.6'	58.1' 58.0'
19	103°23.03	29.28	177°29.07	7.8'	23°38.45	9.5'	58.0'
20	118°23.05	28.68	191°55.87	7.7'	23°47.95	9.4'	58.0'
21	133°23.08 148°23.10	· · 28.07 27.47	206°22.60	7.7'	23°57.32 24°6.54	9.2'	58.0'
22 23	148°23.10 163°23.13	26.86	220°49.27 235°15.88	7.6' 7.6'	24° 0.54 24° 15.61	9.1' 8.9'	57.9' 57.9'
	SD = 15.7'	d = -0.6'			D = 15.9'	0.5	21.3
	3D = 15.7°	u = -0.0		31			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.16	N18°26.25	249°42.44	7.5'	N24°24.53	8.8'	57.9'
1 2	193°23.18 208°23.21	25.64 25.03	264°8.93 278°35.36	7.4' 7.4'	24°33.31 24°41.94	8.6' 8.5'	57.9' 57.9'
3	223°23.24	• • 24.43	293°1.74	7.3'	24° 50.42	8.3	57.8'
4	238°23.27	23.82	307°28.06	7.3'	24°58.75	8.2'	57.8'
5	253°23.29	23.21	321°54.33	7.2'	25°6.93	8.0'	57.8'
6 7	268°23.32 283°23.35	N18°22.59 21.98	336°20.54 350°46.70	7.2' 7.1'	N25°14.95 25°22.83	7.9' 7.7'	57.8' 57.7'
8	298°23.38	21.37	5°12.81	7.1	25°30.54	7.6'	57.7'
9	313°23.41	• • 20.76	19°38.86	7.0'	$25^{\circ}38.10$	7.4'	57.7'
10	328°23.44	20.15	34°4.86	7.0'	25° 45.51 25° 52.76	7.2'	57.7'
11 12	343°23.47 358°23.50	19.53 N18°18.92	48°30.82 62°56.72	6.9' 6.9'	25°52.76 N25°59.85	7.1' 6.9'	57.7' 57.6'
13	13°23.53	18.30	77°22.58	6.8'	26°6.78	6.8'	57.6'
14	28°23.56	17.69	91°48.39	6.8'	26° 13.56	6.6'	57.6'
15 16	43°23.59 58°23.62	· · 17.07 16.46	106°14.16 120°39.88	6.7' 6.7'	26°20.17 26°26.62	6.5' 6.3'	57.6' 57.6'
17	73°23.65	15.84	135° 5.56	6.6'	26°32.92	6.1	57.5'
18	88°23.68	N18°15.22	149°31.20	6.6'	N26°39.05	6.0'	57.5'
19	103°23.71	14.61	163°56.80	6.6'	26° 45.01	5.8'	57.5'
20 21	118°23.74 133°23.78	13.99 •• 13.37	178°22.37 192°47.89	6.5' 6.5'	26°50.82 26°56.46	5.6' 5.5'	57.5' 57.4'
22	148°23.81	12.75	207°13.38	6.5	20° 30.40 27° 1.93	5.3'	57.4
23	163°23.84	12.13	221°38.84	6.4'	27°7.24	5.1'	57.4'
	SD = 15.7'	d = -0.6'		SI	D = 15.8'		
Wed 0	GHA 178°23.87	Dec N18°11.51	GHA 236° 4.26	ν 6.4'	Dec N27°12.38	<i>d</i> 5.0'	HP 57.4'
1	176 23.67 193°23.91	10.89	250° 4.20 250° 29.66	6.4	27° 17.36	4.8'	57.4'
2	208°23.94	10.27	264°55.02	6.3'	27°22.17	4.6'	57.3'
3 4	223°23.97 238°24.01	· · 9.65	279°20.36 293°45.67	6.3' 6.3'	27°26.82 27°31.30	4.5' 4.3'	57.3' 57.3'
4 5	238°24.01 253°24.04	9.02 8.40	293°45.67 308°10.96	6.3	27°31.30 27°35.61	4.3	57.3'
6	268°24.08	N18°7.78	322°36.23	6.2'	N27°39.75	4.0'	57.2'
7	283°24.11	7.15	337°1.48	6.2'	27°43.72	3.8'	57.2'
8 9	298°24.15 313°24.18	6.53 •• 5.91	351°26.70 5°51.91	6.2' 6.2'	27° 47.52 27° 51.16	3.6' 3.5'	57.2' 57.2'
10	313 24.18 328°24.22	5.28	5 51.91 20°17.11	6.2'	27 51.16 27°54.62	3.3'	57.2'
11	343°24.25	4.65	34°42.29	6.2'	$27^{\circ}57.91$	3.1'	57.1'
12	358°24.29	N18°4.03	49°7.46	6.2'	N28°1.04	3.0'	57.1'
13 14	13°24.32 28°24.36	3.40 2.77	63°32.62 77°57.77	6.2' 6.1'	28°3.99 28°6.78	2.8' 2.6'	57.1' 57.1'
15	43°24.40	2.15	92°22.92	6.1	28° 9.39	2.4	57.1 57.0'
16	58°24.43	1.52	106°48.07	6.1'	28°11.84	2.3'	57.0'
17	73°24.47	0.89	121°13.21	6.1'	28°14.11	2.1'	57.0'
18 19	88°24.51 103°24.55	N18°0.26 17°59.63	135°38.35 150°3.49	6.1' 6.1'	N28° 16.21 28° 18.14	1.9' 1.8'	57.0' 57.0'
20	103 24.55 118°24.58	59.00	164°28.64	6.2	28° 19.90	1.6'	56.9
21	133°24.62	• • 58.37	178°53.79	6.2'	$28^{\circ}21.49$	1.4'	56.9'
22	148°24.66 163°24.70	57.74 57.10	193°18.95 207°44.12	6.2' 6.2'	28°22.91 28°24.16	1.2'	56.9'
23		57.10	207 - 44.12			1.1'	56.9'
	SD = 15.7'	d = -0.6'		SI	D = 15.6'		

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil	Junise	Junset	Civil	Naut.
N 72°						
N 70°	////	////	01:11	22:52	////	////
68°	////	////	02:07	22:01	////	////
66°	////	////	02:39	21:30	////	////
64°	////	01:30	03:03	21:07	22:37	////
62°	////	02:09	03:22	20:49	22:01	////
60°	////	02:35	03:37	20:34	21:35	////
N 58°	01:22	02:55	03:50	20:22	21:15	22:46
56°	01:57	03:12	04:01	20:11	20:59	22:13
54°	02:22	03:26	04:11	20:01	20:46	21:49
52°	02:41	03:38	04:19	19:52	20:34	21:30
50°	02:56	03:48	04:27	19:45	20:24	21:15
45°	03:27	04:10	04:44	19:29	20:02	20:45
N 40°	03:49	04:26	04:57	19:15	19:46	20:23
35°	04:06	04:40	05:08	19:04	19:32	20:06
30°	04:21	04:52	05:18	18:54	19:20	19:52
20°	04:43	05:11	05:35	18:38	19:01	19:29
N 10°	05:01	05:27	05:49	18:23	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:54	06:16	17:57	18:19	18:44
20°	05:41	06:07	06:30	17:43	18:06	18:32
30°	05:52	06:21	06:47	17:27	17:52	18:21
35°	05:58	06:29	06:56	17:17	17:44	18:15
40°	06:05	06:37	07:06	17:07	17:36	18:08
45°	06:12	06:47	07:19	16:55	17:26	18:02
S 50°	06:19	06:58	07:34	16:40	17:15	17:54
52°	06:22	07:03	07:41	16:33	17:10	17:51
54°	06:26	07:09	07:49	16:25	17:04	17:48
56°	06:30	07:15	07:57	16:16	16:58	17:44
58°	06:34	07:22	08:07	16:07	16:52	17:40
S 60°	06:38	07:30	08:18	15:55	16:44	17:36

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°	19:54			18:13		
64°	20:55			17:12		
62°	21:30	21:21		16:38	18:45	
60°	21:55	22:05	22:33	16:14	18:01	19:34
N 58°	22:15	22:35	23:12	15:54	17:32	18:56
56°	22:32	22:57	23:39	15:38	17:10	18:29
54°	22:47	23:16		15:24	16:52	18:07
52°	22:59	23:32		15:12	16:36	17:50
50°	23:10	23:45	•• ••	15:02	16:23	17:35
45°	23:34		00:13	14:40	15:55	17:04
N 40°	23:52		00:35	14:22	15:34	16:41
35°		80:00	00:54	14:07	15:16	16:21
30°		00:22	01:10	13:54	15:01	16:04
20°		00:45	01:37	13:32	14:35	15:36
N 10°	00:15	01:06	02:00	13:14	14:13	15:12
0°	00:31	01:25	02:22	12:56	13:52	14:49
S 10°	00:46	01:44	02:44	12:39	13:31	14:27
20°	01:03	02:05	03:07	12:20	13:09	14:03
30°	01:22	02:29	03:35	11:59	12:43	13:35
35°	01:34	02:44	03:51	11:46	12:28	13:18
40°	01:47	03:00	04:10	11:32	12:11	12:59
45°	02:02	03:20	04:33	11:15	11:50	12:35
S 50°	02:22	03:45	05:03	10:54	11:24	12:05
52°	02:31	03:58	05:17	10:45	11:11	11:50
54°	02:41	04:12	05:34	10:34	10:57	11:33
56°	02:53	04:28	05:55	10:21	10:40	11:12
58°	03:07	04:48	06:21	10:07	10:20	10:46
S 60°	03:23	05:12	06:57	09:50	09:55	10:10

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-20%
29	06:30	06:29	12:06	06:43	19:10	
30	06:27	06:26	12:06	07:38	20:07	
31	06:25	06:23	12:06	08:36	21:05	

August 01, 02, 03 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$310^{\circ}5.71$	162°19.99 N14°36.07	244°9.57 N21°0.06	236°56.03 N21°50.39	319°45.01 \$06°26.79	Alpheratz 357°34.93 29°13.
1	325°8.17	177°19.46 35.05	259°10.25 0.37	251°58.02 50.45	334°47.58 26.84	
2	$340^{\circ}10.63$	192°18.93 34.02	274°10.93 0.68	267° 0.01 50.50	349°50.16 26.90	Ankaa 353°7.24 -42°10.0 Schedar 349°31.19 56°40.
3	$355^{\circ}13.10$	207°18.41 · · 32.99	289°11.62 · · 0.98	282°1.99 · · 50.55	4°52.73 · · 26.96	Diphda 348°47.49 -17°50.9
4	10° 15.56	222°17.89 31.96	304°12.30 1.29	297° 3.98 50.60	19°55.31 27.01	Achernar 335°20.28 -57°6.
5	25° 18.03	237°17.36 30.93	319°12.99 1.60	312° 5.97 50.65	34°57.89 27.07	Hamal 327°51.56 23°34.0
6	40°20.49	252°16.84 N14°29.90	334°13.67 N21°1.90	327°7.95 N21°50.70	50°0.46 S06°27.13	Polaris 314°16.53 89°21.
7	55°22.96	267°16.32 28.87 282°15.80 27.84	349°14.36 2.21	342°9.94 50.75	65°3.04 27.18	Acamar 315°12.08 -40°12.0
8	70°25.42		4°15.04 2.52	357°11.93 50.80	80°5.62 27.24	Menkar 314°6.56 4°11.3
10	85°27.88 100°30.35	297°15.27 · · · 26.80 312°14.75	19°15.73 · · · 2.82 34°16.41 3.13	12°13.92 · · 50.85 27°15.91 50.90	95°8.19 · · 27.30 110°10.77 27.36	Mirfak 308°28.89 49°56.
11	115° 32.81	312 14.75 25.77 327°14.23 24.74	49°17.10 3.43	42°17.89 50.96	125°13.35 27.41	Aldebaran 290°40.20 16°33.
12	130°35.28	342°13.71 N14°23.70	64°17.79 N21°3.73	57°19.88 N21°51.01	140°15.92 S06°27.47	Rigel 281°4.42 -8°10.5
13	145° 37.74	357°13.19 22.67	79°18.47 4.04	72°21.87 51.06	155°18.50 27.53	Capella 280°22.72 46°1.
14	160° 40.21	12°12.67 21.63	94° 19.16 4.34	87°23.86 51.11	170°21.08 27.58	Bellatrix 278°23.48 6°22.4
15	175° 42.67	27°12.16 · · 20.59	109°19.84 · · 4.64	102°25.85 · · 51.16	185°23.65 · · 27.64	Elnath 278°2.57 28°37.1
16	190°45.13	42°11.64 19.56	124°20.53 4.95	117°27.84 51.21	200°26.23 27.70	Alnilam 275°38.32 -1°11.0 Betelgeuse 270°52.72 7°24.
17	205°47.60	57°11.12 18.52	139°21.21 5.25	132°29.83 51.26	215°28.81 27.76	Betelgeuse 270°52.72 7°24. Canopus 263°53.01 -52°42.
18	220°50.06	72°10.60 N14°17.48	154°21.90 N21°5.55	147°31.82 N21°51.31	230°31.39 S 06°27.81	Sirius 258°26.85 -16°44.
19	235° 52.53	87° 10.09 16.44	169°22.58 5.85	162°33.80 51.36	245°33.96 27.87	Adhara 255°6.49 -29°0.
20	250° 54.99	102°9.57 15.40	184°23.27 6.16	177°35.79 51.41	260°36.54 27.93	Procyon 244°51.52 5°9.8
21	265° 57.45	117°9.05 · · 14.36	199°23.96 · · 6.46	192°37.78 · · 51.46	275°39.12 · · 27.98	Pollux 243°18.10 27°58.
22	280° 59.92	132°8.54 13.32	214°24.64 6.76	207°39.77 51.51	290°41.70 28.04	Avior 234°15.55 -59°35.
23	296°2.38	147°8.02 12.28	229°25.33 7.06	222°41.76 51.56	305°44.28 28.10	Suhail 222°47.03 -43°31.
Me	r.pass. 03:19	ν -0.5' d-1.0' m-3.87	$ u 0.7' \ d0.3' \ m0.86$	$ u 2.0' \ d0.1' \ \text{m-}2.11$	$ u 2.6' \; d0.1' \; { m m0.75}$	Miaplacidus 221°39.33 -69°49.
						Alphard 217°48.43 -8°45.
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.12 11°50.
0	311°4.85	162°7.51 N14°11.23	244°26.01 N21°7.36	237°43.76 N21°51.61	320°46.86 \$06°28.16	Dubhe 193°41.95 61°37.
1	326°7.31	177°7.00 10.19	259°26.70 7.66	252°45.75 51.66	335°49.43 28.21	Denebola 182°25.53 14°26.3
2	341°9.78	192°6.48 9.15	274°27.39 7.96	267°47.74 51.71	350°52.01 28.27	Gienah 175°44.15 -17°40.
3	356° 12.24	207°5.97 · · 8.10	289°28.07 · · 8.26	282°49.73 · · 51.76	5°54.59 · · 28.33	Acrux 173°0.92 -63°14.
4	11° 14.70	222°5.46 7.06	304°28.76 8.56	297°51.72 51.81	20°57.17 28.39	Gacrux 171°52.38 -57°15.
5	$26^{\circ}17.17$	237°4.95 6.01	319° 29.45 8.85	312°53.71 51.86	35°59.75 28.45	Alioth 166°13.49 55°49.8 Spica 158°22.77 -11°17.3
6	41° 19.63	252°4.43 N14°4.97	334°30.13 N21°9.15	327°55.70 N21°51.91	51°2.33 S06°28.50	Alkaid 152°52.36 49°11.
7	$56^{\circ}22.10$	267°3.92 3.92	349°30.82 9.45	342°57.69 51.96	66°4.91 28.56	Hadar 148°36.61 -60°29.
8	71°24.56	282°3.41 2.87	4°31.51 9.75	357°59.68 52.01	81°7.49 28.62	Menkent 147°58.09 -36°29.
9	86°27.02	297°2.90 · · 1.82	19°32.19 · · 10.05	13° 1.68 · · 52.06	96°10.07 · · 28.68	Arcturus 145°48.25 19°3.
10	101°29.49	312°2.39 14°0.77	34°32.88 10.34	28° 3.67 52.11	111°12.65 28.74	Rigil Kent. 139°40.81 -60°56.
11	116°31.95	327°1.88 13°59.72	49°33.57 10.64	43° 5.66 52.16	126°15.23 28.79	Kochab 137°19.64 74°3.
12	131°34.42	342°1.38 N13°58.67	64°34.25 N21°10.94	58°7.65 N21°52.21	141°17.81 \$06°28.85	Zuben'ubi 136°56.38 -16°8.
13 14	146°36.88 161°39.35	357°0.87 57.62 12°0.36 56.57	79°34.94 11.23 94°35.63 11.53	73° 9.65 52.26 88° 11.64 52.31	156°20.39 28.91 171°22.97 28.97	Alphecca 126°3.93 26°38.
15	176° 41.81	26°59.85 · · 55.52	109° 36.32 · · 11.82	103°13.63 · · 52.36	186°25.55 · · 29.03	Antares 112°16.09 -26°29.3
16	191° 44.27	41°59.35 54.46	124° 37.00 12.12	118°15.63 52.41	201°28.13 29.09	Atria 107°10.30 -69°4.
17	206° 46.74	56°58.84 53.41	139°37.69 12.41	133°17.62 52.46	216°30.71 29.14	Sabik 102°2.97 -15°45.
18	221°49.20	71°58.33 N13°52.36	154°38.38 N21°12.71	148°19.61 N21°52.51	231°33.29	Shaula 96°10.55 -37°7.
19	236°51.67	86°57.83 51.30		163°21.61 52.56	246°35.87 29.26	Rasalhague 95°58.63 12°32.0 Eltanin 90°41.93 51°29.0
20	251°54.13	101°57.32 50.25	184°39.75 13.29	178°23.60 52.61	261°38.45 29.32	Kaus Aust. 83°32.64 -34°22.
21	266° 56.60	116°56.82 · · 49.19	199° 40.44 · · 13.59	193°25.59 · · 52.66	276°41.03 · · 29.38	Vega 80°33.09 38°48.
22	281°59.06	131°56.32 48.13	214°41.13 13.88	208°27.59 52.70	291°43.61 29.44	Nunki 75°47.86 -26°15.
23	297°1.52	146°55.81 47.08	229°41.82 14.17	223°29.58 52.75	306°46.19 29.50	Altair 61°59.97 8°56.0
Me	r.pass. 03:15	ν-0.5' d-1.0' m-3.87	ν0.7' d0.3' m0.86	ν 2.0' d0.1' m-2.12	$\nu 2.6' \ d0.1' \ m0.75$	Peacock 53°5.66 -56°39.3
			-			Deneb 49°25.59 45°22.0
٠.	CIIA	CIIA D	CIIA D	CHA	CIIA D	Enif 33°38.83 9°59.
Sat 0	GHA 312°3.99	GHA Dec 161°55.31 N13°46.02	GHA Dec 244°42.50 N 21°14.46	GHA Dec 238°31.58 N21°52.80	GHA Dec 321°48.78 \$06°29.55	Al Na'ir 27°32.90 -46°50.
1	312° 3.99 327° 6.45	161°55.31 N13°46.02 176°54.81 44.96	259° 43.19 14.76	253°33.57	321°48.78 S06°29.55 336°51.36 29.61	Fomalhaut 15°14.59 -29°29.3
2	342°8.92	191°54.30 43.90	274° 43.88 15.05	268°35.57 52.90	351°53.94 29.67	Scheat 13°45.26 28°12.1
3	357°11.38	206°53.80 · · 42.84	289°44.57 · · 15.34	283°37.56 · · 52.95	6°56.52 · · 29.73	Markab 13°29.99 15°20.
4	12° 13.84	221°53.30 41.78	304°45.26 15.63	298°39.56 53.00	21°59.10 29.79	Aug 01 Thu SHA Mer.pa
5	27° 16.31	236°52.80 40.72	319°45.94 15.92	313°41.55 53.05	37°1.68 29.85	Venus 212°14.28 13:
6	42° 18.77	251°52.30 N13°39.66	334°46.63 N21°16.21	328°43.55 N21°53.10	52°4.27 S 06°29.91	Mars 294°3.86 07:
7	57°21.24	266°51.80 38.59	349°47.32 16.50	343°45.55 53.15	67°6.85 29.97	Jupiter 286°50.33 08:
8	72°23.70	281°51.30 37.53	4°48.01 16.79	358°47.54 53.19	82°9.43 30.03	Saturn 9°39.30 02:
9	87°26.17	296°50.80 · · 36.47	19°48.70 · · 17.08	13°49.54 · · 53.24	97°12.01 · · 30.08	Aug 02 Fri SHA Mer.pa
10	102°28.63	311°50.30 35.40	34°49.39 17.37	28°51.54 53.29	112°14.60 30.14	Venus 211°2.66 13:
11 12	117°31.09 132°33.56	326°49.81 34.34 341°49.31 N13°33.27	49°50.07 17.66 64°50.76 N21°17.95	43°53.53 53.34 58°55.53 N21°53.39	127°17.18 30.20 142°19.76 \$06°30.26	Mars 293°21.17 07:
13	132° 33.56 147° 36.02	341 49.31 N13 33.27 356 48.81 32.20	79°51.45 18.23	73°57.53 N21°53.39	157°22.35 30.32	Jupiter 286°38.91 08:
14	162° 38.49	11°48.32 31.14	94°52.14 18.52	88°59.52 53.49	172°24.93 30.38	Saturn 9°42.01 02:
15	177° 40.95	26°47.82 · · 30.07	109° 52.83 · · 18.81	104°1.52 · · 53.53	187°27.51 · · 30.44	Aug 03 Sat SHA Mer.pa
16	192° 43.41	41°47.33 29.00	124°53.52 19.10	119° 3.52 53.58	202°30.09 30.50	Venus 209°51.32 13::
17	207° 45.88	56°46.83 27.93	139°54.21 19.38	134° 5.52 53.63	217°32.68 30.56	Mars 292°38.52 07:
18	222°48.34	71°46.34 N13°26.86	154°54.90 N21°19.67	149°7.51 N21°53.68	232°35.26 S 06°30.62	Jupiter 286°27.59 08:
19	$237^{\circ}50.81$	86°45.84 25.79	169°55.59 19.95	164° 9.51 53.73	247°37.85 30.68	Saturn 9°44.79 02:
20	252° 53.27	101°45.35 24.72	184°56.28 20.24	179°11.51 53.78	262°40.43 30.74	
21	267°55.74	116°44.85 · · 23.65	199°56.97 · · 20.52	194°13.51 · · 53.82	277°43.01 · · 30.80	Horizontal parallax
22	282°58.20	131°44.36 22.58	214°57.66 20.81	209°15.51 53.87	292°45.60 30.86	Venus: 0.1
23	298°0.66	146°43.87 21.51	229°58.35 21.09	224°17.51 53.92	307°48.18 30.92	Mars: 0.1
Me	r.pass. 03:11	ν -0.5′ d -1.1′ m-3.87	$ u 0.7' \ d0.3' \ m0.85$	$\nu 2.0' \ d0.0' \ \text{m-}2.12$	$\nu 2.6' \ d0.1' \ m0.74$	

h	Su	n					
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.74	N17°56.47	222°9.30	6.2'	N28°25.24	0.9'	56.9'
1	193°24.78 208°24.82	55.84 55.20	236°34.50 250°59.71	6.2' 6.2'	28°26.15 28°26.89	0.7' 0.6'	56.8'
2	208 24.82 223°24.86	55.20 •• 54.57	250 59.71 265°24.94	6.2'	28°27.46	0.6	56.8' 56.8'
4	238°24.90	53.94	279°50.19	6.3	28°27.86	0.2'	56.8'
5	253°24.94	53.30	294°15.46	6.3'	28°28.09	0.1'	56.7'
6 7	268°24.98 283°25.02	N17°52.66 52.03	308°40.75 323°6.07	6.3' 6.3'	N28°28.15 28°28.04	-0.1' -0.3'	56.7' 56.7'
8	298°25.06	51.39	337°31.42	6.4	28°27.76	-0.3 -0.4'	56.7'
9	313°25.10	• • 50.76	351°56.79	6.4'	28°27.32	-0.6'	56.7'
10	328°25.14	50.12	6°22.20	6.4'	28°26.71	-0.8'	56.6'
11 12	343°25.18 358°25.23	49.48 N17°48.84	20°47.64 35°13.11	6.5' 6.5'	28°25.93 N28°24.99	-0.9' -1.1'	56.6' 56.6'
13	13°25.27	48.20	49°38.62	6.6	28°23.88	-1.3'	56.6'
14	28°25.31	47.56	64°4.17	6.6'	28°22.60	-1.4'	56.6'
15 16	43°25.35 58°25.40	· · 46.92 46.28	78°29.77 92°55.40	6.6' 6.7'	28°21.16 28°19.56	-1.6' -1.8'	56.5' 56.5'
17	73°25.44	45.64	107°21.08	6.7	28°17.79	-1.0 -1.9'	56.5
18	88°25.48	N17°45.00	121°46.80	6.8'	N28°15.86	-2.1'	56.5'
19	103°25.53	44.36	136°12.57	6.8'	28°13.76	-2.3'	56.4'
20 21	118°25.57 133°25.62	43.71 •• 43.07	150°38.40 165°4.27	6.9' 6.9'	28°11.50 28°9.09	-2.4' -2.6'	56.4' 56.4'
22	148°25.66	42.43	179°30.19	7.0'	28°6.51	-2.0 -2.7'	56.4
23	163°25.71	41.78	193°56.18	7.0'	28°3.77	-2.9'	56.4'
	SD = 15.8'	d = -0.6'		SD	0 = 15.5'		
۶.			CILA			,	
Fri 0	GHA 178°25.75	Dec N17°41.14	GHA 208°22.21	u 7.1'	Dec N28° 0.87	d -3.1'	HP 56.3'
1	193°25.80	40.49	222°48.31	7.2'	27°57.82	-3.2'	56.3'
2	208°25.84	39.85	237°14.46	7.2'	27°54.61	-3.4'	56.3'
3 4	223°25.89 238°25.93	· · 39.20 38.55	251°40.68 266°6.96	7.3' 7.3'	27°51.24 27°47.71	-3.5' -3.7'	56.3' 56.3'
5	258 25.93 253°25.98	37.91	280°33.30	7.4'	27°44.03	-3.8'	56.2
6	268°26.03	N17°37.26	294°59.71	7.5'	N27°40.20	-4.0'	56.2'
7	283°26.07	36.61	309°26.19	7.5'	27°36.22	-4.1'	56.2'
8 9	298°26.12 313°26.17	35.96 •• 35.31	323°52.73 338°19.35	7.6' 7.7'	27°32.08 27°27.79	-4.3' -4.4'	56.2' 56.2'
10	328°26.22	34.66	352°46.03	7.8'	27°23.35	-4.6'	56.1
11	343°26.27	34.01	7°12.79	7.8'	$27^{\circ}18.76$	-4.7'	56.1'
12	358°26.31	N17°33.36	21°39.62	7.9'	N27°14.03	-4.9'	56.1'
13 14	13°26.36 28°26.41	32.71 32.06	36°6.53 50°33.51	8.0' 8.1'	27°9.14 27°4.11	-5.0' -5.2'	56.1' 56.1'
15	43°26.46	• • 31.41	65°0.58	8.1'	26°58.94	-5.3	56.0'
16	58°26.51	30.76	79°27.72	8.2'	26°53.62	-5.5'	56.0'
17 18	73°26.56 88°26.61	30.10 N17°29.45	93°54.94 108°22.24	8.3' 8.4'	26°48.16 N26°42.56	-5.6' -5.7'	56.0' 56.0'
19	103°26.66	28.79	106 22.24 122°49.62	8.5'	26°36.81	-5.7 -5.9'	56.0'
20	118°26.71	28.14	137°17.09	8.5'	26°30.93		55.9'
21	133°26.76	• • 27.48	151°44.64	8.6'	26°24.91	-6.2'	55.9'
22 23	148°26.81 163°26.86	26.83 26.17	166°12.27 180°39.99	8.7' 8.8'	26°18.75 26°12.46	-6.3' -6.4'	55.9' 55.9'
25	SD = 15.8'	d = -0.6'	100 39.99		0 = 15.4'	-0.4	33.9
	<u>JD = 13.0</u>	<u>u = -0.0</u>			7 — 13.4		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°26.91 193°26.97	N17°25.52 24.86	195°7.80 209°35.69	8.9' 9.0'	N26°6.03 25°59.46	-6.6' -6.7'	55.9' 55.8'
2	208°27.02	24.20	224° 3.67	9.1	25°52.77	-6.8	55.8'
3	223°27.07	• • 23.54	238°31.74	9.2'	25°45.94	-7.0'	55.8'
4 5	238°27.12 253°27.17	22.89 22.23	252°59.90 267°28.15	9.3' 9.3'	25°38.98 25°31.90	-7.1' -7.2'	55.8' 55.8'
6	268°27.23	N17°21.57	281°56.49	9.3 9.4'	N25°24.68	-7.2 -7.3	55.7'
7	283°27.28	20.91	296°24.93	9.5'	25°17.34	-7.5'	55.7'
8	298°27.33	20.25	310°53.45	9.6'	25°9.88	-7.6'	55.7'
9 10	313°27.39 328°27.44	· · 19.59 18.92	325°22.07 339°50.78	9.7' 9.8'	25°2.29 24°54.58	-7.7' -7.8'	55.7' 55.7'
11	343°27.50	18.26	354°19.58	9.9'	24° 46.74	-7.0 -8.0'	55.6'
12	358°27.55	N17°17.60	8°48.47	10.0'	N24°38.79	-8.1'	55.6'
13 14	13°27.61 28°27.66	16.94 16.27	23°17.46 37°46.55	10.1' 10.2'	24°30.72 24°22.53	-8.2' -8.3'	55.6' 55.6'
14 15	43°27.72	16.27	52°15.73	10.2	24° 22.53 24° 14.22	-8.4'	55.6'
16	58°27.77	14.94	$66^{\circ}45.00$	10.4'	24°5.80	-8.5'	55.5'
17	73°27.83	14.28	81°14.37	10.5'	23°57.26	-8.6'	55.5'
18 19	88°27.88 103°27.94	N17°13.61 12.95	95°43.84 110°13.40	10.6' 10.7'	N23°48.62 23°39.86	-8.8' -8.9'	55.5' 55.5'
20	103 27.94 118°28.00	12.95	110 13.40 124°43.05	10.7	23°30.99	-8.9 -9.0'	55.5'
21	133°28.05	• • 11.62	$139^{\circ}12.80$	10.8'	$23^{\circ}22.01$	-9.1'	55.4'
22 23	148°28.11 163°28.17	10.95	153°42.65 168°12.59	10.9' 11.0'	23°12.92 23°3.73	-9.2' -9.3'	55.4' 55.4'
23		10.28	108 12.59			-9.3	55.4
	SD = 15.8'	d = -0.7'		SD	0 = 15.2'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°						
N 70°	////	////	01:39	22:27	////	////
68°	////	////	02:22	21:46	////	////
66°	////	00:45	02:51	21:18	23:14	////
64°	////	01:48	03:13	20:57	22:20	////
62°	////	02:21	03:30	20:41	21:48	////
60°	00:41	02:45	03:44	20:27	21:25	23:20
N 58°	01:38	03:03	03:56	20:15	21:07	22:30
56°	02:08	03:19	04:07	20:05	20:52	22:02
54°	02:30	03:32	04:16	19:56	20:39	21:40
52°	02:48	03:43	04:24	19:47	20:28	21:23
50°	03:03	03:53	04:31	19:40	20:18	21:08
45°	03:31	04:13	04:47	19:25	19:58	20:40
N 40°	03:52	04:29	05:00	19:12	19:42	20:19
35°	04:09	04:43	05:10	19:02	19:29	20:03
30°	04:23	04:54	05:20	18:52	19:18	19:49
20°	04:45	05:13	05:36	18:36	19:00	19:27
N 10°	05:02	05:28	05:50	18:23	18:45	19:11
0°	05:16	05:41	06:03	18:10	18:31	18:57
S 10°	05:28	05:54	06:16	17:57	18:19	18:44
20°	05:40	06:06	06:29	17:44	18:07	18:33
30°	05:51	06:19	06:44	17:28	17:54	18:22
35°	05:56	06:27	06:53	17:20	17:46	18:17
40°	06:02	06:35	07:03	17:10	17:38	18:11
45°	06:08	06:44	07:15	16:58	17:29	18:05
S 50°	06:15	06:54	07:29	16:44	17:19	17:58
52°	06:18	06:59	07:36	16:37	17:14	17:55
54°	06:21	07:04	07:43	16:30	17:09	17:52
56°	06:25	07:10	07:51	16:22	17:03	17:48
58°	06:28	07:16	08:01	16:12	16:57	17:45
S 60°	06:32	07:23	08:11	16:02	16:50	17:41
				1		

Lat.		Moonris	e	Moonset				
Lat.	Thu	Fri	Sat	Thu	Fri	Sat		
N 72°								
N 70°								
68°								
66°						22:37		
64°						21:49		
62°	22:10		00:36	21:58	21:26	21:19		
60°	23:39		01:14	20:28	20:48	20:56		
N 58°		00:16	01:40	19:52	20:22	20:37		
56°		00:42	02:01	19:25	20:00	20:21		
54°	00:00	01:02	02:18	19:05	19:43	20:07		
52°	00:18	01:20	02:33	18:47	19:28	19:56		
50°	00:33	01:34	02:46	18:32	19:15	19:45		
45°	01:04	02:04	03:12	18:02	18:48	19:23		
N 40°	01:27	02:27	03:32	17:39	18:26	19:05		
35°	01:47	02:47	03:50	17:19	18:09	18:50		
30°	02:04	03:03	04:04	17:02	17:53	18:37		
20°	02:32	03:31	04:29	16:34	17:27	18:14		
N 10°	02:57	03:55	04:51	16:10	17:04	17:54		
0°	03:20	04:17	05:11	15:47	16:43	17:36		
S 10°	03:42	04:39	05:31	15:25	16:22	17:17		
20°	04:07	05:03	05:52	15:00	15:59	16:57		
30°	04:36	05:30	06:17	14:32	15:32	16:34		
35°	04:53	05:46	06:31	14:15	15:16	16:20		
40°	05:13	06:05	06:48	13:55	14:58	16:04		
45°	05:37	06:28	07:08	13:31	14:36	15:45		
S 50°	06:08	06:57	07:33	13:00	14:07	15:21		
52°	06:23	07:12	07:45	12:44	13:53	15:10		
54°	06:41	07:28	07:59	12:26	13:37	14:57		
56°	07:03	07:48	08:14	12:04	13:17	14:41		
58°	07:32	08:13	08:33	11:36	12:53	14:23		
S 60°	08:13	08:46	08:56	10:55	12:20	14:01		

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
	00 ^h	12 ^h	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	13-2%	
01	06:21	06:19	12:06	09:34	22:02		
02	06:17	06:15	12:06	10:30	22:57		
03	06:12	06:10	12:06	11:24	23:49		

August 04, 05, 06 UT (Sun., Mon., Tue.)

h	Aries	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	313°3.13	161°43.38	N13°20.43	244°59.04	N21°21.38	239°19.51	N21°53.97	322°50.77	S06°30.98		
1	328°5.59	176° 42.89	19.36	259°59.72	21.66	254°21.51	54.02	337°53.35	31.04	Alpheratz	357°34.91
2	343°8.06	191°42.40	18.29	275°0.41	21.95	269°23.51	54.07	352°55.94	31.10	Ankaa	353°7.21
3	358° 10.52	206°41.91	. 17.21	290°1.10	22.23	284°25.50	• • 54.11	7°58.52	31.16	Schedar	349°31.16
4	13° 12.98	221°41.42	16.14	305°1.79	22.51	299°27.50	54.16	23°1.11	31.10	Diphda	348°47.46
5	28° 15.45	236°40.93	15.06	320°2.48	22.80	314°29.50	54.21	38° 3.69	31.28	Achernar	335°20.24
6	43° 17.91	251° 40.44	N13°13.98	335°3.18	N21°23.08	329°31.50	N21°54.26	53° 6.28	506° 31.34	Hamal	$327^{\circ}51.53$
7	58° 20.38	266°39.95	12.91	350°3.87	23.36	344°33.51	54.30	68°8.86	31.40	Polaris	314°14.98
8	73°22.84	200 39.95 281°39.46		5°4.56	23.64	359°35.51		83°11.45		Acamar	315°12.05
9	73 22.04 88°25.30	201 39.40 296°38.97	11.83	20°5.25			54.35	98°14.03	31.46	Menkar	314°6.53
	00 25.30 103°27.77	311°38.49	• • 10.75		• • 23.92	14°37.51	• • 54.40	96 14.03 113°16.62	• • 31.52	Mirfak	308°28.85
10		311 38.49 326°38.00	9.67	35°5.94	24.20	29°39.51	54.45		31.58	Aldebaran	290°40.18
11	118° 30.23		8.59	50°6.63	24.48	44°41.51	54.50	128°19.20	31.64	Rigel	281°4.40
12	133°32.70	341°37.51	N13°7.51	65°7.32	N21°24.76	59°43.51	N21°54.54	143°21.79	S06°31.70	Capella	280°22.69
13	148°35.16	356°37.03	6.43	80°8.01	25.04	74°45.51	54.59	158°24.37	31.76	Bellatrix	278°23.46
14	163°37.63	11°36.54	5.35	95°8.70	25.32	89°47.51	54.64	173°26.96	31.82	Elnath	278°2.55
15	178° 40.09	26°36.06	• • 4.27	110°9.39	• • 25.60	104°49.52	• • 54.69	188°29.55	• • 31.88	Alnilam	275°38.30
16	193° 42.55	41°35.57	3.18	125°10.08	25.88	119°51.52	54.73	203°32.13	31.94	Betelgeuse	270°52.70
17	208° 45.02	56°35.09	2.10	140°10.77	26.16	134°53.52	54.78	218°34.72	32.00	Canopus	263°52.99
18	223° 47.48	71°34.60	N13° 1.01	155°11.46	N21°26.44	149°55.52	N21°54.83	233°37.31	S06°32.06	Sirius	258°26.84
19	238° 49.95	86°34.12	12°59.93	170°12.16	26.72	164°57.52	54.87	248°39.89	32.12	Adhara	255°6.47
20	253°52.41	101°33.64	58.85	185° 12.85	26.99	179°59.53	54.92	263°42.48	32.18	Procyon	244°51.51
21	268° 54.87	116°33.16	• • 57.76	200° 13.54	• • 27.27	195° 1.53	• • 54.97	278°45.07	• • 32.24	Pollux	243°18.08
22	283°57.34	131°32.67	56.67	215°14.23	27.55	210° 3.53	55.02	293°47.65	32.31	Avior	234°15.55
23	298°59.80	146°32.19	55.59	230°14.92	27.83	225° 5.54	55.06	308°50.24	32.37	Suhail	222°47.03
Mer.ı	pass. 03:07	ν -0.5' d-1	.1′ m-3.86	$\nu 0.7' d0$.3′ m0.85	$\nu 2.0' d0$.0′ m-2.13	$\nu 2.6' \ d0.$	1′ m0.74	Miaplacidus	221°39.34
		- 0.0 4 2								Alphard	217°48.42
										Regulus	207°35.11
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.95
0	314°2.27	161°31.71	N12°54.50	245° 15.61	N21°28.10	240°7.54	N21°55.11	323°52.83	S06°32.43	Denebola	182°25.53
1	329°4.73	176°31.23	53.41	260°16.30	28.38	$255^{\circ}9.54$	55.16	338°55.41	32.49	Gienah	175°44.15
2	344°7.19	191°30.75	52.32	$275^{\circ}17.00$	28.65	$270^{\circ}11.55$	55.20	353°58.00	32.55	Acrux	173°0.94
3	359°9.66	206°30.27	• • 51.23	290°17.69	• • 28.93	285°13.55	• • 55.25	9°0.59	• • 32.61	Gacrux	
4	14° 12.12	221°29.79	50.14	305°18.38	29.20	300°15.56	55.30	24°3.18	32.67	Alioth	166°13.50
5	29°14.59	236°29.31	49.05	320°19.07	29.48	315°17.56	55.35	39°5.77	32.73	Spica	158°22.78
6	44°17.05	251°28.84	N12°47.96	335° 19.76	N21°29.75	330°19.57	N21°55.39	54°8.35	S06°32.79	Alkaid	152°52.37
7	$59^{\circ}19.52$	266°28.36	46.87	$350^{\circ}20.46$	30.03	345°21.57	55.44	69°10.94	32.86	Hadar	148°36.64
8	74°21.98	281°27.88	45.78	5°21.15	30.30	0°23.58	55.49	84°13.53	32.92		147°58.10
9	89°24.44	296°27.40	• • 44.68	20°21.84	• • 30.57	15°25.58	• • 55.53	99°16.12	• • 32.98	Arcturus	145°48.26
10	104°26.91	311°26.93	43.59	35°22.53	30.85	30°27.59	55.58	$114^{\circ}18.71$	33.04	Rigil Kent.	139°40.83
11	119°29.37	326°26.45	42.50	50°23.23	31.12	45°29.59	55.63	129°21.29	33.10	Kochab	137°19.70
12	134°31.84	341°25.98	N12°41.40	65°23.92	N21°31.39	60°31.60	N21°55.67	144°23.88	506°33.16	Zuben'ubi	136°56.39
13	149°34.30	356°25.50	40.31	80°24.61	31.66	75°33.60	55.72	159°26.47	33.22	Alphecca	126°3.94
14	164°36.76	11°25.03	39.21	95°25.31	31.94	90°35.61	55.76	174°29.06	33.29	Antares	112° 16.09
15	179°39.23	26°24.55	• • 38.11	110°26.00	• • 32.21	105°37.62	• • 55.81	189°31.65	• • 33.35	Atria	107°10.32
16	194°41.69	41°24.08	37.02	$125^{\circ}26.69$	32.48	120°39.62	55.86	204°34.24	33.41	Sabik	102°2.97
17	209°44.16	56°23.61	35.92	140°27.39	32.75	135°41.63	55.90	219°36.83	33.47	Shaula	96°10.55
18	224°46.62	71°23.13	N12°34.82	155°28.08	N21°33.02	150°43.64	N21°55.95	234°39.42	S06°33.53	Rasalhague	95°58.64
19	239°49.08	86°22.66	33.72	170°28.77	33.29	165°45.64	56.00	249°42.01	33.59	Eltanin	90°41.95
20	254°51.55	101°22.19	32.62	185°29.47	33.56	180°47.65	56.04	264°44.60	33.66	Kaus Aust.	83°32.64
21	269°54.01	116°21.72	• • 31.52	200°30.16	• • 33.83	195°49.66	• • 56.09	279°47.19	• • 33.72	Vega	80°33.10
22	284°56.48	131°21.25	30.42	215°30.85	34.10	210°51.67	56.13	294°49.78	33.78	Nunki	75°47.85
23	299°58.94	146°20.78	29.32	230°31.55	34.37	225°53.67	56.18	309°52.37	33.84	Altair	61°59.97
N/au -	03.03	0 5/ -/ 1	1′ m-3.86	0 7/ 40	.3′ m0.85	2 0/ 40	.0′ m-2.13	$\nu 2.6' d0.$	1/ 0 72	Peacock	53°5.65
ivier.	pass. 03:03	ν-0.5 α-1	.1 111-3.00	νο.τ αυ	.5 1110.05	ν2.0 αυ	.0 111-2.13	ν2.0 d0.	1 1110.73	Deneb	49°25.59
										Enif	33°38.81
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°32.87
0	$315^{\circ}1.41$	161°20.31	N12°28.22		N21°34.63	240°55.68	N21°56.23	324°54.96	S06°33.90	Fomalhaut	15°14.57
1	330°3.87	$176^{\circ}19.84$	27.12	260°32.93	34.90	255°57.69	56.27	339°57.55	33.97	Scheat	13°45.24
2	345°6.33	191°19.37	26.02	275°33.63	35.17	270°59.70	56.32	355°0.14	34.03	Markab	13° 45.24 13° 29.97
3	0°8.80	206°18.90	• • 24.91	290°34.32	• • 35.44	286° 1.71	• • 56.36	10°2.73	• • 34.09	IVIDINAD	15 23.31
4	$15^{\circ}11.26$	221°18.43	23.81	305°35.02	35.70	301°3.72	56.41	25°5.32	34.15	Aug 04 Sun	SHA
5	$30^{\circ}13.73$	236°17.96	22.71	320°35.71	35.97	316° 5.73	56.46	40°7.91	34.21	Venus	208°40.25
6	45° 16.19	251° 17.49	N12°21.60	335°36.40	N21°36.24	331°7.74	N21°56.50		S06°34.28	Mars	291°55.91
7	$60^{\circ}18.65$	266°17.03	20.50	350°37.10	36.50	346° 9.75	56.55	70°13.09	34.34	Jupiter	$286^{\circ}16.38$
8	75°21.12	281°16.56	19.39	5°37.79	36.77	1°11.75	56.59	85°15.68	34.40	Saturn	9°47.64
9	90°23.58	296°16.09	• • 18.28	20°38.49	• • 37.03	16°13.76	• • 56.64	100°18.27	• • 34.46	A., OF 14	CIIC
10	105°26.05	311°15.63	17.18	35°39.18	37.30	31°15.77	56.68	115°20.86	34.53	Aug 05 Mon	SHA
11	$120^{\circ}28.51$	$326^{\circ}15.16$	16.07	50°39.88	37.56	46°17.78	56.73	130°23.45	34.59	Venus	
12	135°30.97		N12°14.96	65°40.57	N21°37.83	61°19.80	N21°56.78	145°26.05			291°13.35
13	150°33.44	356°14.23	13.85	80°41.27	38.09	76°21.81	56.82	160°28.64	34.71	Jupiter	286°5.27
14	165°35.90	11° 13.77	12.74	95°41.96	38.36	91°23.82	56.87	175°31.23	34.78	Saturn	9°50.56
15	180°38.37	26°13.31	• • 11.63	110°42.66	• • 38.62	106°25.83	• • 56.91	190°33.82	• • 34.84	Aug 06 Tue	SHA
16	195°40.83	41°12.84	10.52	125°43.35	38.88	121°27.84	56.96	205°36.41	34.90		206°18.90
17	210°43.29	56°12.38	9.41	140°44.05	39.15	136°29.85	57.00	220°39.00	34.96		290°30.83
18	225° 45.76	71°11.92	N12°8.30	155° 44.74	N21°39.41	151°31.86	N21°57.05	235°41.60	S06°35.03	Jupiter	
19	240°48.22	86°11.46	7.19	170°45.44	39.67	166°33.87	57.09	250°44.19	35.09	Saturn	9°53.55
20	255°50.69	101°11.00	6.07	185°46.14	39.93	181°35.89	57.14	265°46.78	35.15		
21	270°53.15	116° 10.53	• • 4.96	200°46.83	• • 40.19	196°37.90	• • 57.18	280°49.37	• • 35.21	Horizor	ntal parallax
22	285°55.61	131°10.07	3.85	215°47.53	40.45	211°39.91	57.23	295°51.97	35.28		Venus:
23	300°58.08	146°9.61	2.73	230°48.22	40.71	226°41.92	57.27	$310^{\circ}54.56$	35.34		Mars:
ivier.	pass. 02:59	ν-υ.5' <i>α</i> -1	1′ m-3.86	νυ. <i>Γ΄ d</i> 0	.3′ m0.84	ν2.0' α0	.0′ m-2.13	$\nu 2.6' d0.$	1 1110.73		

Dec 29°13.52

-42°10.09

56°40 15

-17°50.93

-57°6.38

 $23^{\circ}34.68$

89°21.74

-40°12.05

4°11.26

49°56.72

16°33.55

-8°10.23

46°1.24

 $6^{\circ}22.41$

28°37.66

-1°11.04

 $7^{\circ}24.79$

-52°42.24

-16°44.81

-29°0.12

 $27^{\circ}58.07$

-59°35.15

-43°31.82 -69°49.02

-8°45.80

11°50.96

61°37.32

 $14^{\circ}26.23$

-17°40.69

-63°14.32

-57° 15.23

55°49.87

-11°17.35

49°11.71

-60°29.72

-36°29.57

 $19^{\circ}3.43$

74°3.54

-16°8.65

26°38.10

-26°29.25

-69°4.51 -15°45.32

 $-37^{\circ}7.37$

 $12^{\circ}32.63$

51°29.29

-34°22.41

38°48.50

8°56.06

-56° 39.33

 $45^{\circ}22.10$

 $9^{\circ}59.31$

-46°50.38

-29°29.36

28°12.95

15°20.28

Mer.pass

13:14

07:40

08:02

02:28

13:14

07:39

07:58

02:24

07:37

07:55

02:20

0.1

0.1

Mer.pass 13:15

Mer.pass

-26°15.97

-60°56.45

 $5^{\circ}9.83$

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.23	$N17^{\circ}9.61$	$182^{\circ}42.63$	11.1'	N22°54.43	-9.4'	55.4'
1	193°28.28	8.94	197° 12.76	11.2'	22°45.03	-9.5'	55.4'
2	208°28.34 223°28.40	8.27 •• 7.60	211° 42.99 226° 13.32	11.3' 11.4'	22°35.53 22°25.93	-9.6' -9.7'	55.4' 55.3'
4	238°28.46	6.93	240°43.74	11.5'	22° 16.22	-9.8'	55.3'
5	253°28.52	6.26	$255^{\circ}14.26$	11.6'	$22^{\circ}6.42$	-9.9'	55.3'
6	268°28.58	N17°5.59	269° 44.87 284° 15.57	11.7'	N21°56.52	-10.0'	55.3'
7 8	283°28.64 298°28.70	4.92 4.25	284° 15.57 298° 46.37	11.8' 11.9'	21°46.53 21°36.44	-10.1' -10.2'	55.3' 55.2'
9	313°28.76	3.58	313° 17.27	12.0'	21°26.26	-10.3	55.2'
10	328°28.82	2.90	327° 48.26	12.1'	21° 15.98	-10.4'	55.2'
11	343°28.88 358°28.94	2.23 N17°1.55	342° 19.34 356° 50.52	12.2' 12.3'	21°5.62 N20°55.16	-10.5'	55.2'
12 13	13°29.00	0.88	11°21.79	12.3 12.4'	20° 44.62	-10.5' -10.6'	55.2' 55.2'
14	28°29.06	17°0.21	25°53.15	12.5'	20°33.99	-10.7	55.1'
15	43°29.12	16° 59.53	40°24.60	12.5'	20°23.27	-10.8'	55.1'
16 17	58°29.19 73°29.25	58.85 58.18	54°56.15 69°27.79	12.6' 12.7'	20°12.47 20°1.59	-10.9' -11.0'	55.1' 55.1'
18	88°29.31	N16° 57.50	83°59.52	12.7	N19° 50.62	-11.0'	55.1
19	103°29.37	56.82	98°31.34	12.9'	19°39.57	-11.1'	55.1'
20	118°29.44	56.15	113°3.25	13.0'	19°28.45	-11.2'	55.0'
21 22	133°29.50 148°29.56	• • 55.47 54.79	127°35.25 142°7.33	13.1' 13.2'	19°17.24 19°5.96	-11.3' -11.4'	55.0' 55.0'
23	163°29.63	54.79 54.11	142 7.33 156°39.51	13.2	19 5.96 18°54.60	-11.4 -11.4'	55.0'
	SD = 15.8'	d = -0.7'			D = 15.1'		
		<u> </u>		JI			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	178°29.69 193°29.75	N16°53.43 52.75	171°11.77 185°44.12	13.4' 13.4'	N18° 43.17 18° 31.66	-11.5' -11.6'	55.0' 54.9'
2	193°29.75 208°29.82	52.75 52.07	185° 44.12 200° 16.56	13.4	18° 31.66 18° 20.08	-11.6 -11.7'	54.9'
3	223°29.88	• • 51.39	214°49.08	13.6'	18°8.43	-11.7'	54.9'
4	238°29.95	50.71	229°21.69	13.7'	17°56.71	-11.8'	54.9'
5 6	253°30.01 268°30.08	50.02 N16°49.34	243°54.39 258°27.16	13.8' 13.9'	17°44.92 N17°33.06	-11.9' -11.9'	54.9' 54.9'
7	283°30.15	48.66	273°0.02	13.9'	17°21.14	-11.9	54.9'
8	298°30.21	47.97	287°32.96	14.0'	17°9.15	-12.1'	54.8'
9	313°30.28	• • 47.29	302°5.99	14.1'	16°57.10	-12.1'	54.8'
10 11	328°30.34 343°30.41	46.61 45.92	316°39.09 331°12.28	14.2' 14.3'	16° 44.98 16° 32.80	-12.2' -12.2'	54.8' 54.8'
12	358°30.48	N16°45.23	345° 45.54	14.3'	N16° 20.56	-12.3	54.8'
13	13°30.55	44.55	$0^{\circ}18.88$	14.4'	$16^{\circ}8.26$	-12.4'	54.8'
14	28°30.61 43°30.68	43.86	14°52.30 29°25.80	14.5'	15°55.90 15°43.49	-12.4'	54.7'
15 16	43°30.68 58°30.75	· · 43.18 42.49	43° 59.37	14.6' 14.6'	15° 43.49 15° 31.01	-12.5' -12.5'	54.7' 54.7'
17	73°30.82	41.80	58° 33.02	14.7'	15° 18.49	-12.6'	54.7'
18	88°30.89	N16°41.11	73°6.74	14.8'	N15°5.90	-12.6'	54.7'
19 20	103°30.96 118°31.02	40.42 39.73	87° 40.54 102° 14.41	14.9' 14.9'	14°53.27 14°40.58	-12.7'	54.7' 54.7'
21	133°31.09	• • 39.04	116° 48.35	15.0'	14° 40.36	-12.7	54.6
22	148°31.16	38.35	131°22.36	15.1'	$14^{\circ}15.05$	-12.8'	54.6'
23	163°31.23	37.66	145°56.44	15.2'	14°2.21	-12.9'	54.6'
	SD = 15.8'	d = -0.7'		SI	O = 15.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	178°31.30	N16°36.97	160°30.59	15.2'	N13°49.32	-12.9'	54.6'
1	193°31.37	36.28	$175^{\circ}4.81$	15.3'	13°36.39	-13.0'	54.6'
2	208°31.45 223°31.52	35.59 •• 34.90	189°39.09 204°13.45	15.4' 15.4'	13°23.41 13°10.39	-13.0' -13.1'	54.6' 54.6'
3 4	238°31.59	34.20	204 13.45 218° 47.86	15.4 15.5'	13 10.39 12°57.32	-13.1'	54.5'
5	253°31.66	33.51	233°22.34	15.5'	12°44.20	-13.2'	54.5'
6	268°31.73	N16° 32.82	247°56.89	15.6'	N12°31.05	-13.2'	54.5'
7 8	283°31.80 298°31.88	32.12 31.43	262°31.50 277°6.17	15.7' 15.7'	12°17.86 12°4.62	-13.2' -13.3'	54.5' 54.5'
9	313°31.95	30.73	277 0.17 291° 40.90	15.7	12 4.02 11°51.34	-13.3'	54.5'
10	328°32.02	30.04	$306^{\circ}15.69$	15.8'	11°38.03	-13.4'	54.5'
11	343°32.09	29.34	320° 50.53	15.9'	11°24.68	-13.4'	54.5'
12 13	358°32.17 13°32.24	N16°28.64 27.95	335°25.44 350°0.40	16.0' 16.0'	N11°11.29 10°57.87	-13.4' -13.5'	54.4' 54.4'
14	28°32.32	27.25	4°35.42	16.1'	10° 44.42	-13.5'	54.4
15	43°32.39	• • 26.55	19° 10.49	16.1'	10°30.93	-13.5'	54.4'
16 17	58°32.46 73°32.54	25.85 25.15	33°45.62 48°20.80	16.2' 16.2'	10°17.40 10°3.85	-13.6' -13.6'	54.4' 54.4'
17	73°32.54 88°32.61	25.15 N16° 24.46	48° 20.80 62° 56.03	16.2	N09° 50.26	-13.6'	54.4'
19	103°32.69	23.76	77°31.31	16.3'	09°36.65	-13.6'	54.4'
20	118°32.76	23.06	92°6.64	16.4'	09°23.00	-13.7'	54.3'
21 22	133°32.84 148°32.92	· · 22.35 21.65	106° 42.02 121° 17.45	16.4' 16.5'	09°9.33 08°55.63	-13.7' -13.7'	54.3' 54.3'
23	148 32.92 163°32.99	20.95	121 17.45 135°52.92	16.5	08°55.03	-13.7 -13.8'	54.3'
	SD = 15.8'	d = -0.7'			D = 14.9'		-

Lat. Naut. Civil Sunrise Sunset Civil N 72° //// //// 00:48 23:08 //// N 70° //// //// 02:01 22:06 //// 68° //// 01:19 03:03 21:07 22:45 64° //// 02:04 03:22 20:47 22:04 62° ///// 02:32 03:38 20:32 21:36 60° 01:11 02:54 03:51 20:19 21:16 N 58° 01:52 03:11 04:03 20:08 20:59 56° 02:18 03:26 04:12 19:58 20:45 54° 02:39 03:38 04:21 19:50 20:33 52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	Naut.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ivaut.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	////
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	////
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	////
62° //// 02:32 03:38 20:32 21:36 60° 01:11 02:54 03:51 20:19 21:16 N 58° 01:52 03:11 04:03 20:08 20:59 56° 02:18 03:26 04:12 19:58 20:45 54° 02:39 03:38 04:21 19:50 20:33 52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	////
60° 01:11 02:54 03:51 20:19 21:16 N 58° 01:52 03:11 04:03 20:08 20:59 56° 02:18 03:26 04:12 19:58 20:45 54° 02:39 03:38 04:21 19:50 20:33 52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	////
N 58° 01:52 03:11 04:03 20:08 20:59 56° 02:18 03:26 04:12 19:58 20:45 54° 02:39 03:38 04:21 19:50 20:33 52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	////
56° 02:18 03:26 04:12 19:58 20:45 54° 02:39 03:38 04:21 19:50 20:33 52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	22:54
54° 02:39 03:38 04:21 19:50 20:33 52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	22:16
52° 02:55 03:48 04:29 19:42 20:22 50° 03:09 03:58 04:36 19:35 20:13	21:51
50° 03:09 03:58 04:36 19:35 20:13	21:31
	21:15
450 00.00 04.17 04.50 10.01 10.54	21:02
45° 03:36 04:17 04:50 19:21 19:54	20:35
N 40° 03:56 04:33 05:02 19:09 19:39	20:15
35° 04:12 04:45 05:13 18:59 19:26	19:59
30° 04:25 04:56 05:22 18:50 19:15	19:46
20° 04:46	19:25
N 10° 05:02 05:28 05:50 18:22 18:44	19:09
0° 05:16 05:41 06:03 18:09 18:31	18:56
S 10° 05:27	18:45
20° 05:38	18:34
30° 05:49 06:17 06:42 17:30 17:55	18:24
35° 05:54 06:24 06:51 17:22 17:48	18:19
40° 05:59 06:32 07:00 17:12 17:41	18:13
45° 06:05 06:40 07:11 17:01 17:32	18:08
\$ 50° 06:11 06:50 07:25 16:48 17:23	18:01
52° 06:14 06:54 07:31 16:42 17:18	17:59
54° 06:17 06:59 07:38 16:35 17:13	17:56
56° 06:20 07:05 07:45 16:27 17:08	17:53
58° 06:23 07:10 07:54 16:19 17:02	17:50
S 60° 06:26 07:17 08:04 16:09 16:56	17:46

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°			04:29		22:37	21:49
N 70°		02:22	04:54	23:10	22:10	21:36
68°		03:06	05:13	22:24	21:49	21:26
66°	01:15	03:35	05:27	21:54	21:33	21:17
64°	02:01	03:57	05:40	21:31	21:19	21:09
62°	02:31	04:14	05:50	21:13	21:08	21:03
60°	02:53	04:29	05:58	20:58	20:58	20:57
N 58°	03:12	04:41	06:06	20:45	20:49	20:52
56°	03:27	04:51	06:13	20:34	20:42	20:48
54°	03:40	05:01	06:19	20:24	20:35	20:44
52°	03:51	05:09	06:24	20:15	20:29	20:40
50°	04:01	05:16	06:29	20:07	20:23	20:37
45°	04:22	05:32	06:39	19:50	20:11	20:29
N 40°	04:39	05:45	06:48	19:36	20:01	20:23
35°	04:53	05:55	06:55	19:24	19:53	20:18
30°	05:06	06:05	07:01	19:13	19:45	20:13
20°	05:27	06:21	07:13	18:55	19:32	20:05
N 10°	05:45	06:35	07:22	18:39	19:20	19:58
0°	06:02	06:48	07:31	18:24	19:09	19:51
S 10°	06:18	07:01	07:40	18:09	18:58	19:44
20°	06:36	07:15	07:50	17:53	18:46	19:37
30°	06:57	07:31	08:00	17:34	18:32	19:28
35°	07:09	07:40	08:07	17:23	18:24	19:23
40°	07:22	07:50	08:14	17:11	18:15	19:17
45°	07:39	08:02	08:22	16:56	18:05	19:11
S 50°	07:58	08:17	08:32	16:37	17:51	19:03
52°	08:08	08:24	08:36	16:29	17:45	18:59
54°	08:18	08:31	08:41	16:19	17:39	18:55
56°	08:30	08:40	08:46	16:07	17:31	18:51
58°	08:44	08:49	08:53	15:55	17:22	18:46
S 60°	08:59	09:00	08:59	15:39	17:12	18:40

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-2%	
04	06:07	06:04	12:06	12:13	-:-		
05	06:01	05:58	12:06	12:59	00:36		
06	05:55	05:51	12:06	13:41	01:20		

h	Aries	Ve:	•	.ш, т.п, М	ars	Jup	oiter	Sat	urn		Stars
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	316°0.54	161°9.15	N12°1.62	245° 48.92	N21°40.98	241°43.94	N21°57.32	325°57.15	S06° 35.40		
1	331°3.01	176°8.69	12°0.50	260°49.62	41.24	256°45.95	57.36	340°59.75	35.47	Alpheratz	357°34.89
2	346°5.47	191°8.24	11°59.39	275°50.31	41.49	271°47.96	57.41	356°2.34	35.53	Ankaa	353°7.19
3	1°7.93	206°7.78	58.27	290°51.01	• • 41.75	286°49.97	57.45	11°4.93	• • 35.59	Schedar	349°31.14
4	16° 10.40	221°7.32	57.15	305°51.70	42.01	301°51.99	57.50	26°7.52	35.66	Diphda	348°47.44
5	31° 12.86	236°6.86	56.03	320°52.40	42.27	316°54.00	57.54	41°10.12	35.72	Achernar	335°20.21
6	46° 15.33	251°6.41	N11°54.92	335°53.10	N21°42.53	331°56.02	N21°57.59	56°12.71	S06°35.78	Hamal	327°51.51
7	61° 17.79	266°5.95	53.80	350°53.79	42.79	346°58.03	57.63	71°15.31	35.85	Polaris	314° 13.57
8	76°20.26	281°5.49	52.68	5°54.49	43.05	2°0.04	57.68	86°17.90	35.91	Acamar	315°12.02
9	91°22.72	296°5.04	• • 51.56	20°55.19	• • 43.30	17° 2.06	• • 57.72	101°20.49	• • 35.97	Menkar	314°6.51
10	106°25.18	311°4.58	50.44	35°55.88	43.56	32°4.07	57.77	116°23.09	36.04	Mirfak	308°28.82
11	121°27.65	326°4.13	49.32	50° 56.58	43.82	47° 6.09	57.81	131°25.68	36.10	Aldebaran	290°40.16
12	136°30.11	341°3.67	N11°48.19	65°57.28	N21°44.07	62°8.10	N21°57.85	146°28.27	506°36.16	Rigel	281°4.38
13	151°32.58	356°3.22	47.07	80°57.98	44.33	$77^{\circ}10.12$	57.90	161°30.87	36.23	Capella	280°22.67
14	166°35.04	11°2.76	45.95	95°58.67	44.59	92°12.13	57.94	176°33.46	36.29	Bellatrix	278°23.44 278°2.53
15	181°37.50	26°2.31	• • 44.83	$110^{\circ}59.37$	• • 44.84	$107^{\circ}14.15$	• • 57.99	191°36.06	• • 36.35	Elnath Alnilam	276 2.53 275°38.29
16	196°39.97	41°1.86	43.70	$126^{\circ}0.07$	45.10	$122^{\circ}16.17$	58.03	206°38.65	36.42	Betelgeuse	270°52.69
17	211°42.43	56°1.41	42.58	141°0.77	45.35	$137^{\circ}18.18$	58.08	221°41.25	36.48	Canopus	263°52.97
18	226°44.90	71°0.95	N11°41.45	$156^{\circ}1.46$	N21°45.61	152°20.20	N21°58.12	236°43.84	S06°36.54	Sirius	258°26.82
19	241°47.36	86°0.50	40.33	171°2.16	45.86	167°22.21	58.16	251°46.44	36.61	Adhara	255°6.46
20	256° 49.82	101°0.05	39.20	186°2.86	46.11	182°24.23	58.21	266°49.03	36.67	Procyon	244°51.50
21	271°52.29	115°59.60	• • 38.08	201°3.56	• • 46.37	197°26.25	• • 58.25	281°51.63	• • 36.74	Pollux	
22	286° 54.75	130°59.15	36.95	216°4.26	46.62	212°28.27	58.30	296°54.22	36.80	Avior	234°15.54
23	301°57.22	145°58.70	35.82	231°4.96	46.87	227°30.28	58.34	311°56.82	36.86	Suhail	222°47.03
Mer	pass. 02:55	ν -0.5' d-1	.1′ m-3.86	$\nu 0.7' d0$.3′ m0.84	$\nu^2 0' d0$.0′ m-2.14	$\nu^2 6' d0$.1′ m0.72	Miaplacidus	221°39.35
		- 0.5 G I								Alphard	217°48.42
										Regulus	207°35.12
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.96
0	316°59.68	160°58.25	N11°34.70	246° 5.65	N21°47.13	242°32.30	N21°58.38	326°59.41	S06°36.93	Denebola	182°25.53
1	332°2.14	175°57.80	33.57	261°6.35	47.38	257°34.32	58.43	342°2.01	36.99	Gienah	175°44.16
2	347°4.61	190°57.35	32.44	276°7.05	47.63	272°36.34	58.47	357°4.60	37.06	Acrux	173°0.97
3	2°7.07	205°56.90	• • 31.31	291°7.75	• • 47.88	287°38.35	• • 58.52	12°7.20	• • 37.12	Gacrux	171°52.42
4	17°9.54	220°56.46	30.18	306°8.45	48.13	302°40.37	58.56	27°9.80	37.18	Alioth	166°13.52
5	32°12.00	235°56.01	29.05	321°9.15	48.38	317°42.39	58.60	42°12.39	37.25	Spica	158°22.79
6	47° 14.46	250°55.56	N11°27.92	336°9.85	N21°48.63	332°44.41	N21°58.65	57°14.99	S06°37.31	Alkaid	152°52.39
7	62° 16.93	265°55.12	26.79	351°10.55	48.88	347°46.43	58.69	72°17.58	37.38	Hadar	148°36.67
8	77° 19.39	280°54.67	25.65	6°11.24	49.13	2°48.45	58.73	87°20.18	37.44	Menkent	147°58.12
9	92°21.86	295°54.22	• • 24.52	21°11.94	• • 49.38	17°50.47	• • 58.78	102°22.78	• • 37.51	Arcturus	145°48.28
10	107°24.32	310°53.78	23.39	36° 12.64	49.63	32°52.49	58.82	117°25.37	37.57	Rigil Kent.	139°40.87
11	122°26.78	325°53.33	22.25	51°13.34 66°14.04	49.88 N21°50.13	47°54.50	58.86	132°27.97	37.63	Kochab	$137^{\circ}19.75$
12	137° 29.25 152° 31.71	340°52.89	N11°21.12			62°56.52	N21°58.91	147°30.57	\$06° 37.70	Zuben'ubi	136°56.40
13 14	167°34.18	355°52.45 10°52.00	19.98 18.85	81°14.74 96°15.44	50.38 50.62	77°58.54 93°0.56	58.95 58.99	162°33.16 177°35.76	37.76 37.83	Alphecca	126°3.96
14 15	182° 36.64	25° 51.56	10.05	90 15.44 111°16.14	50.87	93 0.50 108°2.59	59.04	177 35.76 192°38.36	• • 37.89	Antares	$112^{\circ}16.11$
16	197°39.10	40°51.12	16.58	111 10.14 126° 16.84	51.12	106 2.59 123°4.61	59.04	207°40.96	37.89	Atria	107°10.36
17	212°41.57	55° 50.67	15.44	141° 17.54	51.12	138° 6.63	59.08	207 40.90 222°43.55	38.02	Sabik	102°2.98
18	227°44.03		N11°14.30	156° 18.24	N21°51.61	150° 0.05	N21°59.17	237°46.15	506° 38.09	Shaula	96°10.57
19	242°46.50	85°49.79	13.17	171° 18.94	51.86	168°10.67	59.21	252°48.75	38.15	Rasalhague	95°58.65
20	257° 48.96	100°49.35	12.03	186° 19.64	52.10	183°12.69	59.25	267°51.35	38.22	Eltanin	90°41.97
21	272°51.43	115°48.91	. 10.89	201°20.34	52.35	198°14.71	59.30	282°53.94	38.28	Kaus Aust.	83°32.65
22	287°53.89	130°48.47	9.75	216°21.04	52.60	213°16.73	59.34	297°56.54	38.35	Vega	80°33.11
23	302°56.35	145°48.03	8.61	231°21.75	52.84	228°18.76	59.38	312°59.14	38.41	Nunki	75°47.86
										Altair	61°59.97
Mer.p	pass. 02:52	ν -0.4′ d-1	.1' m-3.86	$ u 0.7' \ d0$.3′ m0.83	$\nu 2.0' d0$.0′ m-2.14	ν 2.6′ d 0	.1' m 0.72	Peacock	53°5.65
										Deneb	49°25.59
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.81
0	317°58.82	160°47.59	N11°7.47	246°22.45	N21°53.08	243°20.78	N21°59.43	328°1.74	S06°38.48	Al Na'ir	27°32.86 15°14.55
1	333°1.28	175°47.15	6.33	261°23.15	53.33	258°22.80	59.47	343°4.34	38.54	Fomalhaut Scheat	15° 14.55 13° 45.23
2	348°3.75	190°46.71	5.19	276°23.85	53.57	273°24.82	59.51	358°6.93	38.61	Markab	13° 45.25 13° 29.96
3	3°6.21	205°46.27	• • 4.05	291°24.55	• • 53.82	288°26.85	• • 59.55	13°9.53	• • 38.67	IVIAINAD	13 29.90
4	18°8.67	220°45.83	2.90	$306^{\circ}25.25$	54.06	303°28.87	59.60	28°12.13	38.74	Aug 07 Wed	SHA
5	$33^{\circ}11.14$	235°45.40	1.76	321°25.95	54.30	318°30.89	59.64	43°14.73	38.80	Venus	205°8.61
6	48° 13.60	250°44.96	N11°0.62	336° 26.65	N21°54.55	333°32.92	N21°59.68	58°17.33	S 06°38.87	Mars	289°48.38
7	$63^{\circ}16.07$	265°44.52	10°59.47	351°27.36	54.79	348°34.94	59.72	73°19.93	38.93	Jupiter	285°43.39
8	$78^{\circ}18.53$	280°44.09	58.33	6°28.06	55.03	3°36.96	59.77	88°22.53	39.00	Saturn	9°56.61
9	93°20.99	295°43.65	•• 57.18	21°28.76	• • 55.27	18°38.99	•• 59.81	103°25.13	• • 39.06	Aug 08 Thu	SHA
10	$108^{\circ}23.46$	$310^{\circ}43.22$	56.04	$36^{\circ}29.46$	55.51	33°41.01	59.85	118°27.73	39.13	Venus	
11	123°25.92	325°42.78	54.89	51°30.16	55.75	48°43.04	59.89	133°30.32	39.19	Mars	203 56.57 289°5.97
12	138°28.39	340°42.35		66°30.87	N21°55.99	63°45.06	N21°59.94		S06°39.26		285°32.62
13	153°30.85	355°41.91	52.60	81°31.57	56.23	78°47.09	21°59.98	163°35.52	39.32	Saturn	9°59.73
14	168°33.31	10°41.48	51.45	96°32.27	56.47	93°49.11	0.02	178°38.12	39.39	Jatuill	
15	183°35.78	25°41.04	• • 50.30	111°32.97	56.71	108°51.14	• • 0.06	193°40.72	• • 39.45	Aug 09 Fri	SHA
16	198°38.24	40°40.61	49.16	126°33.68	56.95	123°53.16	0.11	208°43.32	39.52	I	202°48.77
17	213°40.71	55°40.18	48.01	141°34.38	57.19	138°55.19	0.15	223°45.92	39.58	1	288°23.63
18	228°43.17		N10°46.86	156° 35.08	N21°57.43	153°57.21	N22°0.19		S06°39.65	Jupiter	
19	243° 45.63	85°39.32	45.71	171°35.78	57.67	168°59.24	0.23	253°51.12	39.72	Saturn	10°2.92
20	258°48.10	100°38.88	44.56	186°36.49	57.91	184° 1.27	0.28	268°53.72	39.78	Horizon	ntal parallax
21	273°50.56	115° 38.45	• • 43.41	201°37.19	58.14	199°3.29	• • 0.32	283°56.32	• • 39.85	HUHZUI	Venus:
22	288° 53.03	130°38.02	42.26	216°37.89	58.38	214°5.32	0.36	298°58.92	39.91		venus: Mars:
23	303°55.49	145°37.59	41.10	231°38.60	58.62	229°7.35	0.40	314°1.52	39.98		ividi 5.
Mer.	pass. 02:48	ν -0.4′ d-1	.1′ m-3.86	$ u$ 0.7 $^{\prime}$ d0	.2′ m0.83	ν 2.0′ d0.	.0′ m-2.15	$\nu 2.6' \ d0$.1' m 0.71		

Dec 29°13.53

-42°10.09

56°40 16

-17°50.92

-57°6.38

23°34.69

 $89^{\circ}21.75$

-40°12.04

49°56.73

16°33.55

-8°10.22

46°1.24

 $6^{\circ}22.42$

28°37.66

 $-1^{\circ}11.03$

 $7^{\circ}24.80$

-52°42.23

-16°44.80

 $-29^{\circ}0.11$

 $27^{\circ}58.07$

-59°35.14

-43°31.80 -69°49.01

-8°45.79

11°50.96

61°37.31

 $14^{\circ}26.23$

-17°40.69

-63°14.31

-57°15.22

55°49.86

-11°17.35

49°11.71

-60°29.72

-36°29.57

19°3.44

-60°56.45

74°3.53

-16°8.65

26°38.10

-26°29.25

-69°4.52 -15°45.32

-37°7.38

 $12^{\circ}32.63$

51°29.30

-34°22.42

38°48.51

-26°15.97

8°56.07

-56°39.34

 $45^{\circ}22.11$

-46°50.39

-29°29.36

28°12.96

15°20.29

Mer.pass

13:16

07:36

07:52

02:16

13:17

07:35

07:49

02:12

07:34

07:46

02:08

0.1

0.1

Mer.pass 13:17

Mer.pass

 $9^{\circ}59.32$

 $5^{\circ}9.83$

4°11.26

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.07	N16°20.25	150°28.44	16.6'	N08°28.15	-13.8'	54.3'
1	193°33.15	19.55	165°4.00	16.6'	08°14.37	-13.8'	54.3'
2	208°33.22	18.84	179°39.61	16.6'	08°0.57	-13.8'	54.3'
3	223°33.30	• • 18.14	194°15.26	16.7'	07°46.75	-13.8'	54.3'
4	238°33.38	17.44	208°50.95	16.7'	07°32.90	-13.9'	54.3'
5	253°33.46	16.73	223°26.68	16.8'	07°19.03	-13.9'	54.3'
6	268°33.53	$N16^{\circ}16.03$	238°2.45	16.8'	N07°5.14	-13.9'	54.2'
7	283°33.61	15.32	252°38.25	16.8'	06°51.23	-13.9'	54.2'
8	298°33.69	14.62	267°14.10	16.9'	06°37.31	-13.9'	54.2'
9	313°33.77	• • 13.91	281°49.98	16.9'	06°23.36	-14.0'	54.2'
10	328°33.85	13.20	296°25.89	16.9'	06°9.40	-14.0'	54.2'
11	343°33.93	12.50	311°1.84	17.0'	05°55.42	-14.0'	54.2'
12	358°34.01	N16°11.79	325°37.82	17.0'	N05°41.42	-14.0'	54.2'
13	13°34.09	11.08	340°13.84	17.0'	05°27.41	-14.0'	54.2'
14	28°34.17 43°34.25	10.37	354°49.88 9°25.95	17.1'	05°13.39 04°59.35	-14.0'	54.2'
15 16	43 34.25 58°34.33	•• 9.66 8.95	9 25.95 24°2.06	17.1' 17.1'	04 59.35 04°45.30	-14.1' -14.1'	54.2' 54.2'
17	73°34.41	8.25	38°38.18	17.1	04°45.30	-14.1'	54.2'
18	88°34.49	N16°7.53	53°14.34	17.2'	N04°17.16	-14.1'	54.1'
19	103°34.57	6.82	67°50.52	17.2'	04°3.07	-14.1'	54.1'
20	118°34.65	6.11	82°26.73	17.2'	03°48.98	-14.1'	54.1
21	133°34.74	5.40	97°2.95	17.3'	03°34.88	-14.1'	54.1'
22	148°34.82	4.69	111°39.20	17.3'	03°20.77	-14.1'	54.1'
23	163°34.90	3.98	126°15.48	17.3'	03°6.65	-14.1'	54.1'
	SD = 15.8'	d = -0.7'			D = 14.8'		
	טט = 15.8′	u = -0.7		51	7 = ۱4.8		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.98	N16°3.26	140°51.77	17.3'	N02°52.52	-14.1'	54.1'
1	193°35.07	2.55	155°28.08	17.3'	02°38.39	-14.1'	54.1'
2	208°35.15	1.84	170°4.40	17.3'	02°24.25	-14.1'	54.1'
3	223°35.23	• • 1.12	184°40.75	17.4'	02°10.11	-14.1'	54.1'
4	238°35.32	$16^{\circ}0.41$	199°17.11	17.4'	01°55.96	-14.1'	54.1'
5	253°35.40	15°59.69	213°53.48	17.4'	01°41.81	-14.2'	54.1'
6	268°35.48	N15°58.98	228°29.87	17.4'	N01°27.66	-14.2'	54.1'
7	283°35.57	58.26	243°6.26	17.4'	01°13.51	-14.2'	54.1'
8	298°35.65	57.54	257°42.67	17.4	00°59.36	-14.2'	54.1'
9	313°35.74	• • 56.83	272°19.09	17.4'	00°45.20	-14.2'	54.1'
10 11	328°35.82 343°35.91	56.11 55.39	286°55.52 301°31.96	17.4' 17.4'	00°31.05 00°16.90	-14.2' -14.2'	54.1' 54.1'
12	358°36.00	N15°54.67	316°8.40	17.4	N00°2.75	-14.2	54.1
13	13°36.08	53.96	330°44.85	17.5	S00°11.40	14.1	54.1
14	28°36.17	53.24	345°21.30	17.5'	00°25.55	14.1'	54.0'
15	43°36.26	52.52	359°57.76	17.5'	00°39.69	14.1'	54.0'
16	58°36.34	51.80	14°34.22	17.5'	00°53.83	14.1'	54.0'
17	73°36.43	51.08	29°10.68	17.5'	01°7.96	14.1'	54.0'
18	88°36.52	N15°50.36	43°47.14	17.5'	S01°22.08	14.1'	54.0'
19	103°36.60	49.63	58°23.60	17.5'	01°36.20	14.1'	54.0'
20	118°36.69	48.91	73°0.06	17.5'	01°50.31	14.1'	54.0'
21	133°36.78	• • 48.19	87°36.51	17.4'	02°4.42	14.1'	54.0'
22	148°36.87	47.47	102°12.96	17.4'	02°18.51	14.1'	54.0'
23	163°36.96	46.74	116°49.40	17.4'	02°32.60	14.1'	54.0'
	SD = 15.8'	d = -0.7'		SI	O = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.05 193°37.14	N15°46.02 45.30	131°25.84 146°2.27	17.4' 17.4'	\$02°46.67 03°0.74	14.1' 14.1'	54.0' 54.0'
1 2	193°37.14 208°37.23	45.30 44.57	146° 2.27 160° 38.69	17.4 17.4'	03°0.74 03°14.79	14.1 14.0'	54.0'
3	208 37.23 223°37.31	· · 43.85	100 38.09 175°15.10	17.4 17.4'	03 14.79 03°28.83	14.0'	54.0'
3 4	238°37.40	43.05	175 15.10 189°51.50	17.4'	03°42.86	14.0'	54.0'
5	253°37.50	42.40	204°27.89	17.4	03°56.88	14.0'	54.0'
6	268°37.59	N15°41.67	219°4.27	17.4'	S04°10.88	14.0'	54.0'
7	283°37.68	40.94	233°40.63	17.3'	04°24.86	14.0'	54.0'
8	298°37.77	40.22	248°16.97	17.3'	04°38.83	14.0'	54.0'
9	313°37.86	• • 39.49	262°53.30	17.3'	$04^{\circ}52.79$	13.9'	54.0'
10	328°37.95	38.76	277°29.61	17.3'	05°6.73	13.9'	54.0'
11	343°38.04	38.03	292°5.90	17.3'	05°20.65	13.9'	54.0'
12	358°38.13	N15°37.31	306°42.17	17.3'	S05°34.55	13.9'	54.0'
13	13°38.23	36.58	321°18.42	17.2'	05°48.43	13.9'	54.0'
14	28°38.32	35.85 · · 35.12	335°54.65	17.2'	06°2.29	13.8'	54.0'
15 16	43°38.41 58°38.50	00.12	350°30.86 5°7.04	17.2'	06°16.14 06°29.96	13.8'	54.1'
16 17	58°38.50 73°38.60	34.39 33.65	5°7.04 19°43.20	17.2' 17.1'	06°29.96 06°43.76	13.8' 13.8'	54.1' 54.1'
18	73°38.60 88°38.69	33.05 N15°32.92	19°43.20 34°19.32	17.1'	506°57.54	13.8'	54.1'
19	103°38.79	32.19	48°55.43	17.1'	07°11.29	13.7	54.1'
20	118°38.88	31.46	63°31.50	17.0'	07°11.29	13.7'	54.1'
21	133°38.97	30.73	78°7.54	17.0'	07°38.73	13.7'	54.1'
22	148°39.07	29.99	92°43.55	17.0'	07°52.41	13.7'	54.1'
23	163°39.16	29.26	107°19.53	16.9'	08°6.07	13.6'	54.1'
	SD = 15.8'	d = -0.7'		SI	D = 14.7'		
	32 - 13.0			- 31			

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	////	01:30	22:33	////	////
N 70°	////	////	02:20	21:46	////	////
68°	////	////	02:51	21:17	23:31	////
66°	////	01:42	03:14	20:55	22:23	////
64°	////	02:18	03:32	20:37	21:49	////
62°	////	02:44	03:46	20:23	21:25	23:35
60°	01:32	03:03	03:58	20:11	21:06	22:34
N 58°	02:05	03:19	04:09	20:01	20:50	22:03
56°	02:28	03:32	04:18	19:52	20:37	21:40
54°	02:47	03:44	04:26	19:44	20:26	21:22
52°	03:02	03:54	04:33	19:37	20:16	21:08
50°	03:15	04:03	04:40	19:30	20:07	20:55
45°	03:40	04:21	04:54	19:17	19:49	20:30
N 40°	04:00	04:36	05:05	19:05	19:35	20:11
35°	04:15	04:48	05:15	18:56	19:23	19:56
30°	04:27	04:58	05:23	18:47	19:13	19:43
20°	04:47	05:15	05:38	18:33	18:56	19:23
N 10°	05:03	05:29	05:51	18:21	18:42	19:08
0°	05:16	05:41	06:02	18:09	18:31	18:55
S 10°	05:27	05:52	06:14	17:58	18:19	18:45
20°	05:37	06:03	06:26	17:46	18:08	18:35
30°	05:46	06:15	06:40	17:32	17:57	18:25
35°	05:51	06:21	06:48	17:24	17:50	18:21
40°	05:56	06:28	06:57	17:15	17:43	18:16
45°	06:01	06:36	07:07	17:05	17:36	18:11
S 50°	06:07	06:45	07:20	16:52	17:27	18:05
52°	06:09	06:49	07:26	16:46	17:22	18:03
54°	06:12	06:54	07:32	16:40	17:18	18:00
56°	06:14	06:59	07:39	16:33	17:13	17:58
58°	06:17	07:04	07:47	16:25	17:08	17:55
S 60°	06:20	07:10	07:57	16:16	17:02	17:52
	1					

Lat.		Moonris	e		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	06:42	08:41	10:38	21:15	20:43	20:10
N 70°	06:53	08:42	10:30	21:10	20:46	20:21
68°	07:01	08:43	10:24	21:06	20:48	20:29
66°	07:08	08:44	10:18	21:03	20:50	20:37
64°	07:14	08:44	10:14	21:00	20:52	20:43
62°	07:19	08:45	10:10	20:58	20:53	20:48
60°	07:23	08:45	10:07	20:56	20:54	20:53
N 58°	07:27	08:46	10:04	20:54	20:56	20:57
56°	07:31	08:46	10:01	20:52	20:57	21:01
54°	07:34	08:47	09:59	20:51	20:58	21:04
52°	07:36	08:47	09:57	20:50	20:58	21:07
50°	07:39	08:47	09:55	20:48	20:59	21:10
45°	07:44	08:48	09:51	20:45	21:01	21:16
N 40°	07:49	08:48	09:47	20:43	21:02	21:21
35°	07:53	08:49	09:44	20:41	21:03	21:26
30°	07:56	08:49	09:42	20:39	21:04	21:30
20°	08:02	08:50	09:37	20:36	21:06	21:37
N 10°	08:07	08:50	09:33	20:33	21:08	21:43
0°	08:12	08:51	09:30	20:31	21:09	21:48
S 10°	08:17	08:51	09:26	20:28	21:11	21:54
20°	08:22	08:52	09:22	20:25	21:13	22:00
30°	08:27	08:53	09:18	20:22	21:14	22:07
35°	08:31	08:53	09:15	20:20	21:16	22:11
40°	08:34	08:54	09:13	20:18	21:17	22:16
45°	08:39	08:54	09:09	20:15	21:18	22:21
S 50°	08:44	08:55	09:06	20:12	21:20	22:28
52°	08:46	08:55	09:04	20:11	21:21	22:31
54°	08:49	08:55	09:02	20:09	21:21	22:34
56°	08:52	08:56	09:00	20:07	21:22	22:38
58°	08:55	08:56	08:58	20:05	21:23	22:42
S 60°	08:58	08:57	08:55	20:03	21:25	22:46
		_				

August 10, 11, 12 UT (Sat., Sun., Mon.)

h	Aries	Venu	S	Ma	ars	Jup	iter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	318° 57.95		10°39.95	246°39.30	N21°58.85	244° 9.37	N22°0.44	329°4.13	S06°40.04			
1	334°0.42	175°36.73	38.80	261°40.00	59.09	259°11.40	0.48	344°6.73	40.11	Alpheratz	357°34.88	29°13.54 -42°10.09
2	$349^{\circ}2.88$	190°36.30	37.65	$276^{\circ}40.71$	59.33	274°13.43	0.53	359°9.33	40.18	Ankaa Schedar	353°7.17 349°31.11	-42 10.09 56°40.17
3	4°5.35		• • 36.49	291°41.41	• • 59.56	289°15.45	• • 0.57	14° 11.93	• • 40.24	Diphda	348° 47.43	-17°50.92
4	19°7.81	220° 35.45	35.34	306°42.12	21°59.80	304°17.48	0.61	29° 14.53	40.31	Achernar	335°20.18	-57°6.39
5	34° 10.27	235°35.02	34.18	321°42.82	22°0.03	319°19.51	0.65	44°17.13	40.37	Hamal	327°51.50	23°34.70
6 7	49° 12.74 64° 15.20	250°34.59 N 265°34.16	10°33.03 31.87	336° 43.52 351° 44.23	N22° 0.27 0.50	334°21.54 349°23.57	N22°0.69 0.74	59° 19.73 74° 22.33	\$06°40.44 40.51	Polaris	314°12.03	$89^{\circ}21.75$
8	79° 17.67	280°33.74	30.72	6°44.93	0.50	4°25.60	0.74	89° 24.93	40.51	Acamar	315° 12.00	-40°12.04
9	94°20.13		• • 29.56	21°45.64	0.97	19°27.63	. 0.82	104°27.54	• • 40.64	Menkar	314°6.50	4°11.27
10	109°22.60	310°32.89	28.40	36°46.34	1.20	34°29.65	0.86	119°30.14	40.71	Mirfak	308°28.79	49°56.73
11	124°25.06	325°32.46	27.25	51°47.05	1.44	49°31.68	0.90	134°32.74	40.77	Aldebaran Rigel	290°40.14 281°4.37	16°33.56 -8°10.21
12	139°27.52		10°26.09	66°47.75	N22° 1.67	64°33.71	N22°0.94	149°35.34	S06°40.84	Capella	280° 22.64	46° 1.24
13	154° 29.99	355°31.61	24.93	81°48.46	1.90	79°35.74	0.98	164°37.94	40.90	Bellatrix	278°23.43	6°22.42
14	169°32.45	10°31.19	23.77	96°49.16	2.13	94°37.77	1.03	179° 40.55	40.97	Elnath	278°2.51	28°37.66
15 16	184° 34.92 199° 37.38	25°30.76 • 40°30.34	· · 22.61 21.45	111°49.87 126°50.57	· · 2.36 2.60	109°39.80 124°41.83	· · 1.07 1.11	194° 43.15 209° 45.75	•• 41.04 41.10	Alnilam	275°38.27	-1°11.03
17	214° 39.84	55°29.91	20.29	141°51.28	2.83	139°43.86	1.11	209 45.75 224° 48.35	41.10	Betelgeuse	270°52.67	$7^{\circ}24.80$
18	229°42.31		10°19.13	156° 51.98	N22° 3.06	154°45.89	N22°1.19	239° 50.95	S06°41.24	Canopus	263°52.95	-52°42.22
19	244° 44.77	85°29.07	17.97	171°52.69	3.29	169°47.93	1.23	254°53.56	41.30	Sirius	258°26.81	-16°44.79
20	259° 47.24	100°28.65	16.81	186°53.39	3.52	184°49.96	1.27	269°56.16	41.37	Adhara	255°6.45	-29°0.10
21	274°49.70	115°28.23	• 15.65	201°54.10	• • 3.75	199°51.99	• • 1.31	284°58.76	• • 41.44	Procyon	244°51.49	5°9.84
22	$289^{\circ}52.16$	130°27.80	14.48	$216^{\circ}54.81$	3.98	214°54.02	1.35	300°1.37	41.50	Pollux Avior	243°18.06 234°15.53	27°58.06 -59°35.12
23	304°54.63	145°27.38	13.32	231°55.51	4.21	229°56.05	1.40	315°3.97	41.57	Suhail	234 15.53 222° 47.03	-43°31.79
Mer	pass. 02:44	ν -0.4' d-1.2'	m-3 86	ν 0.7′ d0.	2′ m0 82	$\nu 2.0' \ d0.0$	0′ m-2 15	ν 2.6′ d0.	1′ m0 71	Miaplacidus	221°39.35	-69°48.99
	Puss. 02.11	7 0.1 0 1.2				- V Z.O GO.				Alphard	217°48.42	-8°45.79
_	6114	6114	_	6114	-	6114	_	6114	_	Regulus	207°35.12	11°50.96
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA 330° 6.57	Dec	Dubhe	193°41.97	$61^{\circ}37.30$
0 1	319° 57.09 334° 59.56	160°26.96 Ni 175°26.54	10°12.16 10.99	246°56.22 261°56.92	N22° 4.43 4.66	244°58.08 260°0.12	N22°1.44 1.48	330° 6.57 345° 9.18	\$06°41.64 41.70	Denebola	182°25.54	$14^{\circ}26.23$
2	350°2.02	175 20.54 190°26.12	9.83	201 50.92 276° 57.63	4.89	275° 2.15	1.52	0° 11.78	41.70	Gienah	175° 44.17	-17°40.68
3	5°4.48	205°25.70	• • 8.66	291°58.34	• 5.12	290° 4.18	. 1.56	15° 14.38	• • 41.84	Acrux	173°1.00	-63°14.29
4	20°6.95	220°25.29	7.50	306°59.04	5.35	305° 6.21	1.60	30° 16.99	41.90	Gacrux	171°52.44	-57°15.21
5	35°9.41	235°24.87	6.33	321°59.75	5.57	320°8.25	1.64	45° 19.59	41.97	Alioth	166° 13.54 158° 22.80	55°49.85 -11°17.34
6	$50^{\circ}11.88$	250°24.45	N10°5.16	337°0.46	N22°5.80	335°10.28	N22°1.68	60°22.19	S06°42.04	Spica Alkaid	150 22.60 152°52.41	49°11.70
7	$65^{\circ}14.34$	265°24.03	4.00	$352^{\circ}1.16$	6.03	$350^{\circ}12.31$	1.72	75°24.80	42.10	Hadar	148° 36.70	-60°29.71
8	80° 16.80	280°23.61	2.83	7°1.87	6.25	5°14.35	1.76	90°27.40	42.17	Menkent	147°58.14	-36°29.56
9	95° 19.27	295°23.20	• • 1.66	22°2.58	• • 6.48	20°16.38	• • 1.80	105°30.01	• • 42.24	Arcturus	145°48.29	19°3.44
10	110°21.73	310°22.78	10°0.49	37°3.29	6.70	35°18.42	1.84	120°32.61	42.30	Rigil Kent.	139°40.90	-60°56.44
11 12	125°24.20 140°26.66		09°59.33 09°58.16	52°3.99 67°4.70	6.93 N22°7.15	50°20.45 65°22.48	1.88 N22°1.92	135°35.21 150°37.82	42.37 \$06°42.44	Kochab	$137^{\circ}19.81$	74° 3.53
13	155° 29.13	355°21.53	56.99	82°5.41	7.38	80°24.52	1.96	165° 40.42	42.51	Zuben'ubi	136°56.42	-16°8.64
14	170°31.59	10°21.12	55.82	97°6.12	7.60	95°26.55	2.00	180°43.03	42.57	Alphecca	126°3.98	26°38.11
15	185°34.05		• • 54.65	112°6.82	• • 7.83	110°28.59	2.04	195° 45.63	• • 42.64	Antares	112°16.12	-26°29.25
16	200°36.52	40°20.29	53.48	127°7.53	8.05	125°30.62	2.08	210°48.24	42.71	Atria Sabik	107° 10.39 102° 3.00	-69°4.52 -15°45.32
17	215°38.98	55°19.87	52.30	142°8.24	8.27	140°32.66	2.13	225°50.84	42.77	Shaula	96° 10.58	-15 45.32 -37°7.38
18	230°41.45		09°51.13	157°8.95	N22°8.50	155°34.70	N22°2.17	240°53.45	S06°42.84	Rasalhague	95°58.66	12°32.64
19	$245^{\circ}43.91$	85° 19.05	49.96	172°9.66	8.72	170°36.73	2.21	255°56.05	42.91	Eltanin	90°41.98	51°29.31
20	260°46.37	100°18.63	48.79	187° 10.37	8.94	185°38.77	2.25	270°58.66	42.98	Kaus Aust.		-34°22.42
21	275°48.84		• • 47.61	202°11.08	• • 9.16	200°40.80	• • 2.29	286°1.26	• • 43.04	Vega	80°33.12	$38^{\circ}48.52$
22 23	290°51.30 305°53.77	130° 17.81 145° 17.40	46.44 45.27	217° 11.78 232° 12.49	9.38 9.61	215°42.84 230°44.88	2.33	301°3.87 316°6.47	43.11	Nunki	75° 47.87	$-26^{\circ}15.97$
	305 53.77						2.37		43.18	Altair	61°59.98	8°56.08
Mer.	pass. 02:40	ν -0.4' d-1.2'	m-3.86	ν 0.7′ d0.	2′ m0.82	$\nu 2.0' \ d0.0$	0′ m-2.15	$\nu 2.6' \ d0.$	1′ m0.70	Peacock		-56°39.35
										Deneb	49°25.59	45°22.13
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.81 27°32.85	9°59.33 -46°50.39
0	320° 56.23		09°44.09	247° 13.20	N22°9.83		N22°2.41	331°9.08	S06°43.25	Al Na'ir Fomalhaut	27 32.85 15° 14.54	-46 50.39 -29°29.37
1	335°58.69	175° 16.57	42.92	$262^{\circ}13.91$	10.05	260°48.95	2.45	$346^{\circ}11.68$	43.31	Scheat	13° 45.22	28°12.97
2	351°1.16	190°16.16	41.74	277° 14.62	10.27	275°50.99	2.49	1°14.29	43.38	Markab	13° 29.95	15°20.30
3	6°3.62		• • 40.57	292°15.33	• 10.49	290°53.03	• • 2.53	16° 16.90	• • 43.45			
4	21°6.09	220°15.34	39.39	307°16.04	10.71	305°55.06	2.56	31° 19.50	43.52	Aug 10 Sat	SHA 201°30 21	Mer.pass
5	36°8.55	235°14.93	38.21	322°16.75	10.93	320°57.10	2.60	46°22.11	43.58		201°39.21 287°41.35	13:18 07:33
6 7	51° 11.02 66° 13.48	250° 14.52 No 265° 14.12	35.86	337°17.46 352°18.17	N22°11.15 11.36	335°59.14 351°1.18	N22°2.64 2.68	61°24.71 76°27.32	\$06°43.65 43.72	Jupiter		07:33
8	81° 15.94	280° 13.71	35.86 34.68	7°18.88	11.58	6°3.22	2.08	91° 29.93	43.72	Saturn	10°6.17	02:03
9	96° 18.41		· · 33.50	7 10.00 22°19.59	• • 11.80	21°5.26	. 2.72	91 29.93 106° 32.53	• • 43.86			
10	111°20.87	310°12.89	32.32	37°20.30	12.02	36°7.30	2.80	121°35.14	43.92	Aug 11 Sun	SHA	Mer.pass
11	126°23.34	325°12.48	31.14	52°21.01	12.23	51°9.34	2.84	136°37.75	43.99		200°29.87	13:19
12	141°25.80		09°29.96		N22°12.45	66°11.38	N22°2.88	151° 40.35	S 06°44.06	Mars Jupiter	286°59.13 285°0.99	07:32 07:39
13	156°28.26	355°11.67	28.78	82°22.43	12.67	81°13.42	2.92	166° 42.96	44.13	Saturn	205 0.99 10°9.48	07:59
14	171°30.73	10°11.26	27.60	97°23.14	12.88	96°15.45	2.96	181°45.57	44.20			
15	186°33.19		• • 26.42	112°23.85	• • 13.10	111°17.50	• • 3.00	196°48.17	• • 44.26	Aug 12 Mon	SHA	Mer.pass
16	201°35.66	40°10.45	25.24	127°24.56	13.32	126°19.54	3.04	211°50.78	44.33		199°20.76	13:19
17 18	216° 38.12 231° 40.58	55°10.05 70°9.64 N	24.06 09°22.88	142°25.27 157°25.99	13.53 N22°13.75	141°21.58 156°23.62	3.08 N22°3.12	226°53.39 241°56.00	44.40 \$06°44.47		286°16.97	07:31
19	246° 43.05	85°9.24	21.69	157 25.99 172°26.70	13.96	171°25.66	3.16	256° 58.60	44.54	Jupiter Saturn	284°50.68 10°12.85	07:36 01:55
20	261°45.51	100°8.83	20.51	187°27.41	14.18	186°27.70	3.20	272°1.21	44.60	Saturn	10 12.85	01:55
21	276° 47.98		• • 19.33	202°28.12	• • 14.39	201°29.74	3.23	287°3.82	• • 44.67	Horizo	ntal parallax	
22	291°50.44	130°8.03	18.14	217°28.83	14.60	216°31.78	3.27	302°6.43	44.74		Venus:	0.1
23	$306^{\circ}52.91$	145°7.62	16.96	$232^{\circ}29.54$	14.82	231°33.82	3.31	$317^{\circ}9.03$	44.81		Mars:	0.1
Mer	pass. 02:36	ν-0.4' d-1.2'	m-3.86	ν0 7′ d0	2′ m0.81	$\nu 2.0' \ d0.0$	0′ m-2 16	$\nu 2.6' d0.$	1′ m0 70			
			5.50									

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.26	N15°28.53	$121^{\circ}55.48$	16.9'	S 08° 19.70	13.6'	54.1'
1	193°39.35	27.79	136°31.39 151°7.26	16.9'	08°33.30	13.6'	54.1'
2	208°39.45 223°39.54	27.06 •• 26.32	151°7.26 165°43.10	16.8' 16.8'	08°46.88 09°0.42	13.5' 13.5'	54.1' 54.1'
4	238°39.64	25.59	180° 18.90	16.8'	09°13.94	13.5'	54.1'
5	253°39.74	24.85	194°54.67	16.7'	09°27.42	13.5'	54.1'
6 7	268°39.83 283°39.93	N15°24.11 23.38	209°30.39 224°6.07	16.7' 16.6'	\$09°40.88 09°54.30	13.4' 13.4'	54.1' 54.1'
8	298°40.03	22.64	238° 41.71	16.6'	10°7.69	13.4	54.1
9	313°40.13	• • 21.90	253° 17.31	16.6'	$10^{\circ}21.05$	13.3'	54.2'
10	328°40.22 343°40.32	21.16 20.43	267°52.86 282°28.36	16.5' 16.5'	10° 34.37 10° 47.66	13.3' 13.3'	54.2' 54.2'
11 12	358°40.42	20.43 N15° 19.69	202 20.30 297°3.82	16.4	S11°0.92	13.2'	54.2'
13	13°40.52	18.95	311°39.23	16.4'	11° 14.13	13.2'	54.2'
14	28°40.62	18.21	326° 14.59	16.3'	11°27.32	13.1'	54.2'
15 16	43°40.72 58°40.81	· · 17.47 16.73	340°49.91 355°25.17	16.3' 16.2'	11°40.46 11°53.56	13.1' 13.1'	54.2' 54.2'
17	73°40.91	15.98	10°0.38	16.2'	12°6.63	13.0'	54.2'
18	88°41.01	N15° 15.24	24°35.53	16.1'	S12°19.66	13.0'	54.2'
19 20	103°41.11 118°41.21	14.50 13.76	39° 10.63 53° 45.68	16.0' 16.0'	12°32.64 12°45.58	12.9' 12.9'	54.3' 54.3'
21	133°41.31	. 13.02	68° 20.67	15.9'	12 45.56 12°58.48	12.9'	54.3'
22	148°41.41	12.27	82°55.60	15.9'	13°11.34	12.8'	54.3'
23	163°41.52	11.53	97°30.47	15.8'	13°24.16	12.8'	54.3'
	SD = 15.8'	d = -0.7'		SE	0 = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	178°41.62	N15° 10.79	112°5.28	15.8'	S13°36.92	12.7'	54.3'
1	193°41.72	10.04	126° 40.03	15.7'	13°49.65	12.7'	54.3'
2	208°41.82 223°41.92	9.30 •• 8.55	141° 14.72 155° 49.35	15.6' 15.6'	14°2.32 14°14.95	12.6' 12.6'	54.3' 54.4'
3 4	238°42.02	7.80	170° 23.91	15.5'	14 14.95 14°27.53	12.5'	54.4'
5	253°42.13	7.06	184°58.41	15.4'	14°40.06	12.5'	54.4'
6	268°42.23	N15°6.31	199°32.84	15.4'	\$14°52.55	12.4	54.4'
7 8	283°42.33 298°42.44	5.57 4.82	214°7.20 228°41.49	15.3' 15.2'	15° 4.98 15° 17.36	12.4' 12.3'	54.4' 54.4'
9	313°42.54	• • 4.07	243° 15.72	15.2'	15°29.68	12.3'	54.4'
10	328°42.64	3.32	257° 49.87	15.1'	15°41.96	12.2'	54.5'
11 12	343°42.75 358°42.85	2.57 N15°1.82	272°23.95 286°57.96	15.0' 14.9'	15°54.18 \$16°6.34	12.2' 12.1'	54.5' 54.5'
13	13°42.95	1.07	301°31.90	14.9'	16° 18.45	12.1	54.5'
14	28°43.06	$15^{\circ}0.32$	$316^{\circ}5.76$	14.8'	$16^{\circ}30.50$	12.0'	54.5'
15	43°43.16 58°43.27	14° 59.57	330°39.55 345°13.26	14.7'	16° 42.49 16° 54.42	11.9' 11.9'	54.5'
16 17	58° 43.27 73° 43.38	58.82 58.07	345° 13.26 359° 46.89	14.6' 14.6'	10°54.42 17°6.30	11.8'	54.5' 54.6'
18	88°43.48	N14° 57.32	14° 20.44	14.5'	S17°18.11	11.8'	54.6'
19	103°43.59	56.57	28°53.92	14.4'	17°29.86	11.7'	54.6'
20 21	118°43.69 133°43.80	55.82 •• 55.06	43°27.31 58°0.62	14.3' 14.2'	17°41.55 17°53.17	11.6' 11.6'	54.6' 54.6'
22	148°43.91	54.31	72°33.85	14.1'	18°4.73	11.5'	54.7'
23	163°44.01	53.56	87°6.99	14.1'	18° 16.22	11.4'	54.7'
	SD = 15.8'	d = -0.7'		SE	0 = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.12	$N14^{\circ}52.80$	$101^{\circ}40.05$	14.0'	S18°27.65	11.4'	54.7'
1	193°44.23 208°44.34	52.05	116° 13.03 130° 45.92	13.9'	18° 39.00 18° 50.29	11.3'	54.7'
2	208°44.34 223°44.44	51.29 •• 50.54	130°45.92 145°18.72	13.8' 13.7'	18°50.29 19°1.51	11.2' 11.1'	54.7' 54.8'
4	238°44.55	49.78	159°51.43	13.6'	$19^{\circ}12.66$	11.1'	54.8'
5	253°44.66	49.03	174°24.06	13.5'	19°23.74	11.0'	54.8'
6 7	268°44.77 283°44.88	N14° 48.27 47.51	188° 56.59 203° 29.04	13.4' 13.4'	\$19°34.74 19°45.67	10.9' 10.9'	54.8' 54.8'
8	298°44.99	46.76	218°1.39	13.3'	19°56.52	10.8'	54.9'
9	313°45.10	• • 46.00	232°33.65	13.2'	20°7.30	10.7'	54.9'
10 11	328°45.21 343°45.32	45.24 44.48	247°5.82 261°37.89	13.1' 13.0'	20° 18.00 20° 28.62	10.6' 10.5'	54.9' 54.9'
12	358°45.43	N14°43.72	276°9.87	12.9'	\$20°39.16	10.5	54.9
13	13°45.54	42.96	290°41.75	12.8'	20°49.62	10.4	55.0'
14 15	28°45.65 43°45.76	42.20 •• 41.44	305° 13.54 319° 45.23	12.7' 12.6'	21°0.00 21°10.30	10.3' 10.2'	55.0' 55.0'
15 16	43 45.76 58°45.87	40.68	319 45.23 334° 16.82	12.5'	21°10.30 21°20.51	10.2	55.0'
17	73°45.98	39.92	348°48.32	12.4'	21°30.63	10.0'	55.1'
18	88°46.09	N14°39.16	3° 19.71	12.3'	\$21°40.67	10.0'	55.1'
19 20	103°46.20 118°46.32	38.40 37.64	17°51.01 32°22.20	12.2' 12.1'	21°50.62 22°0.48	9.9' 9.8'	55.1' 55.1'
21	133°46.43	• • 36.88	46°53.30	12.0'	$22^{\circ}10.26$	9.7'	55.2'
22	148°46.54	36.11	61°24.29	11.9'	22° 19.94	9.6'	55.2'
23	163°46.65	35.35	75°55.18	11.8'	22°29.52	9.5'	55.2'
	SD = 15.8'	d = -0.8'		SE	0 = 14.9'		

N 72° N 70° 68° 66°	Naut. //// //// //// //// 01:03	Civil //// 01:10 02:01 02:32 02:54	01:58 02:37 03:04 03:25 03:41	22:06 21:28 21:03 20:43	Civil //// /// 22:50	Naut. //// ////
N 70° 68° 66°	//// //// //// 01:03	//// 01:10 02:01 02:32	02:37 03:04 03:25	21:28 21:03	////	////
68° 66°	//// //// //// 01:03	01:10 02:01 02:32	03:04 03:25	21:03		
66°	//// //// 01:03	02:01 02:32	03:25		22:50	1111
	//// 01:03	02:32		20.42		1111
	01:03		03.41	20.43	22:04	////
64°		02.54		20:27	21:35	////
			03:54	20:14	21:13	22:59
60°	01:49	03:12	04:06	20:03	20:56	22:17
N 58°	02:17	03:27	04:15	19:53	20:41	21:50
56°	02:38	03:39	04:24	19:45	20:29	21:30
54°	02:55	03:50	04:31	19:38	20:19	21:13
52°	03:09	03:59	04:38	19:31	20:10	21:00
	03:21	04:08	04:44	19:25	20:01	20:48
45°	03:45	04:25	04:57	19:12	19:44	20:24
	04:03	04:39	05:08	19:01	19:31	20:06
35°	04:18	04:50	05:17	18:52	19:19	19:52
30°	04:30	05:00	05:25	18:45	19:10	19:40
	04:49	05:16	05:39	18:31	18:54	19:21
	05:03	05:29	05:51	18:19	18:41	19:07
0°	05:15	05:40	06:02	18:09	18:30	18:55
S 10°	05:26	05:51	06:13	17:58	18:19	18:45
20°	05:35	06:01	06:24	17:46	18:09	18:35
30°	05:44	06:12	06:37	17:34	17:58	18:27
	05:48	06:18	06:44	17:26	17:52	18:22
	05:53	06:25	06:53	17:18	17:46	18:18
45°	05:57	06:32	07:03	17:08	17:39	18:14
	06:02	06:40	07:15	16:56	17:31	18:09
	06:04	06:44	07:20	16:51	17:27	18:07
	06:06	06:48	07:26	16:45	17:23	18:05
	06:09	06:53	07:33	16:38	17:18	18:03
	06:11	06:58	07:40	16:31	17:13	18:00
S 60°	06:14	07:03	07:49	16:22	17:08	17:58

Lat.		Moonris	e	Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°	12:44	15:36		19:28	18:04		
N 70°	12:24	14:40		19:50	19:02		
68°	12:09	14:06	16:59	20:07	19:37	18:17	
66°	11:56	13:43	15:50	20:21	20:02	19:28	
64°	11:46	13:24	15:14	20:33	20:21	20:05	
62°	11:37	13:09	14:49	20:43	20:38	20:31	
60°	11:30	12:56	14:29	20:52	20:51	20:52	
N 58°	11:23	12:46	14:12	20:59	21:03	21:09	
56°	11:17	12:36	13:59	21:06	21:13	21:23	
54°	11:12	12:28	13:47	21:12	21:22	21:35	
52°	11:08	12:21	13:36	21:18	21:30	21:46	
50°	11:03	12:14	13:27	21:22	21:37	21:56	
45°	10:54	12:00	13:08	21:33	21:53	22:17	
N 40°	10:47	11:48	12:52	21:42	22:06	22:34	
35°	10:41	11:38	12:39	21:50	22:17	22:48	
30°	10:35	11:30	12:27	21:57	22:26	23:00	
20°	10:25	11:15	12:08	22:09	22:43	23:22	
N 10°	10:17	11:02	11:51	22:19	22:58	23:40	
0°	10:09	10:51	11:35	22:29	23:11	23:58	
S 10°	10:01	10:39	11:19	22:39	23:25		
20°	09:53	10:26	11:03	22:49	23:40		
30°	09:44	10:12	10:44	23:01	23:57		
35°	09:39	10:04	10:33	23:08		00:07	
40°	09:33	09:55	10:20	23:16		00:19	
45°	09:26	09:44	10:05	23:26		00:32	
S 50°	09:17	09:31	09:48	23:37		00:49	
52°	09:13	09:25	09:39	23:42	•• ••	00:57	
54°	09:09	09:18	09:30	23:48		01:05	
56°	09:05	09:11	09:19	23:55	•• ••	01:15	
58°	09:00	09:02	09:07	••••	00:02	01:27	
S 60°	08:54	08:53	08:53		00:11	01:40	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	26-44%	
10	05:23	05:18	12:05	16:19	03:59		
11	05:14	05:09	12:05	17:01	04:40		
12	05:04	04:58	12:05	17:46	05:23		

August 13, 14, 15 UT (Tue., Wed., Thu.)

h	Aries	Venus		M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA D)ec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	321°55.37		°15.77	247°30.26	N22°15.03	246°35.87	N22°3.35	332°11.64	S06°44.88			
1	336° 57.83	175°6.82	14.59	262°30.97	15.24	261°37.91	3.39	$347^{\circ}14.25$	44.95	Alpheratz	357°34.86	29°13.56 -42°10.10
2	$352^{\circ}0.30$	190°6.42	13.40	$277^{\circ}31.68$	15.46	276°39.95	3.43	$2^{\circ}16.86$	45.01	Ankaa Schedar	353°7.15 349°31.08	-42 10.10 56°40.18
3	7°2.76		12.22	292°32.39	• • 15.67	291°41.99	• • 3.47	17° 19.47	• • 45.08	Diphda	348°47.41	-17°50.92
4	22°5.23	220°5.61	11.03	307°33.10	15.88	306°44.04	3.51	32°22.07	45.15	Achernar	335°20.15	-57°6.39
5	37°7.69	235°5.21	9.84 9°8.66	322°33.82	16.09 N22°16.30	321°46.08	3.55 N22°3.58	47°24.68	45.22	Hamal	327°51.47	23°34.71
6 7	52° 10.15 67° 12.62	250°4.81 N09 265°4.41	9 8.00 7.47	337°34.53 352°35.24	16.51	336°48.12 351°50.17	3.62	62°27.29 77°29.90	\$06°45.29 45.36	Polaris	314°10.28	$89^{\circ}21.75$
8	82° 15.08	280°4.01	6.28	7° 35.96	16.72	6°52.21	3.66	92°32.51	45.43	Acamar	315°11.97	-40°12.04
9	97° 17.55		5.09	22°36.67	• • 16.93	21°54.25	3.70	107°35.12	• • 45.49	Menkar	314°6.47	4°11.27
10	112°20.01	310°3.21	3.90	37°37.38	17.14	36°56.30	3.74	122°37.73	45.56	Mirfak	308°28.76 290°40.11	49°56.74 16°33.56
11	127°22.47	325°2.81	2.71	52°38.10	17.35	51°58.34	3.78	137°40.33	45.63	Aldebaran Rigel	290 40.11 281°4.34	-8° 10.21
12	142°24.94		9°1.52	67°38.81	N22°17.56	67° 0.39	N22°3.82	152° 42.94	S06°45.70	Capella	280°22.61	46°1.24
13	157°27.40		9°0.33	82°39.52	17.77	82°2.43	3.85	167° 45.55	45.77	Bellatrix	278°23.41	6°22.42
14 15	172°29.87 187°32.33		59.14	97°40.24 112°40.95	17.98	97°4.48	3.89	182°48.16 197°50.77	45.84 •• 45.91	Elnath	278°2.48	28°37.66
16	202°34.80	40°0.82	57.95 56.76	112 40.95 127°41.66	· · 18.19 18.40	112° 6.52 127° 8.57	· · 3.93 3.97	212° 53.38	•• 45.91 45.97	Alnilam	275°38.25	-1°11.03
17	217°37.26	55°0.43	55.57	142°42.38	18.60	142° 10.61	4.01	212 55.50 227°55.99	46.04	Betelgeuse	270°52.65	7°24.80
18	232°39.72		°54.37	157°43.09	N22°18.81	157°12.66	N22°4.05	242°58.60	S06°46.11	Canopus	263°52.93	-52°42.21
19	247° 42.19	84°59.64	53.18	172°43.81	19.02	172°14.71	4.08	258°1.21	46.18	Sirius Adhara	258°26.79	-16°44.79 -29°0.09
20	262°44.65	99°59.24	51.99	187°44.52	19.22	187°16.75	4.12	273°3.82	46.25	Procyon	255°6.43 244°51.48	-29°0.09 5°9.84
21	277° 47.12		50.79	202°45.24	•• 19.43	202°18.80	• • 4.16	288°6.43	• • 46.32	Pollux	244 51.46 243°18.05	27°58.06
22	292°49.58	129°58.45	49.60	217° 45.95	19.64	217°20.85	4.20	303°9.04	46.39	Avior	234°15.52	-59°35.11
23	307°52.04	144°58.05	48.41	232°46.67	19.84	232°22.89	4.24	318°11.65	46.46	Suhail	222°47.02	-43°31.78
Mer.	pass. 02:32	ν -0.4 $'$ d-1.2 $'$ m	-3.86	ν 0.7′ d0.	.2′ m0.81	ν 2.0′ d0.	0′ m-2.16	$\nu 2.6' \ d0$.1' m0.69	Miaplacidus	221°39.34	-69°48.98
										Alphard	217°48.41	-8°45.78
Wed	GHA	GHA D) ес	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°35.11	11°50.96
0	322°54.51		°47.21	247° 47.38	N22°20.05	247°24.94	N22°4.27	333°14.26	S06°46.53	Dubhe	193°41.98	61°37.29
1	337°56.97	174°57.27	46.02	262°48.10	20.25	262°26.99	4.31	348° 16.87	46.60	Denebola	182°25.55	14°26.23
2	352°59.44	189°56.87	44.82	277°48.81	20.46	277°29.04	4.35	3°19.48	46.66	Gienah Acrux	175°44.18 173°1.01	-17°40.67 -63°14.28
3	8°1.90		43.63	292°49.53	• • 20.66	292°31.08	• • 4.39	18°22.09	• • 46.73	Gacrux	173 1.01 171°52.45	-57° 15.20
4	23°4.37	219°56.09	42.43	307°50.24	20.87	307°33.13	4.43	33°24.70	46.80	Alioth	166°13.56	55°49.84
5	38°6.83	234°55.69	41.23	322°50.96	21.07	322°35.18	4.46	48°27.31	46.87	Spica	158°22.81	-11° 17.34
6	53°9.29		40.03	337°51.67	N22°21.27	337°37.23	N22°4.50	63°29.92	S06°46.94	Alkaid	152°52.43	49°11.70
7 8	68°11.76	264°54.91 279°54.52	38.84	352°52.39 7°53.11	21.48	352°39.28 7°41.33	4.54	78°32.53 93°35.14	47.01	Hadar	148°36.72	$-60^{\circ}29.71$
9	83° 14.22 98° 16.69		37.64 36.44	7 53.11 22°53.82	21.68 •• 21.88	7 41.33 22°43.38	4.58 • • 4.62	93 35.14 108°37.76	47.08 •• 47.15	Menkent	147°58.15	-36°29.56
10	113° 19.15	309°53.74	35.24	37° 54.54	22.08	37°45.43	4.65	123°40.37	47.13	Arcturus	145°48.30	19°3.44
11	128°21.61	324°53.34	34.04	52°55.26	22.28	52°47.48	4.69	138° 42.98	47.29	Rigil Kent.	139°40.92	-60°56.44
12	143°24.08		32.84	67° 55.97	N22°22.49	67°49.53	N22°4.73	153° 45.59	506°47.36	Kochab Zuben'ubi	137°19.87 136°56.43	74°3.53 -16°8.64
13	158° 26.54	354°52.56	31.64	82°56.69	22.69	82°51.58	4.77	168°48.20	47.43	Alphecca	126°3.99	26°38.11
14	173°29.01	9°52.17	30.44	$97^{\circ}57.41$	22.89	97°53.63	4.80	183°50.81	47.50	Antares	112° 16.13	-26°29.25
15	188°31.47		29.24	112°58.12	• • 23.09	112°55.68	• • 4.84	198°53.42	• • 47.57	Atria	107°10.42	-69°4.53
16	203°33.94	39°51.40	28.04	127°58.84	23.29	127°57.73	4.88	213°56.03	47.64	Sabik	102°3.00	-15°45.32
17 18	218° 36.40	54°51.01	26.84	142°59.56	23.49 N22°23.69	142°59.78	4.91	228°58.65 244°1.26	47.71 \$06°47.78	Shaula	$96^{\circ}10.59$	-37°7.38
18	233° 38.86 248° 41.33	69°50.62 N08° 84°50.23	°25.64 24.44	158°0.27 173°0.99	23.89	158° 1.83 173° 3.88	N22°4.95 4.99	244 1.26 259°3.87	47.85	Rasalhague	95°58.67	12°32.65
20	263°43.79	99°49.84	23.23	188°1.71	24.09	188° 5.93	5.03	274°6.48	47.03	Eltanin	90°42.00	51°29.32
21	278° 46.26		22.03	203°2.43	• • 24.28	203°7.98	• • 5.06	289°9.09	• • 47.98	Kaus Aust.		-34°22.42
22	293°48.72	129°49.07	20.83	218°3.15	24.48	218°10.04	5.10	$304^{\circ}11.71$	48.05	Vega Nunki	80°33.13	38°48.54 -26°15.97
23	308°51.19	144°48.68	19.62	233°3.86	24.68	233°12.09	5.14	$319^{\circ}14.32$	48.12	Altair	61°59.98	8°56.08
Meri	pass. 02:28	ν-0.4' d-1.2' m	-3 86	υ0 7' d0	.2′ m0.80	1/2 0/ d0	0′ m-2.17	1/2 6' d0	.1′ m0.69	Peacock		-56°39.36
- IVICI.	Da33. UZ.ZU	ν-0.4 U-1.2 III	-5.00		.2 1110.00	ν2.0 do.		ν2.0 do.	.1 1110.09	Deneb	49°25.59	45°22.15
					_		_		_	Enif	33°38.80	9°59.34
Thu	GHA)ec ○10.40	GHA	Dec N22°24.88	GHA 248°14.14	Dec	GHA	Dec	Al Na'ir	27°32.84	-46°50.40
0 1	323°53.65 338°56.11	159°48.30 N08° 174°47.91	°18.42 17.22	248°4.58 263°5.30	25.07	248 14.14 263°16.19	N22°5.18 5.21	334°16.93 349°19.54	\$06°48.19 48.26	Fomalhaut	15°14.53	-29°29.37
2	353° 58.58	174 47.91 189°47.53	16.01	203 5.30 278°6.02	25.07	278° 18.25	5.21	4°22.16	48.33	Scheat	13°45.21	28°12.98
3	9°1.04		14.81	293°6.74	• • 25.47	293°20.30	• • 5.29	19°24.77	• 48.40	Markab	13°29.93	15°20.31
4	24°3.51	219°46.75	13.60	308°7.46	25.66	308°22.35	5.32	34°27.38	48.47	Aug 13 Tue	SHA	Mer.pass
5	39°5.97	234°46.37	12.39	323°8.18	25.86	323°24.41	5.36	49°29.99	48.54	Venus	198°11.85	13:20
6	54°8.43		ີ 11.19		N22°26.06		N22°5.40		S06°48.61	Mars	285°34.89	07:30
7	69° 10.90	264°45.60	9.98	353°9.61	26.25	353°28.51	5.43	79°35.22	48.68	Jupiter	284°40.50	07:33
8	84° 13.36	279° 45.22	8.77	8° 10.33	26.45	8°30.57	5.47	94°37.83	48.75	Saturn	10°16.27	01:51
9	99°15.83		7.57	23°11.05	• • 26.64	23°32.62	5.51	109° 40.45	48.82	Aug 14 Wed	SHA	Mer.pass
10 11	114° 18.29 129° 20.76	309° 44.45 324° 44.07	6.36 5.15	38° 11.77 53° 12.49	26.84 27.03	38°34.68 53°36.73	5.54 5.58	124° 43.06 139° 45.67	48.89 48.96	Venus	$197^{\circ}3.15$	13:21
12	129 20.70 144°23.22		3.15 3°3.94	68° 13.21	N22°27.22	68°38.79	0.50 N22°5.62	159 45.07 154° 48.29	\$06°49.03	Mars	284°52.87	07:28
13	159° 25.68	354°43.30	2.73	83° 13.93	27.42	83°40.84	5.65	169° 50.90	49.10	Jupiter	284°30.43	07:29
14	174°28.15	9°42.92	1.52	98° 14.65	27.61	98°42.90	5.69	184°53.51	49.17	Saturn	10°19.75	01:47
15	$189^{\circ}30.61$		3°0.31	$113^{\circ}15.37$	• • 27.80	113°44.95	• • 5.73	$199^{\circ}56.13$	• • 49.24	Aug 15 Thu	SHA	Mer.pass
16	204°33.08		59.10	$128^{\circ}16.09$	28.00	128°47.01	5.76	214°58.74	49.31		195°54.65	13:21
17	219°35.54	54°41.78	57.89	143°16.81	28.19	143°49.07	5.80	230°1.35	49.39	Mars	284°10.93	07:27
18	234°38.00		56.68		N22°28.38		N22°5.84	245°3.97	S06°49.46		284°20.49	07:26
19	249°40.47	84°41.02 99°40.64	55.47 54.26	173° 18.25	28.57 28.76	173°53.18	5.87 5.01	260°6.58 275°9.20	49.53	Saturn	10°23.28	01:43
20 21	264° 42.93 279° 45.40		54.26	188° 18.98 203° 19.70	28.76 •• 28.95	188°55.24 203°57.29	5.91 •• 5.95	275°9.20 290°11.81	49.60 •• 49.67	Horizoi	ntal parallax	
22	294° 47.86	129°39.88	51.84	218° 20.42	29.14	218°59.35	5.98	305°14.43	49.07		Venus:	0.1
23	309° 50.33	144°39.50	50.62	233°21.14	29.33	234° 1.41	6.02	320° 17.04	49.81		Mars:	0.1
Mor	pass. 02:24	ν-0.4' d-1.2' m			.2′ m0.80		0′ m-2.17		.1′ m0.68			<u> </u>
ivier.	Juss. UZ.Z4	ν-0. 4 u-1.2 III	J.00	νο.ι αυ.	1110.00	ν2.1 UU.	U 111-2.11	ν2.0 d0.				

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.77	N14°34.59	90°25.97	11.7'	S22°39.02	9.4'	55.2'
1	193°46.88	33.82	104° 56.66	11.6'	22°48.42	9.3'	55.3'
2	208°46.99 223°47.11	33.06 · · 32.29	119°27.24 133°57.72	11.5' 11.4'	22°57.72 23°6.92	9.2' 9.1'	55.3' 55.3'
4	238°47.22	31.53	148°28.09	11.3'	23°16.03	9.0'	55.3'
5	253°47.34	30.76	162°58.36	11.2'	23°25.04	8.9'	55.4'
6	268°47.45	N14°29.99	177°28.53	11.1'	\$23°33.94 23°42.74	8.8'	55.4'
7 8	283°47.57 298°47.68	29.23 28.46	191°58.59 206°28.54	11.0' 10.8'	23° 42.74 23° 51.44	8.7' 8.6'	55.4' 55.5'
9	313°47.80	27.69	220°58.39	10.7'	24°0.03	8.5'	55.5'
10	328°47.91	26.93	235°28.13	10.6'	24°8.52	8.4'	55.5'
11 12	343°48.03 358°48.14	26.16 N14° 25.39	249°57.76 264°27.29	10.5' 10.4'	24°16.90 \$24°25.17	8.3' 8.2'	55.5' 55.6'
13	13°48.26	24.62	278° 56.71	10.4	24°33.33	8.0'	55.6'
14	28°48.38	23.85	293°26.02	10.2'	24°41.38	7.9'	55.6'
15	43°48.49	• • 23.08	307°55.23	10.1'	24°49.31	7.8'	55.7'
16 17	58°48.61 73°48.73	22.31 21.54	322°24.33 336°53.32	10.0' 9.9'	24°57.13 25°4.83	7.7' 7.6'	55.7' 55.7'
18	88°48.85	N14° 20.77	351°22.20	9.8'	\$25°12.42	7.5	55.7'
19	103°48.96	20.00	5°50.98	9.7'	$25^{\circ}19.89$	7.3'	55.8'
20	118°49.08	19.23	20° 19.65	9.6'	25°27.24	7.2'	55.8'
21 22	133°49.20 148°49.32	· · 18.46	34° 48.21 49° 16.67	9.5' 9.3'	25°34.47 25°41.57	7.1' 7.0'	55.8' 55.9'
23	146 49.32 163°49.44	16.91	63°45.01	9.3 9.2'	25°48.55	6.9	55.9'
	SD = 15.8'	d = -0.8'		SE	0 = 15.1'		
Wed	GHA 178°49.56	Dec N14° 16.14	GHA 78°13.26	u 9.1'	Dec \$25°55.41	d 6.7'	HP
0 1	178°49.56 193°49.68	N14°16.14 15.36	78° 13.26 92° 41.39	9.1	26°2.14	6.6'	55.9' 56.0'
2	208°49.80	14.59	107°9.42	8.9'	26°8.74	6.5	56.0'
3	223°49.91	• • 13.81	121°37.35	8.8'	26°15.22	6.3'	56.0'
4 5	238°50.03 253°50.15	13.04 12.27	136°5.17 150°32.88	8.7' 8.6'	26°21.56 26°27.77	6.2' 6.1'	56.1' 56.1'
6	268° 50.28	N14° 11.49	165°0.49	8.5'	\$26°33.85	5.9'	56.1
7	283°50.40	10.71	179°28.00	8.4'	$26^{\circ}39.79$	5.8'	56.2'
8	298°50.52	9.94	193°55.40	8.3'	26°45.60	5.7'	56.2'
9 10	313°50.64 328°50.76	· · 9.16 8.38	208°22.70 222°49.90	8.2' 8.1'	26°51.27 26°56.80	5.5' 5.4'	56.2' 56.3'
11	343°50.88	7.61	237°17.00	8.0'	20° 30.80 27° 2.19	5.3	56.3
12	358°51.00	N14°6.83	251°43.99	7.9'	\$27°7.44	5.1'	56.3'
13	13°51.12	6.05	266° 10.89	7.8'	27°12.55	5.0'	56.4
14 15	28°51.25 43°51.37	5.27 •• 4.49	280°37.68 295°4.38	7.7' 7.6'	27°17.52 27°22.34	4.8' 4.7'	56.4' 56.4'
16	58°51.49	3.71	309°30.99	7.5'	27°27.01	4.5'	56.5
17	73°51.62	2.93	323°57.49	7.4'	$27^{\circ}31.54$	4.4'	56.5'
18	88°51.74	N14°2.15	338°23.90 352°50.22	7.3'	\$27°35.91 27°40.14	4.2'	56.5'
19 20	103°51.86 118°51.99	1.37 14°0.59	7°16.44	7.2' 7.1'	27 40.14 27°44.22	4.1' 3.9'	56.6' 56.6'
21	133°52.11	13°59.81	21°42.57	7.0'	27°48.14	3.8'	56.6'
22	148°52.23	59.03	36°8.61	6.9'	27°51.91	3.6'	56.7'
23	163°52.36	58.25	50°34.56	6.9'	27°55.52	3.5'	56.7'
	SD = 15.8'	d = -0.8'		SD	0 = 15.3'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°52.48	N13°57.46	65°0.42	6.8'	S27°58.98	3.3'	56.8'
1 2	193°52.61 208°52.73	56.68 55.90	79°26.19 93°51.88	6.7' 6.6'	28°2.28 28°5.42	3.1' 3.0'	56.8' 56.8'
3	200 52.75 223°52.86	55.11	108° 17.48	6.5	28°8.40	2.8'	56.9'
4	238°52.99	54.33	122°43.00	6.4'	28°11.22	2.7'	56.9'
5	253°53.11	53.55	137°8.44	6.4'	28° 13.88	2.5'	56.9'
6 7	268°53.24 283°53.36	N13°52.76 51.98	151°33.80 165°59.07	6.3' 6.2'	\$28° 16.37 28° 18.70	2.3' 2.2'	57.0' 57.0'
8	298°53.49	51.19	180°24.28	6.1	$28^{\circ}20.87$	2.0'	57.0'
9	313°53.62	• • 50.40	194°49.40	6.1'	28°22.87	1.8'	57.1'
10 11	328°53.74 343°53.87	49.62 48.83	209°14.46 223°39.44	6.0' 5.9'	28° 24.70 28° 26.36	1.7' 1.5'	57.1' 57.2'
11	343°53.87 358°54.00	48.83 N13°48.04	223° 39.44 238° 4.35	5.8'	28° 26.36 \$28° 27.85	1.3'	57.2'
13	13°54.13	47.26	252°29.19	5.8'	$28^{\circ}29.18$	1.2'	57.2'
14	28°54.25	46.47	266°53.96	5.7'	28°30.33	1.0'	57.3'
15 16	43°54.38 58°54.51	· · 45.68 44.89	281°18.67 295°43.32	5.6' 5.6'	28°31.31 28°32.11	0.8' 0.6'	57.3' 57.3'
17	73°54.64	44.09	295 43.32 310°7.91	5.5'	28° 32.74	0.6	57.4'
18	88°54.77	N13°43.31	324°32.43	5.5'	S28°33.20	0.3'	57.4'
19	103°54.90 118°55.03	42.53	338° 56.90	5.4'	28° 33.48	0.1'	57.5'
20 21	118°55.03 133°55.16	41.73 •• 40.94	353°21.31 7°45.67	5.4' 5.3'	28° 33.59 28° 33.52	-0.1' -0.3'	57.5' 57.5'
22	148°55.29	40.15	22°9.98	5.3'	28° 33.26	-0.4	57.6'
23	163°55.42	39.36	36°34.24	5.2'	28°32.84	-0.6'	57.6'
	SD = 15.8'	d = -0.8'		SD	0 = 15.5'	_	

Lat.	Twi	light	Sunrise	C	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut
N 72°	////	////	02:21	21:43	////	////
N 70°	////	////	02:54	21:12	23:49	////
68°	////	01:39	03:17	20:49	22:23	////
66°	////	02:18	03:35	20:31	21:47	////
64°	////	02:45	03:50	20:17	21:21	23:51
62°	01:28	03:05	04:02	20:05	21:02	22:35
60°	02:04	03:21	04:13	19:55	20:46	22:02
N 58°	02:28	03:35	04:22	19:46	20:33	21:38
56°	02:47	03:46	04:30	19:38	20:21	21:20
54°	03:02	03:56	04:37	19:31	20:12	21:05
52°	03:16	04:05	04:43	19:25	20:03	20:52
50°	03:27	04:13	04:49	19:19	19:55	20:41
45°	03:49	04:29	05:01	19:07	19:39	20:19
N 40°	04:07	04:42	05:11	18:58	19:27	20:02
35°	04:20	04:53	05:20	18:49	19:16	19:48
30°	04:32	05:02	05:27	18:42	19:07	19:37
20°	04:50	05:17	05:40	18:29	18:52	19:19
N 10°	05:04	05:29	05:51	18:18	18:40	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:25	05:50	06:11	17:58	18:20	18:45
20°	05:33	05:59	06:22	17:47	18:10	18:36
30°	05:41	06:10	06:34	17:35	18:00	18:28
35°	05:45	06:15	06:41	17:28	17:55	18:24
40°	05:49	06:21	06:49	17:21	17:49	18:21
45°	05:53	06:28	06:58	17:12	17:42	18:17
S 50°	05:57	06:35	07:09	17:01	17:35	18:13
52°	05:59	06:39	07:14	16:56	17:31	18:11
54°	06:01	06:43	07:20	16:50	17:27	18:09
56°	06:03	06:47	07:26	16:44	17:23	18:07
58°	06:05	06:51	07:33	16:37	17:19	18:06
S 60°	06:07	06:56	07:41	16:29	17:14	18:04
Lat		Moonris	e		Moonset	;
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°					_	

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°	17:35			19:26		
62°	16:40	18:58		20:22	19:56	
60°	16:07	17:48	19:10	20:55	21:07	21:45
N 58°	15:43	17:13	18:27	21:20	21:42	22:28
56°	15:24	16:47	17:59	21:39	22:08	22:57
54°	15:08	16:27	17:36	21:56	22:28	23:19
52°	14:54	16:10	17:18	22:10	22:45	23:37
50°	14:42	15:56	17:02	22:22	23:00	23:53
45°	14:17	15:26	16:31	22:48	23:30	•• ••
N 40°	13:58	15:04	16:07	23:09	23:53	
35°	13:41	14:45	15:47	23:26		00:12
30°	13:27	14:29	15:30	23:41		00:29
20°	13:03	14:01	15:01		00:06	00:57
N 10°	12:43	13:38	14:36	••••	00:28	01:21
0°	12:23	13:16	14:14	••••	00:48	01:43
S 10°	12:04	12:55	13:51	00:15	01:09	02:06
20°	11:44	12:32	13:26	00:34	01:31	02:30
30°	11:21	12:05	12:58	00:56	01:56	02:58
35°	11:07	11:49	12:41	01:09	02:12	03:15
40°	10:52	11:31	12:21	01:23	02:29	03:34
45°	10:33	11:09	11:57	01:41	02:50	03:58
S 50°	10:10	10:42	11:27	02:03	03:17	04:28
52°	09:59	10:28	11:12	02:13	03:31	04:43
54°	09:47	10:13	10:54	02:25	03:46	05:01
56°	09:32	09:54	10:33	02:39	04:04	05:22
58°	09:16	09:32	10:05	02:55	04:25	05:49
S 60°	08:56	09:03	09:27	03:14	04:54	06:27

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper Lower		9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	54-73%	
13	04:53	04:47	12:05	18:36	06:10		
14	04:42	04:36	12:05	19:30	07:02		
15	04.30	04.24	12.04	20.28	07.58		

August 16, 17, 18 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	324°52.79	159°39.12 N07°49.41	248°21.86 N22°29.52	249°3.47 N22°6.05	335°19.65 S 06°49.88	
1	339°55.25	174°38.74 48.20	263°22.58 29.71	264° 5.52 6.09	350°22.27 49.95	Alpheratz 357°34.83 29°13.57 Ankaa 353°7.13 -42°10.10
2	354° 57.72	189°38.36 46.98	278°23.30 29.90	279°7.58 6.13	5°24.88 50.02	Schedar 349°31.05 56°40.20
3	10°0.18	204°37.99 · · 45.77	293°24.03 · · 30.09	294° 9.64 · · 6.16	20°27.50 · · 50.09	Diphda 348°47.39 -17°50.91
4	25°2.65	219°37.61 44.55	308°24.75 30.28	309°11.70 6.20	35°30.11 50.16	Achernar 335°20.11 -57°6.39
5	40°5.11	234°37.23 43.34	323°25.47 30.47	324°13.76 6.23	50°32.73 50.23	Hamal 327°51.44 23°34.72
6 7	55°7.58 70°10.04	249°36.86 N07°42.12 264°36.48 40.91	338°26.19 N22°30.66 353°26.91 30.84	339°15.82 N22°6.27 354°17.88 6.31	65°35.34 \$06°50.30 80°37.96 50.37	Polaris 314°8.50 89°21.76
8	85° 12.50	279°36.10 39.69	8°27.64 31.03	9°19.94 6.34	95° 40.57 50.44	Acamar 315°11.94 -40°12.03
9	100° 14.97	294°35.73 · · 38.48	23°28.36 · · 31.22	24°22.00 · · 6.38	110°43.19 · · 50.51	Menkar 314°6.44 4°11.28
10	115° 17.43	309°35.35 37.26	38°29.08 31.40	39°24.06 6.41	125° 45.80 50.58	Mirfak 308°28.72 49°56.74
11	$130^{\circ}19.90$	324°34.98 36.04	53°29.81 31.59	54°26.12 6.45	140°48.42 50.66	Aldebaran 290°40.08 16°33.56 Rigel 281°4.32 -8°10.20
12	145°22.36	339°34.60 N07°34.83	68°30.53 N22°31.78	69°28.18 N22°6.48	155°51.03 S 06°50.73	Capella 280°22.57 46°1.24
13	160°24.82	354°34.23 33.61	83°31.25 31.96	84°30.24 6.52	170°53.65 50.80	Bellatrix 278°23.38 6°22.43
14	175° 27.29	9°33.85 32.39	98°31.98 32.15	99°32.30 6.56	185° 56.27 50.87	Elnath 278° 2.45 28° 37.66
15 16	190° 29.75 205° 32.22	24°33.48 · · 31.17 39°33.10 29.95	113°32.70 · · 32.33 128°33.42 32.52	114°34.36 · · 6.59 129°36.42 6.63	200°58.88 · · 50.94 216°1.50 51.01	Alnilam 275°38.22 -1°11.02
17	200° 34.68	54°32.73 28.74	143°34.15 32.70	144°38.48 6.66	231°4.11 51.08	Betelgeuse 270°52.62 7°24.80
18	235° 37.15	69°32.36 N07°27.52	158°34.87 N22°32.89	159°40.54 N22°6.70	246°6.73 S06°51.15	Canopus 263°52.91 -52°42.19
19	250°39.61	84°31.98 26.30	173°35.60 33.07	174°42.61 6.73	261°9.35 51.22	Sirius 258°26.77 -16°44.78
20	265°42.07	99°31.61 25.08	188°36.32 33.25	189°44.67 6.77	276°11.96 51.29	Adhara 255°6.41 -29°0.08
21	280°44.54	114°31.24 · · 23.86	203°37.04 · · 33.44	204°46.73 · · 6.80	291°14.58 · · 51.37	Procyon 244°51.45 5°9.84 Pollux 243°18.02 27°58.05
22	295°47.00	129° 30.87 22.64	218° 37.77 33.62	219°48.79 6.84	306° 17.19 51.44	Avior 234°15.50 -59°35.09
23	310°49.47	144°30.50 21.41	233°38.49 33.80	234°50.86 6.88	321°19.81 51.51	Suhail 222°47.01 -43°31.76
Mer.	pass. 02:20	ν-0.4' d-1.2' m-3.86	ν0.7' d0.2' m0.79	$\nu 2.1' \ d0.0' \ \text{m-}2.18$	ν2.6' d0.1' m0.68	Miaplacidus 221°39.33 -69°48.96
		2.00				Alphard 217°48.40 -8°45.78
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.10 11°50.95
0 0	325°51.93	GHA Dec 159°30.12 N07°20.19	GHA Dec 248°39.22 N22°33.98	GHA Dec 249°52.92 N22°6.91	336°22.43 \$06°51.58	Dubhe 193°41.98 61°37.27
1	340°54.40	174°29.75 18.97	263°39.94 34.17	264°54.98 6.95	351°25.04 51.65	Denebola 182°25.54 14°26.23
2	355°56.86	189°29.38 17.75	278° 40.67 34.35	279°57.05 6.98	6°27.66 51.72	Gienah 175°44.18 -17°40.67
3	10°59.32	204°29.01 · · 16.53	293°41.39 · · 34.53	294°59.11 · · 7.02	21°30.28 · · 51.79	Acrux 173°1.02 -63°14.28 Gacrux 171°52.46 -57°15.19
4	$26^{\circ}1.79$	219°28.64 15.30	308° 42.12 34.71	310° 1.18 7.05	36°32.89 51.86	Alioth 166°13.57 55°49.83
5	41°4.25	234°28.27 14.08	323°42.84 34.89	325° 3.24 7.09	51°35.51 51.94	Spica 158°22.81 -11°17.34
6	56°6.72	249°27.90 N07°12.86	338°43.57 N22°35.07	340°5.30 N22°7.12	66°38.13 S 06°52.01	Alkaid 152°52.44 49°11.69
7	71°9.18	264°27.53 11.63	353°44.30 35.25	355°7.37 7.16	81°40.75 52.08	Hadar 148°36.74 -60°29.70
8	86° 11.64	279°27.16 10.41	8°45.02 35.43	10°9.43 7.19	96°43.36 52.15	Menkent 147°58.15 -36°29.56
9 10	101° 14.11 116° 16.57	294°26.80 · · 9.19 309°26.43 7.96	23°45.75 · · 35.61 38°46.47 35.79	25°11.50 · · 7.23 40°13.56 7.26	111°45.98 · · 52.22 126°48.60 52.29	Arcturus 145°48.31 19°3.43
11	131° 19.04	324°26.06 6.74	53°47.20 35.97	55°15.63 7.30	141°51.22 52.36	Rigil Kent. 139°40.94 -60°56.44
12	146°21.50	339°25.69 N07°5.51	68° 47.93 N22° 36.15	70°17.70 N22°7.33	156°53.83 S06°52.44	Kochab 137°19.93 74°3.52
13	161°23.97	354°25.32 4.29	83°48.65 36.32	85°19.76 7.37	171°56.45 52.51	Zuben'ubi 136°56.43 -16°8.64
14	176°26.43	9°24.96 3.06	98°49.38 36.50	100°21.83 7.40	186° 59.07 52.58	Alphecca 126°4.00 26°38.11 Antares 112°16.14 -26°29.25
15	191°28.89	24°24.59 · · 1.83	113°50.11 · · 36.68	115°23.90 · · 7.43	202°1.69 · · 52.65	Atria 107°10.44 -69°4.53
16	206°31.36	39°24.22 07°0.61	128°50.84 36.86	130°25.96 7.47	217°4.30 52.72	Sabik 102°3.01 -15°45.32
17	221°33.82	54°23.86 06°59.38	143°51.56 37.03	145°28.03 7.50	232°6.92 52.79	Shaula 96°10.59 -37°7.38
18	236° 36.29	69°23.49 N06°58.15	158°52.29 N22°37.21	160°30.10 N22°7.54	247°9.54 \$06°52.87	Rasalhague 95°58.67 12°32.65
19 20	251° 38.75 266° 41.21	84°23.12 56.93 99°22.76 55.70	173°53.02 37.39 188°53.75 37.56	175°32.16 7.57 190°34.23 7.61	262°12.16 52.94 277°14.78 53.01	Eltanin 90°42.02 51°29.33
21	281°43.68	114°22.39 · · 54.47	203°54.47 · · 37.74	205°36.30 · · 7.64	292°17.39 · · 53.08	Kaus Aust. 83°32.66 -34°22.42
22	296°46.14	129°22.03 53.24	218°55.20 37.91	220°38.37 7.68	307°20.01 53.15	Vega 80°33.14 38°48.55
23	311°48.61	144°21.66 52.01	233°55.93 38.09	235°40.44 7.71	322°22.63 53.22	Nunki 75°47.87 -26°15.97 Altair 61°59.98 8°56.09
Man	72.16	ν-0.4' d-1.2' m-3.86	ν0.7' d0.2' m0.79	ν2.1' d0.0' m-2.18	$\nu 2.6' \ d0.1' \ m0.67$	Altair 61°59.98 8°56.09 Peacock 53°5.64 -56°39.37
ivier.	pass. 02:16	ν-0.4 α-1.2 m-3.80	- νυ./ αυ.2 mυ./9	ν2.1 du.0 m-2.18	ν2.0 aυ.1 mυ.07	Deneb 49°25.59 45°22.16
						Enif 33°38.79 9°59.35
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.83 -46°50.40
0	326°51.07	159°21.30 N06°50.78	248°56.66 N22°38.26	250°42.50 N22°7.75	337°25.25	Fomalhaut 15°14.51 -29°29.37
1 2	341°53.54 356°56.00	174°20.93 49.55 189°20.57 48.32	263°57.39 38.44 278°58.12 38.61	265°44.57 7.78 280°46.64 7.81	352°27.87 53.37 7°30.49 53.44	Scheat 13°45.19 28°13.00
3	356°56.00 11°58.46	189°20.57 48.32 204°20.21 • 47.09	278° 58.12 38.61 293° 58.84 · · 38.78	280°46.64 7.81 295°48.71 · · 7.85	7°30.49 53.44 22°33.11 · · 53.51	Markab 13°29.92 15°20.32
4	27°0.93	219°19.84 45.86	308°59.57 38.96	310°50.78 7.88	37°35.72 53.58	Aug 16 Fri SHA Mer.pass
5	42°3.39	234°19.48 44.63	324°0.30 39.13	325°52.85 7.92	52°38.34 53.66	Venus 194°46.33 13:22
6	57°5.86	249°19.12 N06°43.40	339°1.03 N22°39.30	340°54.92 N22°7.95	67°40.96 \$06°53.73	Mars 283°29.07 07:26
7	72°8.32	264°18.75 42.17	354°1.76 39.48	355°56.99 7.98	82°43.58 53.80	Jupiter 284°10.68 07:23
8	87° 10.78	279°18.39 40.94	9°2.49 39.65	10°59.06 8.02	97°46.20 53.87	Saturn 10°26.86 01:38
9	102° 13.25	294°18.03 · · 39.71	24°3.22 · · 39.82	26°1.13 · · 8.05	112°48.82 · · 53.94	Aug 17 Sat SHA Mer.pass
10	117° 15.71	309°17.67 38.47	39°3.95 39.99	41°3.20 8.09	127°51.44 54.02	Venus 193°38.19 13:22
11 12	132° 18.18 147° 20.64	324°17.31 37.24 339°16.95 N06°36.01	54°4.68 40.16 69°5.41 N22°40.33	56° 5.27 8.12 71° 7.35 N22° 8.15	142°54.06 54.09 157°56.68 \$06°54.16	Mars 282°47.29 07:25
13	147 20.04 162°23.11	354°16.58 34.78	84°6.14 40.50	86° 9.42 8.19	172°59.30 54.23	Jupiter 284°0.99 07:19
14	177° 25.57	9°16.22 33.54	99°6.87 40.67	101°11.49 8.22	188°1.92 54.30	Saturn 10°30.50 01:34
15	192° 28.03	24°15.86 · · 32.31	114°7.60 · · 40.84	116°13.56 · · 8.26	203°4.54 · · 54.38	Aug 18 Sun SHA Mer.pass
16	207°30.50	39°15.50 31.07	129°8.33 41.01	131°15.63 8.29	218°7.16 54.45	Venus 192°30.23 13:23
17	222°32.96	54°15.14 29.84	144°9.06 41.18	146°17.71 8.32	233°9.78 54.52	Mars 282°5.59 07:24
18	237° 35.43	69°14.78 N06°28.60	159°9.79 N22°41.35	161°19.78 N22°8.36	248°12.40 \$06°54.59	Jupiter 283°51.43 07:16
19	252° 37.89	84°14.42 27.37	174°10.53 41.52	176°21.85 8.39	263°15.02 54.67	Saturn 10°34.18 01:30
20	267° 40.35	99°14.07 26.13	189°11.26 41.69	191°23.93 8.42	278°17.64 54.74	Horizontal parallax
21 22	282° 42.82 297° 45.28	114°13.71 · · 24.90 129°13.35 23.66	204°11.99 · · 41.86 219°12.72 42.02	206°26.00 · · 8.46 221°28.07 8.49	293°20.26 · · 54.81 308°22.88 54.88	Venus: 0.1
23	312°47.75	144°12.99 22.43	234°13.45 42.19	236°30.15 8.52	323°25.50 54.96	Mars: 0.1
Wer.	pass. 02:12	ν-0.4' d-1.2' m-3.86	ν 0.7′ d 0.2′ m 0.78	ν2.1' d0.0' m-2.19	ν2.6′ d0.1′ m0.67	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.55	N13°38.57	50°58.45	5.2'	\$28°32.23	-0.8'	57.7'
1 2	193°55.68 208°55.81	37.78 36.99	65°22.62 79°46.75	5.1' 5.1'	28°31.44 28°30.47	-1.0' -1.2'	57.7' 57.7'
3	223°55.94	• • 36.19	94°10.83	5.0'	28°29.32	-1.3'	57.8'
4	238°56.07	35.40	108°34.88	5.0'	28°27.99	-1.5'	57.8'
5 6	253° 56.20 268° 56.33	34.61 N13°33.81	122°58.88 137°22.86	5.0' 4.9'	28°26.47 S 28°24.78	-1.7' -1.9'	57.8' 57.9'
7	283° 56.47	33.02	151°46.80	4.9'	28°22.89	-2.1'	57.9'
8	298° 56.60	32.23	166°10.71 180°34.60	4.9'	28°20.83 28°18.58	-2.2'	58.0'
9 10	313° 56.73 328° 56.86	· · 31.43 30.64	180 34.60 194°58.46	4.9' 4.8'	28 18.58 28°16.15	-2.4' -2.6'	58.0' 58.0'
11	343°57.00	29.84	209°22.29	4.8'	$28^{\circ}13.53$	-2.8'	58.1'
12	358° 57.13 13° 57.26	N13°29.04 28.25	223°46.11 238°9.91	4.8' 4.8'	\$28°10.73 28°7.74	-3.0' -3.2'	58.1' 58.1'
13 14	13°57.26 28°57.40	28.25 27.45	238 9.91 252°33.69	4.8'	28° 1.74 28° 4.57	-3.2 -3.4'	58.1' 58.2'
15	43°57.53	• • 26.65	266°57.45	4.8'	28°1.21	-3.5'	58.2'
16	58° 57.66 73° 57.80	25.86	281°21.21 295°44.95	4.7'	27°57.67 27°53.94	-3.7'	58.3'
17 18	88° 57.80	25.06 N13°24.26	295°44.95 310°8.69	4.7' 4.7'	\$27°50.02	-3.9' -4.1'	58.3' 58.3'
19	103°58.07	23.46	324°32.42	4.7'	27°45.92	-4.3'	58.4'
20	118°58.20	22.66	338°56.15	4.7'	27°41.64 27°37.16	-4.5'	58.4'
21 22	133° 58.34 148° 58.47	· · 21.86 21.06	353°19.88 7°43.61	4.7' 4.7'	27°37.16 27°32.50	-4.7' -4.8'	58.4' 58.5'
23	163°58.61	20.26	22°7.34	4.7'	27°27.66	-5.0'	58.5'
	SD = 15.8'	d = -0.8'		S	D = 15.7'		
٠.	CIIA		CUA		Б.	,	
Sat 0	GHA 178° 58.74	Dec N13°19.46	GHA 36°31.08	u 4.7'	Dec 527°22.63	d -5.2'	HP 58.6'
1	193°58.88	18.66	50°54.82	4.8'	27°17.41	-5.4'	58.6'
2	208°59.02	17.86	65°18.58	4.8'	27°12.01	-5.6'	58.6'
3 4	223°59.15 238°59.29	· · 17.06 16.26	79°42.35 94°6.13	4.8' 4.8'	27°6.43 27°0.66	-5.8' -6.0'	58.7' 58.7'
5	253° 59.43	15.46	$108^{\circ}29.93$	4.8'	26°54.71	-6.1	58.7'
6	268° 59.56 283° 59.70	N13°14.65	122°53.75 137°17.58	4.8'	\$26°48.57 26°42.25	-6.3'	58.8'
7 8	283°59.70 298°59.84	13.85 13.05	137°17.58 151°41.44	4.9' 4.9'	26°42.25 26°35.75	-6.5' -6.7'	58.8' 58.9'
9	313°59.98	• • 12.25	166°5.33	4.9'	26°29.06	-6.9'	58.9'
10	329°0.12 344°0.25	11.44 10.64	180°29.24 194°53.17	4.9' 5.0'	26°22.20 26°15.15	-7.0'	58.9'
11 12	359°0.39	N13° 9.83	209°17.14	5.0'	526°7.92	-7.2' -7.4'	59.0' 59.0'
13	14°0.53	9.03	223°41.14	5.0'	26°0.51	-7.6'	59.0'
14 15	29°0.67 44°0.81	8.22 •• 7.42	238°5.17 252°29.24	5.1' 5.1'	25°52.93 25°45.16	-7.8' -7.9'	59.1' 59.1'
16	59°0.95	6.61	266°53.35	5.1'	25°37.22	-7.9 -8.1'	59.1'
17	74°1.09	5.80	281°17.49	5.2'	25°29.10	-8.3'	59.2'
18 19	89°1.23 104°1.37	N13°5.00 4.19	295°41.68 310°5.90	5.2' 5.3'	\$25°20.80 25°12.33	-8.5' -8.6'	59.2' 59.2'
20	119° 1.51	3.38	324°30.17		25°3.68	-8.8'	59.3
21	134°1.65	• • 2.57	338°54.49	5.4'	24°54.87	-9.0'	59.3'
22 23	149°1.79 164°1.93	1.77 0.96	353°18.85 7°43.26	5.4' 5.5'	24°45.87 24°36.71	-9.2' -9.3'	59.3' 59.4'
23	SD = 15.8'	d = -0.8'	- 13.20		D = 16.0'	3.5	33.1
Sun	GHA	Dec N13° 0.15	GHA 22° 7.72	ν	Dec 524°27.38	d 0. F.	HP 59.4'
0 1	179°2.07 194°2.21	12°59.34	36°32.23	5.5' 5.6'	24°17.88	-9.5' -9.7'	59.4 59.4'
2	209°2.35	58.53	50°56.79	5.6'	24°8.21	-9.8'	59.5'
3	224°2.50 239°2.64	· · 57.72 56.91	65°21.41 79°46.08	5.7' 5.7'	23°58.37 23°48.36	-10.0' -10.2'	59.5' 59.5'
4 5	239 2.04 254°2.78	56.10	79 46.08 94°10.80	5. <i>1</i> 5.8'	23° 38.20	-10.2 -10.3	59.5' 59.6'
6	269°2.92	N12°55.29	108°35.58	5.8'	S23°27.86	-10.5'	59.6'
7 8	284°3.07 299°3.21	54.48 53.66	123°0.42 137°25.32	5.9' 6.0'	23°17.37 23°6.71	-10.7' -10.8'	59.6' 59.7'
9	299 3.21 314° 3.35	53.00 •• 52.85	137 25.32 151°50.28	6.0'	23°55.90	-10.8 -11.0'	59.7' 59.7'
10	329°3.49	52.04	$166^{\circ}15.30$	6.1'	22°44.93	-11.1'	59.7'
11 12	344°3.64 359°3.78	51.23 N12°50.41	180°40.38 195°5.53	6.1' 6.2'	22°33.80 S 22°22.51	-11.3' -11.4'	59.8' 59.8'
13	14°3.93	49.60	209°30.74	6.3	22°11.07	-11.4 -11.6'	59.8'
14	29°4.07	48.79	223°56.01	6.3'	21°59.48	-11.7'	59.8'
15 16	44°4.21 59°4.36	· · 47.97 47.16	238°21.35 252°46.75	6.4' 6.5'	21°47.73 21°35.84	-11.9' -12.0'	59.9' 59.9'
17	74°4.50	46.34	267°12.22	6.5	21°23.80	-12.2	59.9'
18	89°4.65	N12°45.53	281°37.76	6.6'	S21°11.61	-12.3'	60.0'
19 20	104°4.79 119°4.94	44.71 43.90	296°3.36 310°29.03	6.7' 6.7'	20°59.27 20°46.80	-12.5' -12.6'	60.0' 60.0'
21	134°5.09	• • 43.08	324°54.77	6.8	$20^{\circ}34.17$	-12.8'	60.0
22	149°5.23	42.26	339°20.58	6.9'	20°21.41	-12.9'	60.1
23	164°5.38	41.45	353°46.46	6.9'	20°8.51	-13.0'	60.1'
	SD = 15.8'	d = -0.8'		S	D = 16.2'		

68° 66° 64° 62° 60°	Naut. //// //// //// 00:58 01:48 02:17 02:39 02:56 03:10 03:22 03:33 03:54	Civil Civil 01:06 02:01 02:34 02:57 03:15 03:30 03:42 03:53 04:02 04:10 04:18	02:41 03:09 03:30 03:46 03:59 04:11 04:20 04:28 04:36 04:42	21:22 20:55 20:35 20:19 20:06 19:55 19:46 19:38 19:31	Civil //// 22:50 22:01 21:30 21:08 20:50 20:36 20:24 20:13	Naut //// //// //// 22:55 22:15 21:47
N 70° 68° 66° 64° 62° 60° N 58° 56° 54° 52°	//// //// 00:58 01:48 02:17 02:39 02:56 03:10 03:22 03:33	01:06 02:01 02:34 02:57 03:15 03:30 03:42 03:53 04:02 04:10	03:09 03:30 03:46 03:59 04:11 04:20 04:28 04:36 04:42	20:55 20:35 20:19 20:06 19:55 19:46 19:38 19:31	22:50 22:01 21:30 21:08 20:50 20:36 20:24	//// //// 22:59 22:15 21:47 21:26
66° 64° 62° 60° N 58° 56° 54° 52°	//// 00:58 01:48 02:17 02:39 02:56 03:10 03:22 03:33	02:01 02:34 02:57 03:15 03:30 03:42 03:53 04:02 04:10	03:30 03:46 03:59 04:11 04:20 04:28 04:36 04:42	20:35 20:19 20:06 19:55 19:46 19:38 19:31	22:01 21:30 21:08 20:50 20:36 20:24	//// 22:59 22:19 21:47 21:26
68° 66° 64° 62° 60° N 58° 56° 54° 52°	//// 00:58 01:48 02:17 02:39 02:56 03:10 03:22 03:33	02:01 02:34 02:57 03:15 03:30 03:42 03:53 04:02 04:10	03:30 03:46 03:59 04:11 04:20 04:28 04:36 04:42	20:35 20:19 20:06 19:55 19:46 19:38 19:31	22:01 21:30 21:08 20:50 20:36 20:24	//// 22:59 22:19 21:47 21:26
66° 64° 62° 60° N 58° 56° 54° 52°	//// 00:58 01:48 02:17 02:39 02:56 03:10 03:22 03:33	02:34 02:57 03:15 03:30 03:42 03:53 04:02 04:10	03:46 03:59 04:11 04:20 04:28 04:36 04:42	20:19 20:06 19:55 19:46 19:38 19:31	21:30 21:08 20:50 20:36 20:24	//// 22:59 22:19 21:47 21:26
62° 60° N 58° 56° 54° 52°	01:48 02:17 02:39 02:56 03:10 03:22 03:33	03:15 03:30 03:42 03:53 04:02 04:10	04:11 04:20 04:28 04:36 04:42	19:55 19:46 19:38 19:31	20:50 20:36 20:24	22:15 21:47 21:20
60° N 58° 56° 54° 52°	02:17 02:39 02:56 03:10 03:22 03:33	03:30 03:42 03:53 04:02 04:10	04:20 04:28 04:36 04:42	19:46 19:38 19:31	20:36 20:24	21:47 21:26
N 58° 56° 54° 52°	02:39 02:56 03:10 03:22 03:33	03:42 03:53 04:02 04:10	04:28 04:36 04:42	19:38 19:31	20:24	21:20
56° 54° 52°	02:56 03:10 03:22 03:33	03:53 04:02 04:10	04:36 04:42	19:31		
54° 52°	03:10 03:22 03:33	04:02 04:10	04:42	1	20:13	01 1
52°	03:22 03:33	04:10				21:10
I	03:33		04.40	19:25	20:04	20:56
50°		04.18	U4.40	19:19	19:56	20:44
	03:54	07.10	04:53	19:14	19:49	20:34
45°		04:33	05:05	19:03	19:34	20:13
N 40°	40° 04:10 04:45		05:14	18:53	19:22	19:57
35°			05:22	18:46	19:12	19:44
30°	30° 04:34 05:04		05:29	18:39	19:04	19:33
20°	20° 04:51 05:18		05:41	18:27	18:50	19:17
N 10°	05:04	05:29	05:51	18:17	18:38	19:04
0°	05:15	05:39	06:01	18:07	18:29	18:53
S 10°	05:24	05:49	06:10	17:58	18:20	18:4
20°	05:31	05:57	06:20	17:48	18:11	18:37
30°	05:39	06:07	06:31	17:37	18:02	18:30
35°	05:42	06:12	06:38	17:31	17:57	18:26
40°	05:45	06:17	06:45	17:23	17:51	18:23
45°	05:49	06:23	06:53	17:15	17:45	18:20
S 50°	05:52	06:30	07:04	17:05	17:39	18:17
52°	05:54	06:33	07:08	17:00	17:36	18:15
54°	05:55	06:36	07:13	16:55	17:32	18:14
56°	05:56	06:40	07:19	16:50	17:29	18:12
58°	05:58	06:44	07:25	16:43	17:25	18:13
S 60°	06:00	06:48	07:33	16:36	17:21	18:09
Lat		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°			21:55			
66°			21:13			

Lat.		Moonris	е		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°			21:55			
66°			21:13			
64°		21:18	20:44		23:51	
62°	20:54	20:31	20:22	22:07	•• ••	00:37
60°	19:49	20:01	20:04	23:13		01:06
N 58°	19:14	19:37	19:49	23:47	•• ••	01:29
56°	18:49	19:19	19:36		00:12	01:47
54°	18:28	19:03	19:25	•• ••	00:32	02:03
52°	18:11	18:49	19:15		00:49	02:16
50°	17:57	18:37	19:06	••••	01:04	02:27
45°	17:27 18:12		18:47	00:24	01:33	02:51
N 40°	17:04	17:52	18:31	00:49	01:55	03:11
35°	16:44	17:35	18:18	01:09	02:14	03:26
30°	16:28	17:20	18:06	01:26	02:30	03:40
20°	16:00	16:55	17:46	01:54	02:57	04:03
N 10°	15:36	16:34	17:29	02:19	03:21	04:23
0°	15:13	16:14	17:12	02:42	03:42	04:42
S 10°	14:51	15:53	16:56	03:05	04:04	05:00
20°	14:27	15:32	16:38	03:29	04:27	05:20
30°	13:59	15:06	16:18	03:58	04:53	05:42
35°	13:42	14:52	16:06	04:15	05:09	05:55
40°	13:23	14:34	15:52	04:34	05:27	06:10
45°	12:59	14:13	15:35	04:58	05:48	06:28
S 50°	12:29	13:47	15:15	05:29	06:16	06:50
52°	12:14	13:34	15:05	05:44	06:29	07:00
54°	11:56	13:19	14:54	06:01	06:44	07:12
56°	11:35	13:02	14:41	06:23	07:02	07:25
58°	11:08	12:41	14:27	06:50	07:24	07:41
S 60°	10:31	12:14	14:09	07:28	07:51	07:59

			Sun		Moon				
Day		Eqn.of Time		Mer.	Mer.Pass.		Age		
-	,	00 ^h	12 ^h	Pass	Upper	Lower	12-14		
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	82-95%		
	16	04:18	04:11	12:04	21:28	08:58			
	17	04:05	03:58	12:04	22:28	09:58			
	18	03:52	03:45	12:04	23:26	10:57			

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	327°50.21	159°12.63 N06°21.19	249°14.18 N22°42.36	251°32.22 N22°8.56	338°28.12 S06°55.03
1	342°52.67	174° 12.27 19.95	264°14.92 42.52	266°34.29 8.59	353°30.74 55.10
2	357°55.14	189°11.92 18.72	279° 15.65 42.69	281°36.37 8.63	8°33.36 55.17
3	12°57.60	204°11.56 · · 17.48	294°16.38 · · 42.86	296°38.44 · · 8.66	23°35.98 · · 55.25
4	28°0.07	219°11.20 16.24	309°17.11 43.02	311°40.52 8.69	38°38.60 55.32
5	43°2.53	234°10.85 15.00	324° 17.85 43.19	326°42.59 8.73	53°41.22 55.39
6	58°5.00	249°10.49 N06°13.77	339°18.58 N22°43.35	341°44.67 N22°8.76	68°43.84 S 06°55.46
7	73°7.46	264°10.13 12.53	354° 19.31 43.52	356°46.75 8.79	83°46.46 55.54
8	88°9.92	279°9.78 11.29	9°20.05 43.68	11°48.82 8.82	98°49.08 55.61
9	103° 12.39	294°9.42 · · 10.05	24°20.78 · · 43.85	26°50.90 · · 8.86	113°51.70 · · 55.68
10	118° 14.85	309°9.07 8.81	39°21.51 44.01	41°52.97 8.89	128°54.33 55.75
11	133° 17.32	324°8.71 7.57	54°22.25 44.17	56°55.05 8.92	143°56.95 55.83
12	148° 19.78	339°8.36 N06°6.33	69°22.98 N22°44.34	71°57.13 N22°8.96	158°59.57 \$06°55.90
13	163°22.24	354°8.00 5.09	84°23.71 44.50	86°59.21 8.99	174°2.19 55.97
14	178°24.71	9°7.65 3.85	99°24.45 44.66	102°1.28 9.02	189°4.81 56.05
15	193°27.17	24°7.29 · · 2.61	114°25.18 • • 44.82	117° 3.36 · · 9.06	204°7.43 · · 56.12
16	208° 29.64	39°6.94 1.37	129°25.92 44.99	132° 5.44 9.09	219°10.05 56.19
17	223°32.10	54°6.59 06°0.13	144°26.65 45.15	147°7.52 9.12	234°12.68 56.26
18	238°34.56	69°6.23 N05°58.88	159°27.39 N22°45.31	162°9.59 N22°9.15	249°15.30 S06°56.34
19	253°37.03	84°5.88 57.64	174°28.12 45.47	177°11.67 9.19	264°17.92 56.41
20	268° 39.49	99°5.53 56.40	189°28.86 45.63	192°13.75 9.22	279°20.54 56.48
21	283°41.96	114°5.17 · · 55.16	204°29.59 · · 45.79	207°15.83 · · 9.25	294°23.16 · · 56.56
22	298° 44.42	129°4.82 53.91	219°30.33 45.95	222°17.91 9.28	309°25.79 56.63
23	313°46.89	144°4.47 52.67	234°31.06 46.11	237°19.99 9.32	324°28.41 56.70
Mer.p	pass. 02:08	ν -0.4 $'$ d-1.2 $'$ m-3.86	$ u 0.7' \ d0.2' \ m0.78$	$ u 2.1' \ d0.0' \ \text{m-}2.19$	ν2.6' d0.1' m0.66
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Tue 0	328° 49.35	159°4.12 N05°51.43	249°31.80 N22°46.27	252°22.07 N22°9.35	339°31.03 S06°56.77
1	328 49.35 343°51.81	174°3.76 50.18	264° 32.53 46.43	267°24.15 9.38	354°33.65 56.85
2	358° 54.28	189°3.41 48.94	279° 33.27 46.59	282°26.23 9.42	9°36.27 56.92
3	358 54.28 13°56.74	204°3.06 · · 47.70	294°34.01 · · 46.75	282 20.23 9.42 297°28.31 • • 9.45	24°38.90 · · 56.99
3 4	28° 59.21	219°2.71 46.45	309°34.74 46.91	312°30.39 9.48	1
	44°1.67				1
5	59°4.13	234°2.36 45.21 249°2.01 N05°43.96	324°35.48 47.06 339°36.22 N22°47.22	327°32.47 9.51 342°34.55 N22°9.54	54°44.14 57.14 69°46.76 \$06°57.21
6					
7	74°6.60	264°1.66 42.72	354°36.95 47.38	357°36.63 9.58	84°49.39 57.29
8	89°9.06	279°1.31 41.47	9°37.69 47.53	12°38.72 9.61	99°52.01 57.36
9	104°11.53	294°0.96 · · 40.23	24°38.43 · · 47.69	27°40.80 · · 9.64	114°54.63 · · 57.43
10	119° 13.99	309°0.61 38.98	39°39.16 47.85	42°42.88 9.67 57°44.96 9.71	129°57.26 57.51
11	134° 16.45 149° 18.92	324°0.26 37.73 338°59.91 N05°36.49	54°39.90 48.00 69°40.64 N22°48.16	57°44.96 9.71 72°47.05 N22°9.74	144°59.88 57.58 160°2.50 \$06°57.65
12					
13 14	164°21.38 179°23.85	353°59.56 35.24 8°59.21 33.99	84°41.38 48.31 99°42.11 48.47	87°49.13 9.77 102°51.21 9.80	175°5.13 57.73 190°7.75 57.80
	179 25.65 194° 26.31	23°58.87 · · 32.74		117°53.29 · · 9.83	1
15					
16 17	209°28.77 224°31.24	38°58.52 31.50 53°58.17 30.25	129° 43.59 48.78 144° 44.33 48.93	132°55.38 9.87 147°57.46 9.90	220°13.00 57.95 235°15.62 58.02
					250°18.24 S06°58.09
18	239°33.70	68°57.82 N05°29.00 83°57.47 27.75	159°45.07 N22°49.09	162°59.55 N22°9.93 178°1.63 9.96	
19	254°36.17		174° 45.81 49.24		
20	269°38.63 284°41.09	98°57.13 26.50 113°56.78 •• 25.25	189° 46.54 49.39 204° 47.28 • • 49.55	193°3.71 9.99 208°5.80 · · 10.02	280°23.49 58.24 295°26.11 · · 58.31
21					
22	299° 43.56 314° 46.02	128°56.43 24.01	219°48.02 49.70		310°28.74 58.39
23		143°56.09 22.76	234°48.76 49.85	238° 9.97 10.09	325°31.36 58.46
Mer.p	pass. 02:04	ν -0.4 $'$ d-1.2 $'$ m-3.86	$ u 0.7' \ d0.2' \ { m m}0.77$	$\nu 2.1' \ d0.0' \ \text{m-}2.20$	$\nu 2.6' \ d0.1' \ \text{m}0.66$
\A/I	GHA	GHA Dec	GHA Dec	CHA D	GHA Dec
Wed 0	329° 48.49	GHA Dec 158°55.74 N05°21.51	GHA Dec 249°49.50 N22°50.00	GHA Dec 253°12.05 N22°10.12	GHA Dec 340°33.99 S 06°58.53
1	329°48.49 344°50.95	173°55.39 20.26	264° 50.24 50.15	268°14.14 10.15	340°33.99 \$06°58.53 355°36.61 58.61
	344°50.95 359°53.41	173°55.39 20.26 188°55.05 19.01	279° 50.98 50.31	283°16.23 10.18	10°39.23 58.68
2 3	359°53.41 14°55.88	203°54.70 · · 17.76	294°51.72 · · 50.46	298°18.31 · · 10.21	25°41.86 · · 58.76
3 4	14 55.88 29°58.34	218° 54.36 16.50	309°52.46 50.61	313°20.40 10.25	40°44.48 58.83
4 5	29 58.34 45°0.81	233°54.01 15.25	324°53.20 50.76	313 20.40 10.25 328°22.49 10.28	55°47.11 58.90
6	45 0.81 60°3.27	248°53.67 N05°14.00	339°53.94 N22°50.91	343°24.57 N22°10.31	70°49.73 S06°58.98
7	75°5.74	263°53.32 12.75	354°54.68 51.06	358°26.66 10.34	85°52.36 59.05
8	75 5.74 90°8.20	278° 52.98 11.50	9°55.42 51.00	13°28.75 10.37	100°54.98 59.12
9	90 8.20 105°10.66	293°52.63 · · 10.25	24°56.16 · · 51.36	28°30.83 · · 10.40	115°57.60 · · 59.20
10	105 10.00 120°13.13	308°52.29 8.99	39°56.91 51.50	43°32.92 10.43	131°0.23 59.27
11	120 13.13 135°15.59	308 52.29 8.99 323°51.95 7.74	54°57.65 51.65	43 32.92 10.43 58°35.01 10.47	131 0.23 59.27 146°2.85 59.35
11	150° 18.06	338°51.60 N05°6.49	69°58.39 N22°51.80	73°37.10 N22°10.50	140 2.85 59.35 161°5.48 \$06°59.42
13	165° 20.52	353°51.26 NUS 6.49	84°59.13 51.95	88°39.19 10.53	176° 8.10 59.49
14	180° 22.98	8°50.92 3.98	99°59.87 52.10	103°41.28 10.56	170 8.10 59.49 191°10.73 59.57
15	100 22.90 195°25.45	23°50.57 · · 2.73	115°0.61 · · 52.24	118°43.36 · · 10.59	
	210° 27.91	38°50.23 1.48	130°1.36 52.39	118°43.36 · · 10.59 133°45.45	206°13.35 · · 59.64 221°15.98 59.72
16		53°49.89 05°0.22	130°1.36 52.39 145°2.10 52.54		
17	225°30.38				
18	240°32.84 255°35.30	68°49.55 N04°58.97 83°49.20 57.71	160°2.84 N22°52.68 175°3.58 52.83	163°49.63 N22°10.68 178°51.72 10.71	251°21.23 S06°59.86 266°23.85 06°59.94
19	255° 35.30 270° 37.77			178°51.72 10.71 193°53.81 10.75	
20	270° 37.77 285° 40.23		190°4.33 52.97 205°5.07 · · 53.12	208°55.90 · · 10.78	
21 22	285°40.23 300°42.70	113°48.52 · · 55.20 128°48.18 53.95	205°5.81 53.26	208°55.90 · · 10.78 223°57.99 10.81	296°29.11 · · 0.09 311°31.73 0.16
22	300 42.70 315°45.16	143°47.84 52.69	235°6.56 53.41	239°0.09 10.81 239°0.09 10.84	311 31.73 0.16 326°34.36 0.23
23	313 45.10				
Mer.p	pass. 02:00	ν -0.3′ <i>d</i> -1.3′ m-3.86	$ u 0.7' \ d0.2' \ m0.77$	$\nu 2.1^\prime~d0.0^\prime~\text{m-}2.20$	$ u 2.6' \ d0.1' \ { m m0.65}$

	Alpheratz	357°34.82	29°13.59
	Ankaa	353°7.10	-42°10.10
	Schedar	349°31.02	56° 40.22
	Diphda	348°47.36	$-17^{\circ}50.91$
	Achernar	335°20.07	-57°6.39
	Hamal	327°51.42	23°34.73
	Polaris	314°7.03	89°21.77
	Acamar	315°11.91	-40°12.03
	Menkar	314°6.42	4°11.29
	Mirfak	308°28.68	49°56.75
	Aldebaran	290°40.06	16°33.57
	Rigel	281°4.29	-8°10.19
	Capella	280°22.54	46°1.24
	Bellatrix	278°23.35	6°22.43
	Elnath	278°2.42	28°37.67
	Alnilam	275°38.20	-1°11.01
_			
Е	Betelgeuse	270°52.60	$7^{\circ}24.81$
	Canopus	263°52.88	-52°42.18
	Sirius	258°26.75	-16°44.77
	Adhara	255°6.39	-29°0.07
			5°9.84
	Procyon	244°51.44	
	Pollux	243°18.00	27°58.05
	Avior	234°15.49	-59°35.08
	Suhail	222°47.00	-43°31.75
1.4	iaplacidus	221°39.33	-69°48.95
IVI			
	Alphard	217°48.39	-8°45.77
	Regulus	207°35.09	11°50.95
	Dubhe	193°41.97	61°37.26
	Denebola	182°25.54	14°26.22
	Gienah	175°44.18	-17°40.67
	Acrux	173°1.05	-63°14.27
	Gacrux	171°52.48	-57° 15.18
	Alioth	166°13.58	55°49.82
	Spica	158°22.82	-11°17.34
	Alkaid	152°52.45	49°11.68
	Hadar	148°36.76	-60°29.70
	Menkent	147°58.17	-36°29.55
	Arcturus	145°48.31	19°3.43
Е		139°40.96	-60° 56.44
r	Rigil Kent.		
	Kochab	137°19.98	74°3.51
	Zuben'ubi	136°56.44	-16°8.64
	Alphecca	126°4.01	26°38.11
	Antares	112°16.15	-26° 29.25
		107°10.48	-69°4.54
	Atria		
	Sabik	102°3.01	-15°45.32
	Shaula	96°10.60	-37°7.39
R	asalhague	95°58.68	12°32.65
	Eltanin	90°42.04	51°29.34
V	aus Aust.	83°32.67	-34°22.43
11			
	Vega	80°33.15	38°48.55
	Nunki	75°47.87	-26°15.98
	Altair	61°59.98	8°56.10
	Peacock	53°5.64	-56°39.38
	Deneb	49°25.59	45°22.18
	Enif	33°38.78	9°59.36
	Al Na'ir	27°32.81	-46°50.41
F	omalhaut	15°14.49	-29°29.37
•	Scheat	13°45.18	28° 13.01
	Markab	13°29.90	15° 20.33
Λ	~ 10 N/	CHV	Man ===
Aug	g 19 Mon	SHA	Mer.pass
	Venus	191°22.42	13:23
	Mars	281°23.97	07:23
	Jupiter	283°42.01	07:13
	Saturn	10°37.91	01:26
	Jucuiii	10 01.91	01.20
Αι	ıg 20 Tue	SHA	Mer.pass
	Venus	190°14.77	13:24
	Mars	280°42.45	07:22
	Jupiter	283°32.72	07:10
	Saturn	10°41.68	01:22
			Mer.pass
Aus		SHA	
Auş	g 21 Wed	SHA 189° 7.25	
Auş	g 21 Wed Venus	$189^{\circ}7.25$	13:25
Aug	g 21 Wed Venus Mars	189°7.25 280°1.01	13:25 07:20
Auş	g 21 Wed Venus Mars Jupiter	189°7.25 280°1.01 283°23.57	13:25 07:20 07:06
Auş	g 21 Wed Venus Mars	189°7.25 280°1.01	13:25 07:20
Auş	g 21 Wed Venus Mars Jupiter Saturn	189°7.25 280°1.01 283°23.57 10°45.50	13:25 07:20 07:06
Auş	g 21 Wed Venus Mars Jupiter Saturn	189°7.25 280°1.01 283°23.57 10°45.50	13:25 07:20 07:06 01:18
Auş	g 21 Wed Venus Mars Jupiter Saturn	189°7.25 280°1.01 283°23.57 10°45.50	13:25 07:20 07:06

Stars SHA

Dec

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°5.52	N12°40.63	8°12.41	7.0'	S19°55.48	-13.2'	60.1'
1 2	194°5.67 209°5.82	39.81 38.99	22°38.43 37°4.51	7.1' 7.2'	19°42.31 19°29.00	-13.3' -13.4'	60.1' 60.2'
3	209 5.62 224°5.96	38.17	51°30.67	7.2'	19 29.00 19°15.56	-13.4	60.2
4	239°6.11	37.36	65°56.90	7.3'	19°1.99	-13.7'	60.2
5	254°6.26	36.54	80°23.20	7.4'	18°48.29	-13.8'	60.2'
6	269°6.41 284°6.55	N12°35.72 34.90	94° 49.57 109° 16.00	7.4' 7.5'	\$18° 34.47 18° 20.52	-13.9' -14.1'	60.3' 60.3'
7 8	284 6.55 299°6.70	34.90 34.08	109 16.00 123° 42.51	7.5 7.6'	18 20.52 18°6.45	-14.1 -14.2'	60.3
9	314°6.85	33.26	138°9.09	7.6'	17°52.25	-14.3'	60.3
10	329°7.00	32.44	152° 35.74	7.7'	17° 37.94	-14.4'	60.3'
11	344°7.15	31.62 N12°30.79	167°2.46 181°29.25	7.8'	17°23.51 \$17°8.96	-14.5'	60.4'
12 13	359°7.30 14°7.45	N12 30.79 29.97	181° 29.25 195° 56.11	7.9' 7.9'	16°54.30	-14.7' -14.8'	60.4' 60.4'
14	29°7.60	29.15	210°23.04	8.0'	16° 39.52	-14.9'	60.4
15	44°7.74	• • 28.33	224°50.04	8.1'	$16^{\circ}24.64$	-15.0'	60.4'
16	59°7.89	27.50	239° 17.11	8.1'	16°9.65	-15.1'	60.5'
17 18	74°8.04 89°8.19	26.68 N12°25.86	253° 44.24 268° 11.44	8.2' 8.3'	15°54.55 \$15°39.34	-15.2' -15.3'	60.5' 60.5'
19	104°8.34	25.03	282°38.72	8.3'	15°24.04	-15.3 -15.4'	60.5
20	119°8.50	24.21	297°6.05	8.4'	15°8.63	-15.5'	60.5
21	134°8.65	• • 23.39	311°33.46	8.5'	$14^{\circ}53.12$	-15.6'	60.5'
22	149°8.80	22.56	326°0.93	8.5'	14° 37.52	-15.7'	60.6'
23	164°8.95	21.74	340°28.47	8.6'	14°21.82	-15.8'	60.6'
	SD = 15.8′	d = -0.8'		SI	O = 16.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°9.10	N12°20.91	$354^{\circ}56.07$	8.7'	S 14°6.03	-15.9'	60.6'
1	194°9.25 209°9.40	20.08 19.26	9°23.73 23°51.46	8.7' 8.8'	13°50.14 13°34.17	-16.0' -16.1'	60.6' 60.6'
2 3	209°9.40 224°9.55	19.26	23°51.46 38°19.26	8.8'	13°34.17 13°18.11	-16.1' -16.1'	60.6'
4	239°9.71	17.60	52°47.11	8.9'	13°1.97	-16.2	60.6'
5	254°9.86	16.78	$67^{\circ}15.03$	9.0'	$12^{\circ}45.74$	-16.3'	60.7'
6	269°10.01	N12° 15.95	81°43.01	9.0'	\$12°29.43	-16.4'	60.7'
7 8	284°10.16 299°10.32	15.12 14.29	96°11.05 110°39.14	9.1' 9.2'	12°13.04 11°56.58	-16.5' -16.5'	60.7' 60.7'
9	314°10.47	14.29	125°7.30	9.2' 9.2'	11°40.04	-10.5 -16.6'	60.7'
10	329°10.62	12.64	139°35.51	9.3'	11°23.42	-16.7'	60.7'
11	344°10.78	11.81	154°3.78	9.3'	11°6.74	-16.8'	60.7'
12 13	359°10.93 14°11.09	N12° 10.98 10.15	168°32.11 183°0.49	9.4' 9.4'	\$10°49.99 10°33.17	-16.8' -16.9'	60.7' 60.7'
13 14	29°11.24	9.32	183 0.49 197°28.93	9.4 9.5'	10 33.17 10°16.28	-16.9'	60.7'
15	44°11.39	8.49	211°57.42	9.5'	09°59.33	-17.0'	60.8'
16	59°11.55	7.66	226°25.96	9.6'	$09^{\circ}42.32$	-17.1'	60.8'
17	74°11.70	6.82	240°54.55	9.6'	09°25.26	-17.1'	60.8'
18 19	89°11.86 104°12.01	N12°5.99 5.16	255°23.20 269°51.89	9.7' 9.7'	\$09°8.13 08°50.95	-17.2' -17.2'	60.8' 60.8'
20	119°12.17	4.33	284°20.63	9.8'	08°33.72		60.8'
21	134°12.32	• • 3.50	298°49.42	9.8'	$08^{\circ}16.43$	-17.3'	60.8'
22	149°12.48	2.66	313° 18.25	9.9'	07°59.10	-17.4	60.8'
23	164°12.64	1.83	327° 47.13	9.9'	07°41.72	-17.4'	60.8'
	SD = 15.8′	d = -0.8'		51	O = 16.5'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°12.79 194°12.95	N12°1.00 12°0.16	342°16.05 356°45.02	10.0' 10.0'	\$07°24.30 07°6.83	-17.5' -17.5'	60.8' 60.8'
2	194 12.95 209°13.11	12 0.16 11°59.33	11°14.03	10.0'	07 6.83 06°49.32	-17.5'	60.8'
3	224°13.26	• • 58.49	25°43.08	10.1'	06°31.78	-17.6'	60.8'
4	239°13.42	57.66	40° 12.16	10.1'	06°14.19	-17.6'	60.8'
5	254°13.58 269°13.73	56.82 N11°55.99	54°41.29 69°10.45	10.2' 10.2'	05°56.57 \$05°38.92	-17.7' -17.7'	60.8' 60.8'
6 7	269°13.73 284°13.89	55.15	83° 39.65	10.2'	05° 21.24	-17.7' -17.7'	60.8
8	299°14.05	54.32	98°8.88	10.3'	05°3.53	-17.7'	60.8
9	314°14.21	• • 53.48	112°38.15	10.3'	04°45.79	-17.8'	60.8'
10	329°14.36	52.64	127°7.45	10.3'	04°28.03	-17.8'	60.8'
11 12	344°14.52 359°14.68	51.81 N11°50.97	141°36.78 156°6.14	10.4' 10.4'	04° 10.25 \$03° 52.44	-17.8' -17.8'	60.8' 60.8'
13	14°14.84	50.13	170°35.53	10.4	03°34.62	-17.8	60.8
14	29°15.00	49.29	$185^{\circ}4.95$	10.4'	03°16.78	-17.9'	60.8'
15	44°15.16	· · 48.45	199°34.39	10.5'	02°58.92	-17.9'	60.8'
16 17	59°15.32 74°15.48	47.62 46.78	214°3.86 228°33.36	10.5' 10.5'	02°41.05 02°23.17	-17.9' -17.9'	60.8' 60.8'
18	74 15.48 89°15.64	40.78 N11°45.94	243°2.87	10.5	502°5.28	-17.9'	60.8
19	104°15.80	45.10	257°32.41	10.6'	01°47.39	-17.9'	60.8'
20	119°15.96	44.26	272°1.96	10.6'	01°29.49	-17.9'	60.7'
21	134°16.12 149°16.28	43.42	286°31.54 301°1.13	10.6'	01°11.58 00°53.68	-17.9'	60.7'
22 23	149°16.28 164°16.44	42.58 41.73	301°1.13 315°30.74	10.6' 10.6'	00°53.68 00°35.77	-17.9' -17.9'	60.7' 60.7'
_5	SD = 15.8'	d = -0.8'			O = 16.6'		
				J.	10.0		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunnse	Sunset	Civil	Naut.
N 72°	////	////	02:59	21:03	////	////
N 70°	////	01:40	03:23	20:40	22:19	////
68°	////	02:21	03:42	20:22	21:41	////
66°	////	02:48	03:56	20:08	21:15	////
64°	01:27	03:08	04:08	19:56	20:55	22:32
62°	02:04	03:25	04:19	19:46	20:39	21:58
60°	02:29	03:38	04:27	19:38	20:26	21:34
N 58°	02:49	03:50	04:35	19:30	20:15	21:15
56°	03:04	04:00	04:42	19:24	20:05	21:00
54°	03:18	04:08	04:48	19:18	19:57	20:47
52°	03:29	04:16	04:53	19:13	19:49	20:36
50°	03:39	04:23	04:58	19:08	19:43	20:27
45°	03:58	04:37	05:08	18:58	19:29	20:07
N 40°	04:14	04:48	05:17	18:49	19:18	19:52
35°	04:26	04:58	05:24	18:42	19:08	19:40
30°	04:36	05:06	05:31	18:36	19:00	19:30
20°	04:52	05:19	05:42	18:25	18:47	19:14
N 10°	05:04	05:30	05:51	18:15	18:37	19:02
0°	05:14	05:39	06:00	18:07	18:28	18:52
S 10°	05:22	05:47	06:09	17:58	18:19	18:44
20°	05:29	05:55	06:18	17:49	18:11	18:37
30°	05:36	06:04	06:28	17:39	18:03	18:31
35°	05:39	06:08	06:34	17:33	17:59	18:28
40°	05:41	06:13	06:41	17:26	17:54	18:26
45°	05:44	06:18	06:49	17:19	17:49	18:23
S 50°	05:47	06:25	06:58	17:09	17:43	18:20
52°	05:48	06:27	07:02	17:05	17:40	18:19
54°	05:49	06:30	07:07	17:01	17:37	18:19
56°	05:50	06:33	07:12	16:55	17:34	18:18
58°	05:51	06:37	07:18	16:50	17:31	18:17
S 60°	05:52	06:41	07:24	16:43	17:27	18:16

Lat.		Moonris	e		Moonset	į.
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	21:54	20:54	20:12		03:19	06:11
N 70°	21:23	20:42	20:10		03:47	06:20
68°	21:01	20:32	20:08	01:18	04:08	06:27
66°	20:43	20:23	20:07	01:58 04:24		06:33
64°	20:28	20:16	20:06	02:26	04:37	06:38
62°	20:16	20:10	20:05	02:47	04:48	06:42
60°	20:05	20:05	20:04	03:04	04:57	06:46
N 58°	19:56	20:00	20:03	03:18	05:05	06:49
56°	19:47	19:55	20:02	03:30	05:12	06:52
54°	19:40	19:52	20:01	03:40	05:18	06:54
52°	19:34	19:48	20:01	03:50	05:24	06:56
50°	19:28	19:45	20:00	03:58	05:29	06:59
45°	19:15	19:38	19:59	04:15	05:40	07:03
N 40°	19:04	19:32	19:58	04:30	05:49	07:07
35°	18:55	19:27	19:57	04:41	05:56	07:10
30°	18:46	19:22	19:56	04:52	06:03	07:13
20°	18:32	19:15	19:55	05:10	06:15	07:18
N 10°	18:20	19:08	19:53	05:25	06:24	07:22
0°	18:08	19:01	19:52	05:39	06:34	07:26
S 10°	17:56	18:55	19:51	05:53	06:43	07:29
20°	17:44	18:48	19:50	06:08	06:52	07:33
30°	17:29	18:40	19:49	06:25	07:03	07:38
35°	17:21	18:35	19:48	06:35	07:10	07:40
40°	17:11	18:30	19:47	06:46	07:17	07:43
45°	17:00	18:24	19:46	06:59	07:25	07:47
S 50°	16:46	18:16	19:45	07:15	07:34	07:50
52°	16:39	18:13	19:44	07:22	07:39	07:52
54°	16:32	18:09	19:44	07:31	07:44	07:54
56°	16:24	18:05	19:43	07:40	07:49	07:56
58°	16:15	18:00	19:42	07:50	07:55	07:59
S 60°	16:04	17:55	19:42	08:02	08:02	08:01

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%	
19	03:38	03:31	12:04	-:-	11:54		
20	03:24	03:16	12:03	00:21	12:48		
21	03:09	03:01	12:03	01:13	13:39		

h	Aries	Ve	nus	M	ars	Ju	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	330°47.62	158°47.50	N04°51.44	250°7.30	N22°53.55	254°2.18	N22°10.87	341°36.98	S07°0.31			
1	345°50.09	173°47.15	50.18	265°8.04	53.70	269°4.27	10.90	356°39.61	0.38	Alpheratz	357°34.81	29°13.60
2	$0^{\circ}52.55$	188°46.81	48.93	280°8.79	53.84	284°6.36	10.93	11°42.23	0.46	Ankaa Schedar	353°7.08 349°31.01	-42°10.10 56°40.23
3	$15^{\circ}55.02$	203°46.47	• • 47.67	295°9.53	• • 53.99	299°8.45	• • 10.96	26°44.86	• • 0.53	Diphda	349° 31.01	-17°50.91
4	$30^{\circ}57.48$	218°46.13	46.41	310° 10.28	54.13	314°10.54	10.99	41°47.49	0.60	Achernar	335° 20.05	-17 30.91 -57° 6.40
5	45°59.94	233°45.79	45.16	325°11.02	54.27	329°12.64	11.02	56°50.11	0.68	Hamal	327°51.40	23°34.74
6	61°2.41	248°45.45	N04°43.90	340°11.76	N22°54.41	344°14.73	N22°11.05	71°52.74	S07° 0.75	Polaris	314°5.65	89°21.77
7	76°4.87	263°45.11	42.64	355° 12.51	54.56	359°16.82	11.08	86°55.36	0.83	Acamar	315°11.89	-40°12.03
8	91°7.34	278° 44.77	41.38	10°13.25	54.70	14°18.91	11.11	101°57.99	0.90	Menkar	314°6.40	4°11.30
9	106°9.80	293°44.43	• • 40.13	25°14.00	• • 54.84	29°21.01	• • 11.14	117°0.62	• • 0.98	Mirfak	308°28.66	49°56.76
10	121°12.26	308°44.10	38.87	40° 14.74 55° 15.49	54.98	44°23.10	11.17	132°3.24 147°5.87	1.05	Aldebaran	290°40.04	16°33.58
11 12	136° 14.73 151° 17.19	323°43.76 338°43.42	37.61 N04°36.35	70° 16.23	55.12 N22°55.26	59°25.20 74°27.29	11.20 N22°11.23	162°8.50	1.12 \$07°1.20	Rigel	281°4.28	-8°10.19
13	166° 19.66	353° 43.42	35.09	85° 16.98	55.40	89°29.38	11.26	177°11.12	1.27	Capella	280°22.52	46°1.24
14	181°22.12	8° 42.74	33.83	100° 17.73	55.54	104°31.48	11.29	192°13.75	1.35	Bellatrix	278°23.34	6°22.44
15	196° 24.58	23°42.40	• • 32.57	115° 18.47	• • 55.68	119°33.57	• • 11.33	207°16.38	• • 1.42	Elnath	278°2.41	28°37.67
16	211°27.05	38°42.07	31.31	130° 19.22	55.82	134°35.67	11.36	222°19.00	1.50	Alnilam	275°38.18	-1°11.01
17	226°29.51	53°41.73	30.06	145° 19.96	55.96	149°37.76	11.39	237°21.63	1.57	Betelgeuse	270°52.59	7°24.82
18	241°31.98	68°41.39	N04°28.80	160°20.71	N22°56.10	164°39.86	N22°11.42	252°24.26	S07°1.64	Canopus	263°52.86	-52°42.17 -16°44.76
19	256° 34.44	83°41.05	27.54	175°21.46	56.24	179°41.96	11.45	267°26.88	1.72	Sirius	258° 26.74 255° 6.38	-10 44.76 -29°0.06
20	271°36.90	98°40.72	26.28	190°22.21	56.38	194°44.05	11.48	282°29.51	1.79	Adhara Procyon	244°51.43	5° 9.85
21	286°39.37	113°40.38	• • 25.01	205°22.95	• • 56.51	209°46.15	• • 11.51	297°32.14	• • 1.87	Pollux	243°17.99	27°58.05
22	301°41.83	128°40.04	23.75	220°23.70	56.65	224°48.24	11.54	312°34.76	1.94	Avior	234° 15.48	-59°35.06
23	316°44.30	143°39.71	22.49	235°24.45	56.79	239°50.34	11.57	327°37.39	2.02	Suhail	222° 47.00	-43°31.74
Mer	pass. 01:57	ν -0.3' d-1	3′ m-3.86	$\nu_{0.7'} d0$.1′ m0.76	$\nu 2.1' d0$.0′ m-2.21	$\nu 2.6' d0.$	1′ m0.65	Miaplacidus	221°39.32	-69°48.93
	Puss. 01.51	- 0.5 4 1								Alphard	217°48.39	-8°45.77
			_		_		_		_	Regulus	207°35.09	11°50.97
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.97	61°37.24
0	331°46.76	158°39.37	N04°21.23	250°25.19	N22°56.93	254°52.44	N22°11.60	342°40.02	S07°2.09	Denebola	182°25.55	14°26.22
1 2	346° 49.22	173°39.03	19.97	265°25.94	57.06	269°54.54	11.62	357°42.65	2.17	Gienah	175°44.19	-17°40.66
3	1°51.69 16°54.15	188°38.70 203°38.36	18.71	280°26.69 295°27.44	57.20	284°56.63 299°58.73	11.65	12°45.27 27°47.90	2.24	Acrux	$173^{\circ}1.07$	-63°14.25
3 4	31° 56.62	203 36.30 218° 38.03	· · 17.45 16.19	310°28.19	• • 57.34 57.47	315° 0.83	· · 11.68 11.71	42°50.53	· · 2.32 2.39	Gacrux		-57°15.17
5	46° 59.08	233° 37.69	14.92	325°28.94	57.47	330° 2.93	11.71	57°53.16	2.46	Alioth	166°13.60	55°49.81
6	62°1.54	248°37.36	N04°13.66	340°29.68	N22°57.74	345° 5.03	N22°11.77	72°55.78	S07°2.54	Spica	158°22.83	-11°17.33
7	77°4.01	263°37.02	12.40	355°30.43	57.88	0°7.12	11.80	87°58.41	2.61	Alkaid	152°52.47	49°11.67
8	92°6.47	278°36.69	11.14	10°31.18	58.01	15° 9.22	11.83	103°1.04	2.69	Hadar	148°36.79	-60°29.69
9	107°8.94	293°36.35	• • 9.87	25°31.93	• • 58.14	30°11.32	. 11.86	118°3.67	2.76	Menkent	147°58.18	-36°29.55
10	122°11.40	308°36.02	8.61	40°32.68	58.28	45°13.42	11.89	133°6.30	2.84	Arcturus Rigil Kent.	145°48.33 139°41.00	19°3.43 -60°56.43
11	$137^{\circ}13.87$	323°35.68	7.35	55°33.43	58.41	60°15.52	11.92	148°8.92	2.91	Kochab	137° 20.03	74° 3.51
12	$152^{\circ}16.33$	338°35.35	N04°6.08	70°34.18	N22°58.55	75°17.62	N22°11.95	163°11.55	S07°2.99	Zuben'ubi	136° 56.46	-16° 8.64
13	$167^{\circ}18.79$	353°35.01	4.82	85°34.93	58.68	90°19.72	11.98	178°14.18	3.06	Alphecca	126°4.03	26°38.11
14	182°21.26	8°34.68	3.55	100°35.68	58.81	105°21.82	12.01	193°16.81	3.14	Antares	112° 16.16	-26°29.25
15	197°23.72	23°34.35	• • 2.29	115°36.43	• • 58.94	120°23.92	• • 12.04	208°19.44	• • 3.21	Atria	107° 10.52	-69°4.54
16	212°26.19	38°34.01	04°1.02	130°37.18	59.08	135°26.02	12.07	223°22.06	3.29	Sabik	102°3.03	-15°45.32
17	227° 28.65	53°33.68	03°59.76	145°37.93	59.21	150°28.12	12.10	238°24.69	3.36	Shaula	96°10.62	-37°7.39
18	242°31.11	68°33.35	N03°58.50	160°38.68	N22°59.34	165°30.23	N22°12.13		S07°3.44	Rasalhague	95°58.70	12°32.66
19	257° 33.58	83°33.01	57.23	175°39.43	59.47	180°32.33	12.16	268°29.95	3.51	Eltanin	90°42.06	51°29.34
20 21	272°36.04 287°38.51	98°32.68 113°32.35	55.96 •• 54.70	190°40.18 205°40.94	59.60 •• 59.73	195°34.43 210°36.53	12.18 •• 12.21	283°32.58 298°35.21	3.59 · · 3.66	Kaus Aust.	83°32.68	-34°22.43
22	302°40.97	113 32.33 128°32.02	53.43	200° 40.94 220° 41.69	22°59.86	225°38.63	12.24	313°37.84	3.74	Vega	80°33.17	38°48.56
23	317°43.43	143°31.68	52.17	235° 42.44	22°59.99	240°40.74	12.27	328°40.46	3.81	Nunki	75°47.88	-26°15.98
										Altair	61°59.98	8°56.10
Mer. _I	pass. 01:53	ν -0.3′ d-1	3′ m-3.86	u 0.7' d0	$.1^\prime$ m0.76	$\nu 2.1' d0$.0′ m-2.21	ν 2.6′ d0.	1′ m0.64	Peacock	53°5.65	-56°39.39
										Deneb	49°25.60	45°22.19
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif Al Na'ir	33°38.78 27°32.81	9°59.36 -46°50.42
0	332°45.90		N03°50.90	250°43.19	N23°0.12	255°42.84		343°43.09		Fomalhaut	15° 14.49	-40 50.42 -29°29.37
1	347°48.36	173°31.02	49.64	265°43.94	0.25	270°44.94	12.33	358°45.72	3.96	Scheat	13° 45.17	28°13.02
2	2°50.83	188°30.69	48.37	280°44.69	0.38	285°47.05	12.36	13°48.35	4.04	Markab	13°29.90	15°20.34
3	17°53.29	203°30.36	• • 47.10	295°45.45	• • 0.51	300°49.15	• • 12.39	28°50.98	• • 4.11			
4	32°55.75	218°30.03	45.84	310°46.20	0.64	315°51.25	12.42	43°53.61	4.19	Aug 22 Thu	SHA	Mer.pass
5	47° 58.22	233°29.69	44.57	325° 46.95	0.76	330°53.36	12.45	58°56.24	4.26		187°59.87	13:25
6	63°0.68	248°29.36	N03°43.30	340° 47.71	N23° 0.89	345°55.46	N22°12.47	73°58.87	\$07°4.34	1	279°19.68	07:19
7	78°3.15	263°29.03	42.03	355°48.46	1.02	0°57.57	12.50	89°1.50	4.41	Jupiter Saturn	283°14.55 10°49.36	07:03 01:13
8 9	93°5.61 108°8.07	278°28.70 293°28.37	40.77	10°49.21 25°49.97	1.15 •• 1.27	15°59.67	12.53 •• 12.56	104°4.13	4.49	Saturn	10 49.30	01:13
10	108°8.07 123°10.54	293°28.37 308°28.04	· · 39.50 38.23	40° 50.72	1.40	31° 1.78 46° 3.88	12.59	119°6.76 134°9.38	• • 4.56 4.64	Aug 23 Fri	SHA	Mer.pass
11	123 10.54 138° 13.00	308 28.04 323°27.71	36.23 36.96	40 50.72 55°51.47	1.40	40 3.88 61°5.99	12.59	134 9.38 149°12.01	4.04 4.71		$186^{\circ}52.61$	13:26
12	153° 15.47	338° 27.71	N03°35.69	70°52.23	N23° 1.65	76° 8.09	N22°12.65	164°14.64	\$07°4.79	l l	278°38.43	07:18
13	168° 17.93	353°27.05	34.42	85°52.98	1.78	91°10.20	12.67	179°17.27	4.86	Jupiter	283°5.68	07:00
14	183° 20.40	8°26.72	33.16	100°53.74	1.90	106°12.31	12.70	194°19.90	4.94	Saturn	10°53.26	01:09
15	198°22.86	23°26.39	• • 31.89	115°54.49	• • 2.03	121°14.41	• • 12.73	209°22.53	• • 5.01	Aug 24 Sat	SHA	Mer.pass
16	213°25.32	38°26.06	30.62	130°55.25	2.15	136°16.52	12.76	224°25.16	5.09		185° 45.45	13:26
17	228°27.79	53°25.73	29.35	145°56.00	2.28	151°18.63	12.79	239°27.79	5.16		277°57.29	07:17
18	243°30.25	68°25.40	N03°28.08	160°56.76	N23°2.40	166°20.74	N22°12.82	254°30.42	S07°5.24		282°56.94	06:56
19	258° 32.72	83°25.07	26.81	175° 57.51	2.52	181°22.84	12.84	269°33.05	5.31	Saturn	$10^{\circ}57.20$	01:05
20	273°35.18	98°24.75	25.54	190°58.27	2.65	196°24.95	12.87	284°35.68	5.39	,, ,		
21	288° 37.64	113°24.42	• • 24.27	205°59.02	• • 2.77	211°27.06	• • 12.90	299°38.31	• • 5.46	Horizoi	ntal parallax	0.1
22	303°40.11	128°24.09	23.00	220°59.78	2.89	226°29.17	12.93	314°40.94	5.54		Venus: Mars:	0.1 0.1
23	318° 42.57	143°23.76	21.73	236°0.53	3.02	241°31.28	12.96	329°43.57	5.62		ividi5.	0.1
Mer.ı	pass. 01:49	ν -0.3′ d-1	3′ m-3.86	ν 0.8′ d0	.1′ m0.75	$\nu 2.1' d0$.0′ m-2.22	ν 2.6′ d0.	1′ m0.64			

า	Su	n	Moon				
hu -	GHA	Dec	GHA	ν	Dec	d	HP
)	$179^{\circ}16.60$	N11°40.89	330°0.36	10.6'	S00°17.87	-17.9'	60.7
L	194°16.76	40.05	344°30.00	10.6'	N00°0.03	17.9'	60.7
	$209^{\circ}16.92$	39.21	358°59.65	10.7'	00°17.92	17.9'	60.7
3	224°17.08	• • 38.37	13°29.31	10.7'	00°35.80	17.9'	60.7
ļ	239°17.24	37.52	27°58.98	10.7'	00°53.67	17.9'	60.7
,	254°17.41	36.68	42°28.66	10.7'	$01^{\circ}11.53$	17.8'	60.7
5	269°17.57	N11°35.84	56°58.34	10.7'	N01°29.38	17.8'	60.7
7	284°17.73	34.99	71°28.04	10.7'	$01^{\circ}47.21$	17.8'	60.6
3	299°17.89	34.15	85°57.73	10.7'	$02^{\circ}5.02$	17.8'	60.6
)	314°18.05	• • 33.31	100°27.43	10.7'	$02^{\circ}22.81$	17.8'	60.6
0	329°18.22	32.46	114°57.14	10.7'	02°40.58	17.7'	60.6
1	344°18.38	31.62	129°26.84	10.7'	02°58.33	17.7'	60.6
2	359°18.54	N11°30.77	143°56.54	10.7'	N03° 16.05	17.7'	60.6
3	14°18.71	29.93	158°26.25	10.7'	03°33.75	17.7'	60.6
4	29°18.87	29.08	172°55.94	10.7'	$03^{\circ}51.41$	17.6'	60.5
5	44°19.03	· · 28.23	187°25.64	10.7'	04°9.05	17.6'	60.5
6	59°19.20	27.39	201°55.33	10.7'	04°26.65	17.6'	60.5
7	74°19.36	26.54	216°25.01	10.7'	04°44.22	17.5'	60.5
8	89°19.53	N11°25.69	230°54.69	10.7'	N05°1.75	17.5'	60.5
9	104°19.69	24.85	245°24.35	10.7'	05° 19.25	17.5'	60.5
0	119°19.85	24.00	259°54.01	10.6'	05°36.70	17.4	60.4
1	134°20.02	. 23.15	274° 23.65	10.6'	05°54.11	17.4	60.4
2	149°20.18	22.30	288° 53.28	10.6'	06°11.48	17.3	60.4
3	164° 20.35	21.45	303° 22.90	10.6'	06°28.81	17.3'	60.4
-						11.3	50.2
_	SD = 15.8'	d = -0.8'		SI	D = 16.6'		
ri	GHA	Dec	GHA	ν	Dec	d	HF
)	179°20.51	N11°20.60	317°52.50	10.6'	N06° 46.09	17.2'	60.4
	194°20.68	19.75	$332^{\circ}22.09$	10.6'	07°3.32	17.2'	60.4
2	209°20.85	18.90	346°51.66	10.5'	07°20.50	17.1'	60.3
3	224°21.01	•• 18.05	1°21.21	10.5'	07°37.62	17.1'	60.3
ļ	239°21.18	17.20	15°50.74	10.5'	07°54.70	17.0'	60.3
5	254°21.34	16.35	30°20.24	10.5'	$08^{\circ}11.71$	17.0'	60.3
5	269°21.51	N11°15.50	44°49.73	10.5'	N08°28.68	16.9'	60.3
7	284°21.68	14.65	59° 19.20	10.4'	08°45.58	16.8'	60.2
3	299°21.84	13.80	73°48.63	10.4'	09°2.42	16.8'	60.2
)	314°22.01	• • 12.95	88° 18.05	10.4'	09° 19.20	16.7'	60.2
0	329°22.18	12.10	102°47.43	10.4'	09°35.91	16.6'	60.2
1	344°22.34	11.24	117° 16.79	10.3'	09°52.56	16.6'	60.2
2	359°22.51	N11°10.39	131°46.12	10.3'	N10°9.15	16.5'	60.1
3	14°22.68	9.54	146°15.42	10.3'	10°25.66	16.4	60.1
4	29°22.85	8.68	160°44.69	10.2'	10°42.10	16.4'	60.1
5	44°23.01	7.83	175°13.93	10.2'	10°58.47	16.3'	60.1
6	59°23.18	6.98	189°43.14	10.2'	11°14.77	16.2'	60.0
7	74°23.35	6.12	204°12.31	10.1'	11°30.99	16.1'	60.0
8	89°23.52	N11°5.27	218°41.44	10.1'	N11°47.14	16.1'	60.0
9	104°23.69	4.41	233° 10.54	10.1'	12°3.20	16.0'	60.0
0	119°23.86	3.56	247°39.61	10.0'	12° 19.19	15.9'	59.9
1	134°24.03	2.70	262°8.63	10.0'	12°35.09	15.8'	59.9
2	149°24.20	1.85	276°37.62	9.9'	12°50.91	15.7'	59.9
3	164°24.36	0.99	291°6.56	9.9'	13°6.65	15.6'	59.9
-	SD = 15.8'	d = -0.8'			D = 16.5'	10.0	
-							
at	GHA	Dec	GHA	ν	Dec	d	HP
)	179°24.53	N11°0.13	305°35.47	9.9'	N13°22.30	15.6'	59.8
L	194°24.70	10°59.28	320°4.34	9.8'	13°37.86	15.5'	59.8
2	209°24.87	58.42	334°33.16	9.8'	13°53.33	15.4'	59.8
3	224°25.04	• • 57.56	349°1.94	9.7'	14°8.71	15.3'	59.8
ŀ	239°25.21	56.70	3°30.67	9.7'	14°24.00	15.2'	59.7
5	254°25.38	55.85	$17^{\circ}59.37$	9.6'	14°39.19	15.1'	59.7
5	269°25.55	N10°54.99	$32^{\circ}28.01$	9.6'	N14°54.29	15.0'	59.7
7	284°25.73	54.13	$46^{\circ}56.61$	9.6'	15°9.29	14.9'	59.7
3	299°25.90	53.27	61°25.16	9.5'	15°24.19	14.8'	59.6
)	314°26.07	• • 52.41	75°53.67	9.5'	15°38.99	14.7'	59.6
0	329°26.24	51.55	$90^{\circ}22.13$	9.4'	15°53.69	14.6'	59.6
1	344°26.41	50.69	104°50.53	9.4'	16°8.29	14.5'	59.5
2	359°26.58	N10°49.83	119° 18.89	9.3'	N16°22.78	14.4'	59.5
3	14°26.75	48.97	133°47.20	9.3'	16°37.17	14.3'	59.5
4	29°26.93	48.11	148° 15.46	9.2'	16°51.45	14.2'	59.5
5	44°27.10	• • 47.25	162°43.66	9.2'	17°5.62	14.1'	59.4
6	59°27.27	46.39	177°11.82	9.1'	17° 19.68	13.9'	59.4
7	74°27.44	45.53	191°39.92	9.0'	17°33.63	13.8'	59.4
8	89°27.62	N10°44.66	206°7.97	9.0'	N17°47.46	13.7'	59.3
	104°27.79	43.80	220°35.97	8.9'	18°1.18	13.6'	59.3
9	119°27.96	42.94	235°3.91	8.9'	18° 14.79	13.5'	59.3
		12.51				13.4'	
0		· · 42 08	249°31 80	8 8'	18-78-77	134	5u ·
0 1	134°28.13	· · 42.08 41.21	249°31.80 263°59.63	8.8' 8.8'	18°28.27 18°41.64		
0 1 2	134°28.13 149°28.31	41.21	263°59.63	8.8'	18°41.64	13.2'	59.3 59.2 59.2
0 1 2	134°28.13 149°28.31 164°28.48	41.21 40.35		8.8' 8.7'	18°41.64 18°54.89		59.2
9 0 1 2 3	134°28.13 149°28.31	41.21	263°59.63	8.8' 8.7'	18°41.64	13.2'	59.2

	Twilight		Sunriso		Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	01:07	03:17	20:44	22:45	////
N 70°	////	02:05	03:37	20:24	21:54	////
68°	////	02:38	03:54	20:09	21:23	////
66°	00:58	03:01	04:07	19:56	21:00	22:56
64°	01:49	03:20	04:17	19:45	20:43	22:10
62°	02:19	03:34	04:27	19:37	20:28	21:42
60°	02:41	03:47	04:34	19:29	20:16	21:21
N 58°	02:58	03:57	04:41	19:22	20:06	21:04
56°	03:13	04:06	04:47	19:16	19:57	20:50
54°	03:25	04:14	04:53	19:11	19:49	20:38
52°	03:35	04:21	04:58	19:06	19:43	20:28
50°	03:44	04:27	05:02	19:02	19:36	20:19
45°	04:03	04:41	05:12	18:52	19:23	20:01
N 40°	04:17	04:51	05:20	18:45	19:13	19:47
35°	04:29	05:00	05:26	18:38	19:04	19:36
30°	04:38	05:07	05:32	18:32	18:57	19:26
20°	04:53	05:20	05:42	18:22	18:45	19:11
N 10°	05:05	05:30	05:51	18:14	18:35	19:00
0°	05:14	05:38	05:59	18:06	18:27	18:51
S 10°	05:21	05:46	06:07	17:58	18:19	18:44
20°	05:27	05:53	06:16	17:50	18:12	18:38
30°	05:33	06:01	06:25	17:40	18:05	18:33
35°	05:35	06:05	06:30	17:35	18:01	18:30
40°	05:37	06:09	06:37	17:29	17:57	18:28
45°	05:39	06:14	06:44	17:22	17:52	18:26
S 50°	05:41	06:19	06:52	17:14	17:47	18:24
52°	05:42	06:21	06:56	17:10	17:45	18:24
54°	05:43	06:24	07:00	17:06	17:42	18:23
56°	05:43	06:27	07:05	17:01	17:39	18:23
58°	05:44	06:30	07:10	16:56	17:37	18:22
S 60°	05:44	06:33	07:16	16:50	17:33	18:22
	I			ı		

Lat.		Moonris	e		Moonset	:
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	19:33	18:46	17:12	08:44	11:20	14:45
N 70°	19:40	19:06	18:11	08:41	11:03	13:48
68°	19:46	19:21	18:46	08:38	10:50	13:14
66°	19:51	19:34	19:12	08:36	10:40	12:50
64°	19:55	19:45	19:32	08:34	10:31	12:32
62°	19:59	19:54	19:48	08:33	10:23	12:17
60°	20:03	20:02	20:02	08:31	10:17	12:04
N 58°	20:05	20:09	20:14	08:30	10:11	11:53
56°	20:08	20:15	20:24	08:29	10:06	11:44
54°	20:11	20:21	20:33	08:28	10:02	11:36
52°	20:13	20:26	20:42	08:27	09:58	11:28
50°	20:15	20:30	20:49	08:27	09:54	11:21
45°	20:19	20:40	21:05	08:25	09:46	11:07
N 40°	20:23	20:49	21:18	08:23	09:40	10:56
35°	20:26	20:56	21:29	08:22	09:34	10:46
30°	20:29	21:03	21:39	08:21	09:29	10:37
20°	20:34	21:14	21:56	08:19	09:21	10:23
N 10°	20:38	21:24	22:11	08:18	09:13	10:10
0°	20:43	21:33	22:26	08:16	09:06	09:58
S 10°	20:47	21:43	22:40	08:14	08:59	09:46
20°	20:51	21:53	22:55	08:13	08:52	09:33
30°	20:57	22:05	23:13	08:11	08:44	09:19
35°	21:00	22:12	23:24	08:10	08:39	09:11
40°	21:03	22:19	23:36	08:08	08:34	09:01
45°	21:07	22:29	23:50	08:07	08:28	08:50
S 50°	21:12	22:40		08:05	08:20	08:37
52°	21:15	22:45		08:04	08:17	08:31
54°	21:17	22:51		08:04	08:13	08:24
56°	21:20	22:57		08:03	08:09	08:17
58°	21:23	23:05		08:02	08:04	08:08
S 60°	21:27	23:13		08:00	07:59	07:59

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 ^h	12 ^h	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-76%	
22	02:54	02:46	12:03	02:04	14:29		
23	02:38	02:30	12:02	02:54	15:20		
24	02:22	02:14	12:02	03:45	16:12		

August 25, 26, 27 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	333° 45.04	158°23.43 N03°20.46	251°1.29 N23°3.14	256°33.39 N22°12.99	344°46.20 \$07°5.69
1	348° 47.50	173°23.10 19.19	266°2.05 3.26	271°35.49 13.01	359°48.83 5.77
2	3°49.96	188° 22.78 17.92	281°2.80 3.38	286°37.60 13.04	14°51.46 5.84
	3 49.90 18°52.43				
3		203°22.45 · · 16.64 218°22.12 15.37	296°3.56 · · 3.50		
4	33°54.89		311°4.32 3.62	316°41.82 13.10	
5	48° 57.36	233°21.79 14.10	326°5.08 3.74	331°43.93 13.13	59°59.36 6.07
6	63°59.82	248°21.47 N03°12.83	341°5.83 N23°3.86	346°46.04 N22°13.15	75°1.99 S07°6.14
7	79°2.29	263°21.14 11.56	356° 6.59 3.98	1°48.16 13.18	90°4.62 6.22
8	94°4.75	278°20.81 10.29	11°7.35 4.10	16°50.27 13.21	105°7.25 6.29
9	109°7.21	293°20.49 · · 9.01	26°8.11 • • 4.22	31°52.38 · · 13.24	120°9.88 · · 6.37
10	124°9.68	308°20.16 7.74	41°8.87 4.34	46°54.49 13.27	135°12.51 6.45
11	139° 12.14	323°19.83 6.47	56°9.62 4.46	61°56.60 13.29	150°15.14 6.52
12	$154^{\circ}14.61$	338°19.51 N03°5.20	71°10.38 N23°4.58	76°58.71 N22°13.32	165°17.77 S 07°6.60
13	169° 17.07	353°19.18 3.92	86°11.14 4.70	92°0.83 13.35	180°20.40 6.67
14	184° 19.53	8°18.85 2.65	101°11.90 4.82	107°2.94 13.38	195°23.03 6.75
15	199°22.00	23°18.53 · · 1.38	116°12.66 · · 4.93	122°5.05 · · 13.40	210°25.66 · · 6.82
16	214° 24.46	38°18.20 03°0.10	131° 13.42 5.05	137°7.16 13.43	225°28.30 6.90
17	229° 26.93	53°17.88 02°58.83	146° 14.18 5.17	152° 9.28 13.46	240°30.93 6.97
18	244°29.39	68°17.55 N02°57.56	161°14.94 N23°5.28	167°11.39 N22°13.49	255°33.56 S07°7.05
19	259°31.85	83°17.23 56.28	176° 15.70 5.40	182°13.50 13.51	270°36.19 7.13
20	274°34.32	98°16.90 55.01	191°16.46 5.52	197°15.62 13.54	285°38.82 7.20
	274 34.32 289°36.78	113°16.58 · · 53.74	206° 17.22 · · 5.63	212°17.73 · · 13.57	300°41.45 · · 7.28
21 22	289° 36.78 304° 39.25				
23	319°41.71	143°15.93 51.19	236° 18.74 5.86	242°21.96 13.62	330°46.72 7.43
Mer.	pass. 01:45	ν-0.3′ d-1.3′ m-3.86	$ u 0.8' \ d0.1' \ \text{m}0.74$	ν2.1′ d0.0′ m-2.22	ν2.6' d0.1' m0.64
NA =	CHV	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Mon	GHA				
0	334° 44.18	158°15.60 N02°49.91	251°19.50 N23°5.98	257°24.08 N22°13.65	345°49.35
1	349° 46.64	173°15.28 48.64	266°20.26 6.09	272°26.19 13.68	0°51.98 7.58
2	4°49.10	188°14.95 47.36	281°21.02 6.21	287°28.31 13.71	15°54.61 7.66
3	19°51.57	203°14.63 · · 46.09	296°21.79 · · 6.32	302°30.42 · · 13.73	30°57.24 · · 7.73
4	34°54.03	218°14.30 44.81	311°22.55 6.44	317°32.54 13.76	45°59.87 7.81
5	49°56.50	233°13.98 43.54	326°23.31 6.55	332°34.66 13.79	61°2.51 7.88
6	64°58.96	248°13.66 N02°42.26	341°24.07 N23°6.66	347°36.77 N22°13.81	76°5.14 S 07°7.96
7	80°1.42	263°13.33 40.99	356° 24.83 6.77	2°38.89 13.84	91°7.77 8.03
8	95°3.89	278°13.01 39.71	11°25.60 6.89	17°41.01 13.87	106°10.40 8.11
9	110°6.35	293°12.68 · · 38.43	26°26.36 · · 7.00	32°43.12 · · 13.90	121°13.03 · · 8.19
10	125°8.82	308°12.36 37.16	41°27.12 7.11	47°45.24 13.92	136°15.67 8.26
11	140°11.28	323°12.04 35.88	56°27.89 7.22	62°47.36 13.95	150 15.07 8.20 151°18.30 8.34
11	140 11.28 155°13.75	323 12.04 35.88 338°11.71 N02°34.60	71°28.65 N23°7.33	77°49.48 N22°13.98	166°20.93 \$07°8.41
	155° 13.75 170° 16.21	353°11.71 N02°34.60 353°11.39 33.33	71°28.65 N23°7.33 86°29.41 7.45	92°51.60 14.00	
13					
14	185° 18.67	8°11.07 32.05		107°53.72 14.03	196°26.20 8.57
15	200°21.14	23°10.75 · · · 30.77	116° 30.94 · · 7.67	122°55.83 · · 14.06	211°28.83 · · 8.64
16	215°23.60	38°10.42 29.50	131°31.70 7.78	137°57.95 14.08	226°31.46 8.72
17	230°26.07	53°10.10 28.22	146° 32.47 7.89	153°0.07 14.11	241°34.09 8.79
18	245°28.53	68°9.78 N02°26.94	161°33.23 N23°8.00	168°2.19 N22°14.14	256°36.73 S 07°8.87
19	260°30.99	83°9.46 25.67	176° 34.00 8.11	183°4.31 14.16	271°39.36 8.94
20	275°33.46	98°9.13 24.39	191°34.76 8.21	198° 6.43 14.19	286°41.99 9.02
21	290°35.92	113°8.81 · · 23.11	206°35.53 · · 8.32	213°8.55 · · 14.22	301°44.62 · · 9.10
22	305°38.39	128°8.49 21.83	221°36.29 8.43	228°10.67 14.24	316°47.26 9.17
23	320° 40.85	143°8.17 20.55	236° 37.06 8.54	243°12.80 14.27	331°49.89 9.25
		$\frac{1.8 \text{ c.1.}}{\nu - 0.3' \text{ d-1.3' m-3.86}}$	$\frac{250 \text{ S} \cdot .50}{\nu 0.8' d0.1' \text{ m} 0.74}$	$\frac{2.13 \text{ 12.00}}{\nu 2.1' d0.0' \text{ m-2.23}}$	$\frac{351 \text{ is.65}}{\nu 2.6' \text{ d}0.1' \text{ m}0.63}$
ivier.	pass. 01:41	ν-υ.5 α-1.5 m-3.86	νυ.δ΄ αυ.1΄ mυ./4	ν2.1 d0.0 m-2.23	ν2.0° dU.1° mU.03
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	335° 43.32	158°7.85 N02°19.28	251°37.82 N23°8.65	258°14.92 N22°14.30	346°52.52 S 07°9.32
1	350° 45.78	173°7.52 18.00	266°38.59 8.75	273°17.04 14.32	1°55.16 9.40
2	5° 48.24	188°7.20 16.72	281°39.36 8.86	288°19.16 14.35	16°57.79 9.48
3	20°50.71	203°6.88 · · 15.44	296°40.12 · · 8.97	303°21.28 · · 14.38	32°0.42 · · 9.55
3 4	20 50.71 35°53.17	218° 6.56 14.16	311°40.89 9.07	318°23.40 14.40	47°3.06 9.63
	50°55.64				
5			326°41.66 9.18	333°25.53 14.43	62°5.69 9.71
6	65°58.10	248°5.92 N02°11.60	341°42.42 N23°9.29	348°27.65 N22°14.45	77°8.32 S07°9.78
7	81°0.56	263°5.60 10.33	356°43.19 9.39	3°29.77 14.48	92°10.95 9.86
8	96°3.03	278°5.28 9.05	11°43.96 9.50	18°31.90 14.51	107°13.59 9.93
9	111°5.49	293°4.96 · · 7.77	26°44.73 · · 9.60	33°34.02 · · 14.53	122°16.22 · · 10.01
10	126°7.96	308°4.63 6.49	41°45.49 9.71	48°36.14 14.56	137°18.86 10.09
11	141° 10.42	323°4.31 5.21	56°46.26 9.81	63°38.27 14.59	152°21.49 10.16
12	$156^{\circ}12.89$	338°3.99 N02°3.93	71°47.03 N23°9.92	78°40.39 N22°14.61	167°24.12 S 07°10.24
13	171° 15.35	353°3.67 2.65	86°47.80 10.02	93°42.52 14.64	182°26.76 10.31
14	$186^{\circ}17.81$	8°3.35 1.37	101°48.57 10.12	108°44.64 14.66	197°29.39 10.39
15	201°20.28	23°3.03 02°0.09	116°49.34 · · 10.23	123°46.77 · · 14.69	212°32.02 · · 10.47
16	216°22.74	38°2.71 01°58.81	131°50.11 10.33	138°48.89 14.72	227°34.66 10.54
17	231°25.21	53°2.39 57.53	146° 50.88 10.43	153°51.02 14.74	242°37.29 10.62
18	246°27.67	68°2.07 N01°56.25	161°51.64 N23°10.53	168°53.14 N22°14.77	257°39.92 S07°10.70
19	261°30.14	83°1.75 54.97	176°52.41 10.64	183°55.27 14.79	272°42.56 10.77
20	276° 32.60	98°1.43 53.69	191°53.18 10.74	198°57.40 14.82	287°45.19 10.85
21	276 32.60 291°35.06	113°1.12 · · 52.40	206°53.95 · · 10.84	213°59.52 · · 14.84	302°47.83 · · 10.92
22	291 35.06 306°37.53	113 1.12 · · · 52.40 128° 0.80 51.12	200 53.95 · · 10.84 221°54.73	213 59.52 · · 14.84 229°1.65 14.87	317°50.46 11.00
	306° 37.53 321° 39.99				
23	321-39.99	143°0.48 49.84	236°55.50 11.04	244° 3.78 14.90	332°53.09 11.08
Mer.	pass. 01:37	ν -0.3' d-1.3' m-3.86	$ u 0.8' \ d0.1' \ m0.73$	$\nu 2.1' \ d0.0' \ \text{m-}2.23$	$ u 2.6' \ d0.1' \ \text{m}0.63$

Stars SHA

357°34.79 353°7.07

349°30.98

348°47.34

 $335^{\circ}20.02$

Alpheratz

Ankaa Schedar

Diphda Achernar **Dec** 29° 13.61

-42°10.11

56° 40.25 -17° 50.91

-57°6.40

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°28.65	N10°39.49	292°55.14	8.7'	N19°8.02	13.0'	59.2'
1	194°28.83	38.62	307°22.81	8.6'	19°21.02	12.9'	59.1'
2	209°29.00	37.76	321°50.42	8.6'	19°33.91	12.8'	59.1'
3	224°29.18	• • 36.89	336°17.98	8.5'	19°46.66	12.6'	59.1'
4 5	239°29.35 254°29.53	36.03 35.16	350°45.48 5°12.93	8.4' 8.4'	19°59.29 20°11.80	12.5' 12.4'	59.0' 59.0'
6	269°29.70	35.16 N10°34.30	5 12.93 19°40.32	8.3'	N20° 24.17	12.4	59.0'
7	284°29.87	33.43	34°7.65	8.3	20° 36.41	12.1'	59.0'
8	299°30.05	32.57	48°34.93	8.2'	20° 48.53	12.0'	58.9'
9	314°30.23	• • 31.70	63°2.15	8.2'	21°0.51	11.8'	58.9'
10	329°30.40	30.83	77°29.32	8.1'	21°12.35	11.7'	58.9'
11	344°30.58	29.97	91°56.43	8.1'	21°24.06	11.6'	58.8'
12 13	359°30.75 14°30.93	N10°29.10 28.23	106°23.48 120°50.48	8.0' 7.9'	N21°35.64 21°47.07	11.4' 11.3'	58.8' 58.8'
13 14	29°31.10	28.23	120 50.48 135°17.42	7.9' 7.9'	21 47.07 21°58.37	11.3 11.2'	58.7'
15	44°31.28	. 26.50	149°44.31	7.8'	21° 30.57 22° 9.53	11.0'	58.7'
16	59°31.46	25.63	164°11.14	7.8'	22° 20.55	10.9	58.7'
17	74°31.63	24.76	178°37.92	7.7'	22°31.43	10.7'	58.6'
18	89°31.81	N10°23.89	193°4.64	7.7'	N22°42.16	10.6'	58.6'
19	104°31.99	23.02	207°31.30	7.6'	22°52.75	10.4'	58.6'
20	119°32.16	22.15	221°57.92	7.6'	23°3.20	10.3'	58.6'
21 22	134°32.34 149°32.52	· · 21.28 20.41	236°24.48 250°50.98	7.5' 7.5'	23° 13.50 23° 23.65	10.2' 10.0'	58.5' 58.5'
22	149°32.52 164°32.69	20.41 19.54	250°50.98 265°17.44	7.5° 7.4'	23°23.65 23°33.65	9.9'	58.5° 58.5'
20						5.5	30.3
	SD = 15.8'	d = -0.9'		SI	D = 16.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°32.87	$N10^{\circ}18.67$	279°43.84	7.4'	N23° 43.51	9.7'	58.4'
1	194°33.05	17.80	294°10.19	7.3'	23°53.21	9.6'	58.4'
2	209°33.23	16.93	308°36.49	7.2'	24°2.77	9.4'	58.4'
3 4	224°33.41 239°33.58	· · 16.06 15.18	323°2.74 337°28.94	7.2' 7.2'	24°12.17 24°21.42	9.2' 9.1'	58.3' 58.3'
5	254°33.76	14.31	351° 55.09	7.1'	24 21.42 24°30.51	9.1 8.9'	58.3'
6	269°33.94	N10°13.44	6°21.19	7.1'	N24° 39.46	8.8'	58.2
7	284°34.12	12.57	20°47.25	7.0'	24°48.24	8.6'	58.2'
8	299°34.30	11.69	35°13.26	7.0'	24° 56.87	8.5'	58.2'
9	314°34.48	• • 10.82	49°39.22	6.9'	25°5.34	8.3'	58.2'
10	329°34.66	9.95	64°5.14	6.9'	25° 13.66	8.2'	58.1'
11	344°34.84	9.07	78°31.02	6.8'	25°21.81	8.0'	58.1'
12 13	359°35.02 14°35.20	N10°8.20 7.32	92°56.85 107°22.64	6.8' 6.8'	N25°29.81 25°37.64	7.8' 7.7'	58.1' 58.0'
13	29°35.37	6.45	107 22.04 121°48.39	6.7'	25°45.32	7.7 7.5'	58.0'
15	44°35.55	• • 5.57	136°14.10	6.7'	25°52.83	7.4	58.0'
16	59°35.74	4.70	150°39.77	6.6'	26°0.18	7.2'	57.9'
17	74°35.92	3.82	$165^{\circ}5.41$	6.6'	26°7.37	7.0'	57.9'
18	89°36.10	N10°2.95	179°31.01	6.6'	N26° 14.39	6.9'	57.9'
19	104°36.28	2.07	193°56.57	6.5'	26°21.25	6.7'	57.8'
20 21	119°36.46 134°36.64	1.19 10°0.32	208°22.10 222°47.60	6.5' 6.5'	26°27.95 26°34.48	6.5° 6.4°	57.8' 57.8'
22	149°36.82	09°59.44	237°13.07	6.4	26° 40.84	6.2	57.8'
23	164°37.00	58.56	251°38.51	6.4	26° 47.04	6.0'	57.7'
	SD = 15.8'	d = -0.9'		SI	D = 15.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	179°37.18 194°37.36	N09°57.69 56.81	266°3.92 280°29.30	6.4' 6.4'	N26°53.07 26°58.93	5.9' 5.7'	57.7'
2	194 37.36 209°37.55	55.81 55.93	280°29.30 294°54.65	6.3	26°58.93 27°4.63	5.7° 5.5'	57.7' 57.6'
3	224°37.73	• • 55.05	309°19.99	6.3	27° 10.16	5.4	57.6'
4	239°37.91	54.17	323°45.30	6.3'	$27^{\circ}15.52$	5.2'	57.6'
5	254°38.09	53.29	338°10.59	6.3'	27°20.71	5.0'	57.5'
6	269°38.27	N09°52.41	352°35.86	6.3'	N27°25.73	4.9'	57.5'
7	284°38.46	51.54	7°1.11	6.2'	27°30.58	4.7'	57.5'
8 9	299°38.64 314°38.82	50.66 •• 49.78	21°26.34 35°51.56	6.2' 6.2'	27°35.26 27°39.77	4.5' 4.3'	57.5' 57.4'
10	329°39.00	48.89	50°16.77	6.2'	27°44.11	4.2'	57.4'
11	344°39.19	48.01	64°41.97	6.2'	27°48.28	4.0'	57.4
12	359°39.37	N09°47.13	79°7.15	6.2'	N27°52.28	3.8'	57.3'
13	14°39.55	46.25	93°32.33	6.2'	27°56.11	3.7'	57.3'
14	29°39.74	45.37	107°57.50	6.2'	27°59.76	3.5'	57.3'
15	44°39.92	• • 44.49	122°22.67	6.2'	28°3.25	3.3'	57.2'
16 17	59°40.10 74°40.29	43.61 42.73	136°47.83 151°13.00	6.2' 6.2'	28°6.56 28°9.70	3.1' 3.0'	57.2' 57.2'
18	89°40.47	42.73 N09°41.84	151 13.00 165°38.16	6.2	28 9.70 N28°12.68	2.8'	57.2'
19	104°40.66	40.96	180°3.33	6.2	28° 15.47	2.6'	57.1
20	119°40.84	40.08	194°28.50	6.2'	28° 18.10	2.5'	57.1'
21	134°41.03	• • 39.19	208°53.67	6.2'	28° 20.56	2.3'	57.1'
22	149°41.21	38.31	223°18.86	6.2'	28° 22.85	2.1'	57.0'
23	164°41.40	37.43	237°44.05	6.2'	28°24.96	1.9'	57.0'
	SD = 15.8'	d = -0.9'		SI	D = 15.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juliuse	Junset	Civil	Naut.
N 72°	////	01:44	03:33	20:26	22:11	////
N 70°	////	02:26	03:51	20:09	21:32	////
68°	////	02:54	04:05	19:55	21:06	23:48
66°	01:30	03:14	04:17	19:44	20:46	22:26
64°	02:07	03:30	04:26	19:35	20:30	21:51
62°	02:33	03:44	04:35	19:27	20:17	21:27
60°	02:52	03:55	04:42	19:20	20:06	21:08
N 58°	03:08	04:04	04:48	19:14	19:57	20:53
56°	03:21	04:13	04:53	19:09	19:49	20:40
54°	03:32	04:20	04:58	19:04	19:42	20:30
52°	03:41	04:26	05:03	19:00	19:36	20:20
50°	03:50	04:32	05:07	18:56	19:30	20:12
45°	04:07	04:44	05:15	18:47	19:18	19:55
N 40°	04:21	04:54	05:22	18:40	19:08	19:42
35°	04:31	05:02	05:29	18:34	19:00	19:31
30°	04:40	05:09	05:34	18:29	18:54	19:23
20°	04:54	05:21	05:43	18:20	18:42	19:09
N 10°	05:05	05:30	05:51	18:12	18:34	18:58
0°	05:13	05:37	05:58	18:05	18:26	18:50
S 10°	05:20	05:44	06:06	17:58	18:19	18:44
20°	05:25	05:51	06:13	17:50	18:13	18:38
30°	05:30	05:58	06:22	17:42	18:06	18:34
35°	05:32	06:01	06:27	17:37	18:03	18:32
40°	05:33	06:05	06:32	17:32	17:59	18:31
45°	05:35	06:09	06:38	17:26	17:55	18:29
S 50°	05:36	06:13	06:46	17:18	17:51	18:29
52°	05:36	06:15	06:49	17:15	17:49	18:28
54°	05:36	06:17	06:53	17:11	17:47	18:28
56°	05:36	06:19	06:57	17:07	17:45	18:28
58°	05:37	06:22	07:02	17:02	17:42	18:28
S 60°	05:37	06:25	07:07	16:57	17:40	18:28

Lat.		Moonris	е		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°	18:30			15:25		
64°	19:13			14:43		
62°	19:42	19:33		14:15	16:22	
60°	20:04	20:11	20:30	13:54	15:45	17:26
N 58°	20:22	20:38	21:08	13:37	15:18	16:48
56°	20:37	20:59	21:35	13:22	14:57	16:22
54°	20:51	21:17	21:56	13:09	14:40	16:01
52°	21:02	21:32	22:13	12:58	14:25	15:43
50°	21:13	21:45	22:29	12:49	14:13	15:28
45°	21:34	22:12	22:59	12:28	13:47	14:58
N 40°	21:52	22:33	23:23	12:12	13:26	14:35
35°	22:07	22:51	23:42	11:58	13:09	14:15
30°	22:20	23:07	23:59	11:46	12:54	13:59
20°	22:42	23:33		11:25	12:29	13:31
N 10°	23:02	23:56		11:08	12:07	13:07
0°	23:20		00:17	10:51	11:47	12:45
S 10°	23:39		00:38	10:35	11:27	12:22
20°	23:58		01:01	10:17	11:06	11:58
30°		00:22	01:28	09:57	10:41	11:31
35°		00:35	01:44	09:46	10:27	11:14
40°		00:51	02:03	09:33	10:10	10:55
45°		01:10	02:26	09:17	09:50	10:32
S 50°	00:08	01:34	02:54	08:58	09:25	10:03
52°	00:16	01:45	03:09	08:49	09:13	09:48
54°	00:25	01:58	03:25	08:39	09:00	09:31
56°	00:36	02:14	03:45	08:27	08:44	09:11
58°	00:48	02:32	04:10	08:14	08:25	08:46
S 60°	01:02	02:54	04:43	07:59	08:02	08:12

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-43%	
25	02:05	01:57	12:02	04:38	17:06		
26	01:49	01:40	12:02	05:34	18:02		
27	01.21	01.00	10.01	06.21	10.00	400	

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	336° 42.46	158°0.16 N01°48.56	251°56.27 N23°11.14	259°5.91 N22°14.92	347°55.73 S07°11.15
1	351°44.92	172°59.84 47.28	266° 57.04 11.24	274°8.03 14.95	2°58.36 11.23
2	6°47.38	187°59.52 46.00	281°57.81 11.34	289°10.16 14.97	18°1.00 11.31
3	21°49.85	202°59.20 · · 44.72	296°58.58 · · 11.44	304°12.29 · · 15.00	33°3.63 · · 11.38
4	$36^{\circ}52.31$	217°58.88 43.44	311°59.35 11.54	319°14.42 15.02	48°6.27 11.46
5	51°54.78	232°58.56 42.15	327°0.12 11.64	334°16.55 15.05	63°8.90 11.53
6	66° 57.24	247°58.24 N01°40.87	342°0.90 N23°11.74	349°18.68 N22°15.08	78°11.53 S 07°11.61
7	$81^{\circ}59.71$	262°57.93 39.59	357°1.67 11.84	4°20.81 15.10	93°14.17 11.69
8	97°2.17	277°57.61 38.31	12°2.44 11.94	19°22.94 15.13	108°16.80 11.76
9	112°4.63	292°57.29 · · 37.03	27°3.21 · · 12.03	34°25.07 · · 15.15	123°19.44 · · 11.84
10	$127^{\circ}7.10$	307°56.97 35.74	42°3.99 12.13	49°27.20 15.18	138°22.07 11.92
11	$142^{\circ}9.56$	322°56.65 34.46	57°4.76 12.23	64°29.33 15.20	153°24.71 11.99
12	157° 12.03	337°56.33 N01°33.18	72°5.53 N23°12.33	79°31.46 N22°15.23	168°27.34 S07°12.07
13	$172^{\circ}14.49$	352°56.02 31.90	87°6.31 12.42	94°33.59 15.25	183°29.98 12.15
14	$187^{\circ}16.95$	7°55.70 30.61	102°7.08 12.52	109°35.72 15.28	198°32.61 12.22
15	202° 19.42	22°55.38 · · 29.33	$117^{\circ}7.86 \cdot \cdot 12.61$	124°37.85 · · 15.30	213°35.25 · · 12.30
16	$217^{\circ}21.88$	37°55.06 28.05	132°8.63 12.71	139°39.98 15.33	228°37.88 12.38
17	232°24.35	52°54.75 26.76	147°9.40 12.81	154°42.12 15.35	243°40.52 12.45
18	247°26.81	67°54.43 N01°25.48	162°10.18 N23°12.90	169°44.25 N22°15.38	258°43.15 S 07°12.53
19	262°29.28	82°54.11 24.20	177° 10.95 13.00	184°46.38 15.40	273°45.79 12.60
20	277°31.74	97°53.79 22.91	192°11.73 13.09	199°48.51 15.43	288°48.42 12.68
21	292°34.20	112°53.48 · · 21.63	207°12.50 · · 13.19	214°50.65 · · 15.45	303°51.06 · · 12.76
22	307° 36.67	127°53.16 20.35	222°13.28 13.28	229°52.78 15.48	318°53.69 12.83
23	322°39.13	142°52.84 19.06	237°14.06 13.37	244°54.91 15.50	333°56.33 12.91
Mer.	pass. 01:33	ν-0.3′ d-1.3′ m-3.86	ν0.8' d0.1' m0.73	ν2.1′ d0.0′ m-2.24	ν2.6' d0.1' m0.62
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	337°41.60	157°52.52 N01°17.78	252°14.83 N23°13.47	259°57.05 N22°15.53	348°58.96 S07°12.99
1	352° 44.06	172°52.21 16.50	267°15.61 13.56	274°59.18 15.55	4°1.60 13.06
2	7° 46.52	187°51.89 15.21	282°16.38 13.65	290°1.32 15.58	19°4.23 13.14
3	22°48.99	202°51.57 · · 13.93	297° 17.16 · · 13.75	305° 3.45 · · 15.60	34°6.87 · · 13.22
4	37°51.45	217°51.26 12.64	312°17.94 13.84	320° 5.59 15.63	49°9.50 13.29
5	52°53.92	232°50.94 11.36	327°18.72 13.93	335°7.72 15.65	64°12.14 13.37
6	67° 56.38	247°50.62 N01°10.08	342°19.49 N23°14.02	350° 9.86 N22° 15.68	79°14.77 S07°13.45
7	82°58.85	262°50.31 8.79	357°20.27 14.11	5°11.99 15.70	94°17.41 13.52
8	98°1.31	277°49.99 7.51	12°21.05 14.20	20°14.13 15.73	109°20.05 13.60
9	113°3.77	292°49.68 · · 6.22	27°21.83 · · 14.29	35°16.27 · · 15.75	124°22.68 · · 13.68
10	128°6.24	307°49.36 4.94	42°22.60 14.39	50°18.40 15.78	139°25.32 13.75
11	143°8.70	322°49.04 3.65	57°23.38 14.48	65°20.54 15.80	154°27.95 13.83
12	158° 11.17	337°48.73 N01°2.37	72°24.16 N23°14.57	80°22.68 N22°15.82	169°30.59 S 07°13.91
13	173° 13.63	352°48.41 01°1.08	87°24.94 14.65	95°24.81 15.85	184°33.22 13.98
14	$188^{\circ}16.09$	7°48.09 00°59.80	102°25.72 14.74	110°26.95 15.87	199°35.86 14.06
15	203° 18.56	22°47.78 · · 58.51	117°26.50 · · 14.83	125°29.09 · · 15.90	214°38.50 · · 14.14
16	218°21.02	37° 47.46 57.23	132° 27.28 14.92	140°31.23 15.92	229°41.13 14.21
17	233°23.49	52°47.15 55.94	147°28.06 15.01	155°33.37 15.95	244°43.77 14.29
18	248°25.95	67°46.83 N00°54.66	162°28.84 N23°15.10	170°35.51 N22°15.97	259°46.40 S 07°14.37
19	263°28.42	82°46.52 53.37	177°29.62 15.19	185°37.65 15.99	274°49.04 14.44
20	278°30.88	97°46.20 52.09	192°30.40 15.27	200°39.79 16.02	289°51.68 14.52
21	293°33.34	112°45.88 •• 50.80	207°31.18 · · 15.36	215°41.92 · · 16.04	304°54.31 · · 14.60
22	308°35.81	127° 45.57 49.52	222°31.96 15.45	230°44.06 16.07	319°56.95 14.67
23	323°38.27	142°45.25 48.23	237°32.74 15.54	245°46.20 16.09	334°59.58 14.75
Mer.	pass. 01:29	ν-0.3' d-1.3' m-3.86	$\nu 0.8' \ d0.1' \ \text{m}0.72$	ν2.1' d0.0' m-2.25	ν2.6' d0.1' m0.62
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	338°40.74	157°44.94 N00°46.95	252°33.52 N23°15.62	260°48.35 N22°16.12	350°2.22 S07°14.83
1	353°43.20	172°44.62 45.66	267°34.31 15.71	275°50.49 16.14	5°4.86 14.90
2	8°45.66	187° 44.31 44.37	282°35.09 15.79	290°52.63 16.16	20°7.49 14.98
3	23°48.13	202°43.99 · · 43.09	297°35.87 · · 15.88	305°54.77 · · 16.19	35°10.13 · · 15.06
4	38°50.59	217°43.68 41.80	312°36.65 15.96	320°56.91 16.21	50°12.77 15.13
5	53°53.06	232°43.36 40.52	327°37.43 16.05	335°59.05 16.24	65°15.40 15.21
6	68°55.52	247°43.05 N00°39.23	342°38.22 N23°16.13	351°1.19 N22°16.26	80°18.04 S07°15.29
7	83°57.99	262°42.73 37.94	357°39.00 16.22	6°3.34 16.28	95°20.67 15.37
8	99°0.45	277°42.42 36.66	12°39.78 16.30	21°5.48 16.31	110°23.31 15.44
9	114°2.91	292°42.10 · · 35.37	27°40.57 · · 16.39	36°7.62 · · 16.33	125°25.95 · · 15.52
10	129°5.38	307°41.79 34.08	42°41.35 16.47	51° 9.77 16.35	140°28.58 15.60
11	144°7.84	322°41.47 32.80	57°42.13 16.55	66°11.91 16.38 81°14.05 N22°16.40	155°31.22 15.67
12	159° 10.31	337°41.16 N00°31.51	72°42.92 N23°16.64		170°33.86 S07°15.75
13	174° 12.77	352°40.84 30.22	87°43.70 16.72	96°16.20 16.43	185°36.50 15.83
14	189° 15.23	7°40.53 28.94	102°44.49 16.80	111°18.34 16.45	200°39.13 15.90 \(\sum_{215}^{\circ} \delta_1 77 \\ \delta_1 15.00 \\ \sum_{215}^{\circ} \delta_1 77 \\ \delta_2 15.00 \\ \sum_{215}^{\circ} \delta_2 \delta_2
15 16	204° 17.70	22°40.22 · · 27.65	117°45.27 · · 16.88	126°20.49 · · 16.47	215°41.77 · · 15.98
16	219°20.16	37°39.90 26.36	132°46.06 16.97	141°22.63 16.50	230°44.41 16.06
17	234° 22.63 249° 25.09	52°39.59 25.08 67°39.27 N00°23.79	147° 46.84 17.05 162° 47.63 N23° 17.13	156°24.78 16.52	245°47.04 16.13 260°49.68 S07°16.21
18 19	249°25.09 264°27.56	67°39.27 N00°23.79 82°38.96 22.50	162°47.63 N23°17.13 177°48.42 17.21	171°26.92 N22°16.54 186°29.07 16.57	275°52.32 16.29
20	279° 30.02	97°38.64 21.22	177 48.42 17.21 192°49.20 17.29	201°31.21 16.59	275 52.32 10.29 290°54.95 16.36
20	279°30.02 294°32.48	112°38.33 · · 19.93	207°49.99 · · 17.37	216°33.36 · · 16.61	305°57.59 · · 16.44
22	294 32.48 309°34.95	112 38.33 · · 19.93 127°38.01 18.64	207 49.99 · · 17.37 222°50.77 17.45	231°35.51 16.64	305 57.59 · · 10.44 321°0.23 16.52
23	324° 37.41	142°37.70 17.35	237°51.56 17.53	246°37.65 16.66	336°2.86 16.60
			$\frac{237 \ 31.30}{\nu 0.8' \ d0.1' \ m0.71}$	$\frac{240 \text{ 37.03}}{\nu 2.1' \text{ d0.0' m-2.25}}$	
ivier.	pass. 01:25	ν-0.3' d-1.3' m-3.86	νυ.σ΄ αυ.1΄ mυ./1	ν2.1 αυ.υ m-2.25	$\frac{\nu 2.6' \ d0.1' \ \text{m}0.61}{}$

Stars SHA

357°34.77 353°7.05

349°30.95

348°47.32

 $335^{\circ}19.99$

327°51.35

 $314^{\circ}2.18$

315°11.84

314°6.35

308°28.58

290°39.99

281°4.23

280°22.45

278°23.29

278°2.35

275°38.14

270°52.54

Alpheratz

Ankaa Schedar

Diphda Achernar

Hamal

Polaris

Acamar

Menkar

Mirfak

 ${\sf Capella}$

Bellatrix

Elnath

Alnilam

Betelgeuse

Aldebaran Rigel **Dec** 29°13.62

-42°10.11

56°40.26

-17°50.90

-57°6.41

 $23^{\circ}34.75$

89°21.79

-40°12.03

4°11.31

49°56.77

16°33.58

-8°10.18

46°1.24

 $6^{\circ}22.44$

28°37.67

 $-1^{\circ}11.00$

 $7^{\circ}24.82$

Page 162

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°41.58	N09°36.54	252° 9.25	6.2'	N28°26.90	1.8'	57.0'
1	194°41.77	35.66	266°34.47	6.2'	28°28.68	1.6'	57.0'
2	209°41.95 224°42.14	34.77 •• 33.89	280°59.70 295°24.95	6.2' 6.3'	28°30.28 28°31.71	1.4' 1.3'	56.9' 56.9'
4	239° 42.32	33.00	309°50.22	6.3'	28°32.97	1.1'	56.9'
5	$254^{\circ}42.51$	32.12	324°15.50	6.3'	28°34.06	0.9'	56.9'
6	269° 42.69	N09°31.23	338°40.81	6.3'	N28°34.98	0.8'	56.8'
7 8	284° 42.88 299° 43.07	30.35 29.46	353°6.15 7°31.51	6.4' 6.4'	28°35.73 28°36.32	0.6' 0.4'	56.8' 56.8'
9	314° 43.25	• • 28.57	21°56.89	6.4	28°36.73	0.4	56.7'
10	329°43.44	27.69	$36^{\circ}22.31$	6.4'	28°36.98	0.1'	56.7'
11	344° 43.63	26.80	50°47.76	6.5'	28°37.05	-0.1'	56.7'
12 13	359°43.81 14°44.00	N09°25.91 25.02	65°13.24 79°38.75	6.5' 6.6'	N28°36.96 28°36.71	-0.3' -0.4'	56.7' 56.6'
14	29°44.19	24.14	94°4.30	6.6'	28°36.28	-0.4	56.6
15	44°44.37	• • 23.25	108°29.89	6.6'	28°35.69	-0.8'	56.6'
16	59° 44.56	22.36	122°55.52	6.7'	28°34.94	-0.9'	56.6'
17 18	74° 44.75 89° 44.94	21.47 N09°20.58	137°21.19 151°46.91	6.7' 6.8'	28°34.02 N28°32.93	-1.1' -1.2'	56.5' 56.5'
19	104°45.12	19.69	166°12.67	6.8	28°31.68	-1.4'	56.5
20	119° 45.31	18.80	180°38.47	6.9'	28°30.27	-1.6'	56.5'
21	134°45.50	•• 17.91	195° 4.32	6.9'	28°28.70	-1.7'	56.4'
22 23	149°45.69 164°45.88	17.02 16.13	209°30.23 223°56.18	7.0' 7.0'	28°26.96 28°25.06	-1.9' -2.1'	56.4' 56.4'
23			223 30.16			-2.1	50.4
	SD = 15.8'	d = -0.9'		SE	0 = 15.5'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.07	N09°15.24	238°22.19	7.1'	N28°23.00	-2.2'	56.4'
1	194°46.25	14.35	252°48.25	7.1'	28°20.79 28°18.41	-2.4'	56.3'
2	209° 46.44 224° 46.63	13.46 •• 12.57	267°14.37 281°40.55	7.2' 7.2'	28°18.41 28°15.87	-2.5' -2.7'	56.3' 56.3'
4	239° 46.82	11.68	296° 6.78	7.3'	28°13.18	-2.8'	56.3
5	254°47.01	10.79	310°33.08	7.4'	28°10.33	-3.0'	56.2'
6	269° 47.20	N09° 9.90	324°59.44	7.4'	N28°7.33	-3.2'	56.2'
7 8	284° 47.39 299° 47.58	9.00 8.11	339°25.86 353°52.34	7.5' 7.6'	28° 4.17 28° 0.85	-3.3' -3.5'	56.2' 56.2'
9	314° 47.77	7.22	8°18.90	7.6'	27°57.38	-3.6'	56.1
10	329°47.96	6.32	22°45.51	7.7'	27°53.76	-3.8'	56.1'
11	344°48.15	5.43	37°12.20	7.8'	27°49.99	-3.9'	56.1'
12 13	359°48.34 14°48.53	N09° 4.54 3.64	51°38.96 66°5.79	7.8' 7.9'	N27°46.07 27°42.00	-4.1' -4.2'	56.1' 56.0'
14	29° 48.72	2.75	80°32.69	8.0'	27° 37.77	-4.4'	56.0'
15	44°48.91	• • 1.86	94°59.66	8.0'	27°33.41	-4.5'	56.0'
16	59°49.10	0.96	109°26.71	8.1'	27°28.89	-4.7'	56.0'
17 18	74°49.29 89°49.48	09° 0.07 N08° 59.17	123°53.84 138°21.04	8.2' 8.3'	27°24.23 N27°19.42	-4.8' -4.9'	55.9' 55.9'
19	104°49.67	58.28	150° 21.04 152° 48.32	6.3 8.4'	27°14.47	-4.9 -5.1'	55.9'
20	119°49.87	57.38	167°15.68	8.4'	$27^{\circ}9.38$	-5.2'	55.9'
21	134°50.06	• • 56.49	181°43.11	8.5'	27°4.15	-5.4'	55.8'
22 23	149°50.25 164°50.44	55.59 54.69	196°10.63 210°38.23	8.6' 8.7'	26°58.77 26°53.26	-5.5' -5.7'	55.8' 55.8'
23			210 36.23			-3.7	33.0
	SD = 15.8'	d = -0.9'		SL	0 = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.63	N08°53.80	225° 5.92	8.8'	N26°47.61	-5.8'	55.8'
1	194°50.82 209°51.02	52.90 52.00	239°33.68 254°1.53	8.8' 8.9'	26°41.82 26°35.89	-5.9'	55.8' 55.7'
2	209°51.02 224°51.21	52.00 •• 51.10	254°1.53 268°29.46	8.9° 9.0'	26°35.89 26°29.83	-6.1' -6.2'	55.7' 55.7'
4	239°51.40	50.21	282°57.48	9.1'	26°23.63	-6.3	55.7'
5	254°51.59	49.31	297°25.59	9.2'	26°17.31	-6.5'	55.7'
6 7	269°51.79 284°51.98	N08°48.41 47.51	311°53.78 326°22.06	9.3' 9.4'	N26°10.85 26°4.26	-6.6' -6.7'	55.6' 55.6'
8	284 51.98 299°52.17	46.61	320 22.00 340°50.43	9.4 9.5'	26 4.26 25°57.54	-6.8'	55.6'
9	314°52.37	• • 45.72	355°18.89	9.5'	25°50.69	-7.0'	55.6'
10	329°52.56	44.82	9°47.43	9.6'	25°43.71	-7.1'	55.6'
11 12	344° 52.75 359° 52.95	43.92 N08°43.02	24°16.07 38°44.79	9.7' 9.8'	25°36.61 N25°29.38	-7.2' -7.3'	55.5' 55.5'
13	359 52.95 14°53.14	42.12	58 44.79 53°13.61	9.8 9.9'	25°22.03	-7.5'	55.5'
14	29°53.33	41.22	67°42.51	10.0'	25°14.56	-7.6'	55.5'
15	44°53.53	• • 40.32	82°11.51	10.1'	25°6.97	-7.7'	55.5'
16 17	59°53.72 74°53.92	39.42 38.52	96°40.60 111°9.78	10.2' 10.3'	24°59.25 24°51.42	-7.8' -8.0'	55.4' 55.4'
18	74°53.92 89°54.11	38.52 N08°37.62	111 9.78 125°39.05	10.3	N24°43.47	-8.0' -8.1'	55.4'
19	104° 54.30	36.71	140°8.42	10.5'	24°35.40	-8.2	55.4'
20	119°54.50	35.81	154°37.87	10.5'	24°27.22	-8.3'	55.4'
21 22	134° 54.69 149° 54.89	· · 34.91 34.01	169°7.42 183°37.06	10.6' 10.7'	24°18.93 24°10.52	-8.4' -8.5'	55.3' 55.3'
22	149°54.89 164°55.08	34.01 33.11	183°37.06 198°6.80	10.7	24°10.52 24°2.00	-8.5' -8.6'	55.3' 55.3'
	SD = 15.8'	d = -0.9'			0 = 15.2'	5.0	
		<u>u — -0.9</u>	-	JL	, — 13.2		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	02:11	03:49	20:09	21:43	////
N 70°	////	02:45	04:04	19:54	21:12	////
68°	01:02	03:08	04:17	19:42	20:50	22:48
66°	01:53	03:26	04:27	19:33	20:32	22:03
64°	02:23	03:41	04:35	19:24	20:18	21:34
62°	02:45	03:53	04:42	19:17	20:06	21:13
60°	03:03	04:03	04:49	19:11	19:57	20:56
N 58°	03:17	04:12	04:54	19:06	19:48	20:43
56°	03:29	04:19	04:59	19:01	19:41	20:31
54°	03:39	04:26	05:04	18:57	19:34	20:21
52°	03:48	04:32	05:08	18:53	19:28	20:12
50°	03:55	04:37	05:11	18:49	19:23	20:05
45°	04:11	04:48	05:19	18:42	19:12	19:49
N 40°	04:24	04:57	05:25	18:36	19:03	19:37
35°	04:34	05:05	05:31	18:30	18:56	19:27
30°	04:42	05:11	05:36	18:26	18:50	19:19
20°	04:55	05:21	05:44	18:17	18:40	19:06
N 10°	05:05	05:30	05:51	18:11	18:32	18:57
0°	05:12	05:37	05:57	18:04	18:25	18:49
S 10°	05:18	05:43	06:04	17:58	18:19	18:44
20°	05:23	05:48	06:11	17:51	18:13	18:39
30°	05:26	05:54	06:18	17:44	18:08	18:36
35°	05:28	05:57	06:23	17:39	18:05	18:34
40°	05:29	06:00	06:28	17:35	18:02	18:33
45°	05:30	06:04	06:33	17:29	17:59	18:33
S 50°	05:30	06:07	06:40	17:23	17:55	18:33
52°	05:30	06:09	06:43	17:20	17:54	18:33
54°	05:30	06:10	06:46	17:16	17:52	18:33
56°	05:29	06:12	06:50	17:13	17:50	18:33
58°	05:29	06:14	06:54	17:09	17:48	18:34
S 60°	05:28	06:16	06:59	17:04	17:46	18:35

Lat.		Moonris	e		Moonset		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri	
N 72°							
N 70°							
68°							
66°							
64°			23:28			20:14	
62°		22:06			19:46	19:35	
60°	21:24	22:53		18:33	18:59	19:08	
N 58°	22:04	23:23		17:53	18:29	18:46	
56°	22:31	23:46		17:25	18:05	18:29	
54°	22:53		00:05	17:04	17:46	18:14	
52°	23:11		00:21	16:46	17:30	18:01	
50°	23:26		00:34	16:30	17:17	17:49	
45°	23:56		01:02	15:59	16:48	17:26	
N 40°		00:20	01:24	15:35	16:26	17:06	
35°		00:40	01:42	15:16	16:07	16:50	
30°		00:57	01:57	14:59	15:51	16:36	
20°	00:28	01:25	02:23	14:30	15:24	16:12	
N 10°	00:52	01:49	02:46	14:05	15:01	15:51	
0°	01:15	02:12	03:07	13:42	14:39	15:32	
S 10°	01:38	02:35	03:28	13:20	14:17	15:12	
20°	02:02	02:59	03:50	12:55	13:53	14:51	
30°	02:31	03:27	04:16	12:26	13:25	14:26	
35°	02:48	03:44	04:31	12:09	13:09	14:12	
40°	03:08	04:03	04:49	11:49	12:50	13:55	
45°	03:32	04:27	05:10	11:25	12:27	13:35	
S 50°	04:04	04:57	05:36	10:53	11:57	13:09	
52°	04:19	05:12	05:49	10:38	11:42	12:57	
54°	04:38	05:30	06:04	10:19	11:25	12:42	
56°	05:00	05:51	06:21	09:57	11:04	12:25	
58°	05:29	06:18	06:42	09:28	10:38	12:05	
S 60°	06:12	06:55	07:08	08:45	10:00	11:39	

Sun

mm:ss

01:05

00:47

00:28

Mer.

Pass

hh:mm

12:01

12:01

12:00

Eqn.of Time 12^h

mm:ss

01:14

00:56

00:37

Day

28 29 30 Moon

Lower

hh:mm

19:57 20:53

21:45

Age

24-26 33-16%

Mer.Pass.

Upper hh:mm

07:29 08:25

09:19

August 31, 01, 02 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	339°39.88	157°37.39 N00°16.07	252°52.35 N23°17.61	261°39.80 N22°16.68	351°5.50 S07°16.67
1	354°42.34	172°37.07 14.78	267°53.14 17.69	276°41.95 16.71	6°8.14 16.75
2	9°44.80	187°36.76 13.49	282°53.92 17.77	291°44.10 16.73	21°10.78 16.83
3	24° 47.27	202°36.44 · · 12.20	297°54.71 · · 17.85	306°46.24 · · 16.75	36°13.41 · · 16.90
4	39°49.73	217°36.13 10.92	312°55.50 17.92	321°48.39 16.78	51°16.05 16.98
5	54°52.20	232°35.82 9.63	327°56.29 18.00	336°50.54 16.80	66°18.69 17.06
6	69°54.66	247°35.50 N00°8.34	342°57.08 N23°18.08	351°52.69 N22°16.82	81°21.33 S 07°17.13
7	84°57.12	262°35.19 7.05	357°57.86 18.16	6°54.84 16.85	96°23.96 17.21
8	99° 59.59	277°34.88 5.77	12°58.65 18.23	21°56.99 16.87	111°26.60 17.29
9	115°2.05	292°34.56 · · 4.48	27°59.44 · · 18.31	36°59.14 · · 16.89	126°29.24 · · 17.37
10	130°4.52	307°34.25 3.19	43°0.23 18.39	52°1.29 16.92	141°31.88 17.44
11	145°6.98	322°33.93 1.90	58°1.02 18.46	67°3.44 16.94	156°34.51 17.52
12	$160^{\circ}9.45$	337°33.62 N00°0.62	73°1.81 N23°18.54	82°5.59 N22°16.96	171°37.15 S07°17.60
13	$175^{\circ}11.91$	352°33.31 S 00°0.67	88°2.60 18.62	97°7.74 16.98	186°39.79 17.67
14	$190^{\circ}14.37$	7°32.99 1.96	103°3.39 18.69	112°9.89 17.01	201°42.43 17.75
15	$205^{\circ}16.84$	22°32.68 · · 3.25	118°4.18 · · 18.77	127°12.04 · · 17.03	216°45.06 · · 17.83
16	$220^{\circ}19.30$	37°32.37 4.54	133°4.97 18.84	142°14.19 17.05	231°47.70 17.90
17	235°21.77	52°32.05 5.82	148°5.76 18.92	157°16.34 17.07	246°50.34 17.98
18	250°24.23	67°31.74 S00°7.11	163°6.56 N23°18.99	172°18.50 N22°17.10	261°52.98 S07°18.06
19	265°26.69	82°31.43 8.40	178°7.35 19.07	187°20.65 17.12	276°55.62 18.14
20	280°29.16	97°31.11 9.69	193°8.14 19.14	202°22.80 17.14	291°58.25 18.21
21	295°31.62	112°30.80 · · 10.98	208°8.93 · · 19.21	217°24.95 · · 17.17	307°0.89 · · 18.29
22	310°34.09	127°30.49 12.27	223°9.72 19.29	232°27.11 17.19	322°3.53 18.37
23	325°36.55	142°30.17 13.55	238° 10.52 19.36	247°29.26 17.21	337°6.17 18.44
Merr	pass. 01:21	ν-0.3' d-1.3' m-3.86	ν0.8' d0.1' m0.71	ν2.1' d0.0' m-2.26	ν2.6' d0.1' m0.61
- 10101.	7433. 01.21	ν-0.5 u-1.5 m-5.00			
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	340° 39.01	157°29.86 \$00°14.84	253°11.31 N23°19.43	262°31.41 N22°17.23	352°8.80 \$07°18.52
1	355°41.48	172°29.55 16.13	268° 12.10 19.50	277°33.57 17.26	7°11.44 18.60
2	10°43.94	187°29.23 17.42	283°12.89 19.58	292°35.72 17.28	22°14.08 18.68
3	$25^{\circ}46.41$	202°28.92 · · 18.71	298°13.69 · · 19.65	307°37.88 ·· 17.30	37°16.72 · · 18.75
4	40°48.87	217°28.61 20.00	313°14.48 19.72	322°40.03 17.32	52°19.36 18.83
5	55°51.34	232°28.29 21.28	328°15.28 19.79	337°42.19 17.35	67°22.00 18.91
6	70°53.80	247°27.98 \$00°22.57	343°16.07 N23°19.86	352°44.34 N22°17.37	82°24.63 S 07°18.98
7	85°56.26	262°27.67 23.86	358°16.87 19.93	7°46.50 17.39	97°27.27 19.06
8	100°58.73	277°27.36 25.15	13°17.66 20.00	22°48.65 17.41	112°29.91 19.14
9	116°1.19	292°27.04 · · 26.44	28° 18.45 · · 20.07	37°50.81 · · 17.43	127°32.55 · · 19.21
10	131°3.66	307°26.73 27.73	43° 19.25 20.14	52°52.97 17.46	142°35.19 19.29
11	146°6.12	322°26.42 29.01	58°20.05 20.21	67°55.12 17.48	157°37.83 19.37
12	161°8.58	337°26.10	73°20.84 N23°20.28	82°57.28 N22°17.50	172°40.46 \$07°19.45
13	176° 11.05	352°25.79 31.59	88°21.64 20.35	97°59.44 17.52	187°43.10 19.52
14	191° 13.51	7°25.48 32.88	103°22.43 20.42	113°1.60 17.55	202°45.74 19.60
15	206° 15.98	22°25.16 · · 34.17	118°23.23 · · 20.49	128° 3.75 · · 17.57	217°48.38 · · 19.68
16	221°18.44	37°24.85 35.46	133°24.03 20.55	143°5.91 17.59	232°51.02 19.75
17	236° 20.90	52°24.54 36.75	148°24.82 20.62	158°8.07 17.61	247°53.66 19.83
18	251°23.37	67°24.23	163°25.62 N23°20.69	173°10.23 N22°17.63	262°56.29 \$07°19.91
19	266°25.83	82°23.91 39.32	178°26.42 20.76	188°12.39 17.66	277°58.93 19.99
20	281°28.30	97°23.60 40.61	193°27.22 20.82	203°14.55 17.68	293°1.57 20.06
21	296°30.76	112°23.29 · · 41.90	208°28.01 · · 20.89	218°16.71 · · 17.70	308°4.21 · · 20.14
22	311°33.22	127°22.97 43.19	223° 28.81 20.96 238° 29.61 21.02	233°18.87 17.72	323°6.85 20.22
23	326°35.69	142°22.66 44.48		248°21.03 17.74	338°9.49 20.29
Mer.p	oass. 01:17	ν -0.3 $'$ $d1.3'$ m-3.86	$ u 0.8' \; d0.1' \; { m m} 0.70$	$\nu 2.2' \ d0.0' \ \text{m-}2.26$	$ u 2.6' \ d0.1' \ \text{m}0.61$
Man	CHA	CHA Doo	CHA Doo	CHA Doo	CHA Doo
Mon 0	GHA 341° 38.15	GHA Dec 157°22.35 S 00°45.77	GHA Dec 253°30.41 N23°21.09	GHA Dec 263°23.19 N22°17.76	GHA Dec 353°12.13 S 07°20.37
1	356° 40.62	172°22.04 47.06	268°31.21 21.15	278°25.35 17.79	8°14.77 20.45
2	11°43.08	187°21.72 48.35	283°32.01 21.22	293°27.51 17.81	23°17.40 20.53
3	26° 45.54	202°21.41 · · 49.64	298° 32.81 · · 21.28	308°29.67 · · 17.83	38°20.04 · · 20.60
4	41°48.01	217°21.10 50.92	313°33.61 21.35	323°31.84 17.85	53°22.68 20.68
5	56° 50.47	232°20.78 52.21	328°34.41 21.41	338°34.00 17.87	68°25.32 20.76
6	71°52.94	247°20.47 \$00°53.50	343°35.21 N23°21.48	353°36.16 N22°17.89	83°27.96 S07°20.84
7	86°55.40	262°20.16 54.79	358°36.01 21.54	8°38.32 17.92	98°30.60 20.91
8	101°57.87	277°19.85 56.08	13°36.81 21.60	23°40.48 17.94	113°33.24 20.99
9	117°0.33	292°19.53 · · 57.37	28° 37.61 · · 21.67	38°42.65 · · 17.96	128°35.88 · · 21.07
10	132°2.79	307°19.22 58.66	43°38.41 21.73	53°44.81 17.98	143°38.52 21.14
11	147°5.26	322°18.91 00°59.95	58°39.21 21.79	68°46.98 18.00	158°41.15 21.22
12	162°7.72	337°18.60 S01°1.24	73°40.01 N23°21.86	83°49.14 N22°18.02	173°43.79 \$07°21.30
13	177° 10.19	352°18.28 2.52	88°40.82 21.92	98°51.30 18.04	188°46.43 21.38
14	192° 12.65	7°17.97 3.81	103°41.62 21.98	113°53.47 18.07	203°49.07 21.45
15	207° 15.11	22°17.66 · · 5.10	118°42.42 · · 22.04	128°55.63 · · 18.09	218°51.71 · · 21.53 S
16	222° 17.58	37°17.34 6.39	133°43.22 22.10	143°57.80 18.11	233°54.35 21.61
17	237°20.04	52°17.03 7.68	148°44.03 22.16	158°59.96 18.13	248°56.99 21.68
18	252°22.51	67°16.72 S 01°8.97	163°44.83 N23°22.22	174°2.13 N22°18.15	263°59.63 S 07°21.76
19	267°24.97	82°16.41 10.26	178° 45.63 22.28	189° 4.30 18.17	279°2.27 21.84
20	282°27.43	97°16.09 11.55	193°46.44 22.34	204° 6.46 18.19	294°4.91 21.92
21	297°29.90	112°15.78 · · 12.84	208°47.24 · · 22.40	219°8.63 · · 18.21	309°7.55 · · 21.99
22	$312^{\circ}32.36$	127° 15.47 14.12	223°48.05 22.46	234°10.79 18.23	324°10.19 22.07
23	327°34.83	142°15.15 15.41	238° 48.85 22.52	249°12.96 18.26	339°12.83 22.15
More	pass. 01:13	ν-0.3' d1.3' m-3.86	ν0.8' d0.1' m0.69	ν2.2' d0.0' m-2.27	ν2.6' d0.1' m0.60
- ivier.	Jubb. U1.13	ν-0.5 u1.5 III-3.00	νο.ο αυ.1 IIIU.09	ν Δ.Δ. UU.U III-Δ.ΔΙ	ν 2.0 d0.1 iii0.00

	SHA	Dec
Alphoratz	357°34.76	29° 13.64
Alpheratz Ankaa	357 34.70 353°7.03	-42° 10.12
Schedar	349°30.93	56°40.28
Diphda	348°47.30	$-17^{\circ}50.90$
Achernar	335°19.96	-57°6.41
Hamal	327°51.33	23°34.77
Polaris Acamar	314°0.69 315°11.81	89°21.80 -40°12.02
Menkar	314°6.33	4° 11.31
Mirfak	308°28.55	49°56.78
Aldebaran	$290^{\circ}39.96$	$16^{\circ}33.59$
Rigel	281°4.20	-8° 10.17
Capella	280°22.41 278°23.26	46°1.24 6°22.45
Bellatrix Elnath	278°2.32	0 22.45 28°37.67
Alnilam	275°38.11	-1°11.00
Betelgeuse	270°52.51	7°24.82
Canopus	263°52.78	$-52^{\circ}42.14$
Sirius	258°26.67	-16°44.75
Adhara	255°6.31 244°51.37	-29°0.04 5°9.85
Procyon Pollux	244 51.37 243° 17.92	5° 9.85 27° 58.03
Avior	234° 15.42	-59° 35.02
Suhail	222°46.96	-43°31.70
Miaplacidus	221°39.27	-69°48.89
Alphard	217°48.35	-8°45.76
Regulus	207°35.07	11°50.94
Dubhe Denebola	193°41.96 182°25.54	61°37.19 14°26.21
Gienah	182 25.54 175°44.19	-17°40.65
Acrux	173°1.10	-63°14.22
Gacrux	$171^{\circ}52.52$	$-57^{\circ}15.14$
Alioth	$166^{\circ}13.63$	55°49.77
Spica	158°22.84	-11°17.33
Alkaid	152°52.52 148°36.84	49°11.65 -60°29.67
Hadar Menkent	148 36.84 147°58.21	-80° 29.57
Arcturus	145°48.35	19°3.42
Rigil Kent.	139°41.06	-60°56.41
Kochab	$137^{\circ}20.20$	74°3.48
Zuben'ubi	136°56.48	-16°8.63
Alphecca Antares	126°4.06 112°16.19	26°38.11 -26°29.25
Antares	107°10.61	-20 29.25 -69°4.55
Sabik	102°3.06	-15°45.31
Shaula	$96^{\circ}10.65$	-37°7.40
Rasalhague	95°58.72	12°32.67
Eltanin	90°42.13	51°29.36
Kaus Aust. Vega	83°32.71 80°33.21	-34°22.44 38°48.59
Nunki	75°47.90	-26° 15.98
Altair	61°59.99	8°56.12
Peacock	53°5.66	-56°39.42
Deneb	49°25.62	45°22.23
Enif	33°38.77	9°59.39
Al Na'ir Fomalhaut	27°32.78 15°14.45	-46°50.45 -29°29.38
Scheat	15 14.45 13°45.14	-29 29.38 28°13.07
Markab	13°29.87	15° 20.37
Λυσ 21 Ca±	SHA	Mor pass
Aug 31 Sat Venus	3HA 177°57.51	Mer.pass 13:30
Mars	273°12.47	07:08
Jupiter	$281^{\circ}59.92$	06:32
Saturn	11°25.63	00:36
Sep 01 Sun	SHA	Mer.pass
Venus	176°50.85	13:30
Mars	272°32.29	07:07
Jupiter	281°52.40	06:29
Saturn	11°29.79	00:31
Sep 02 Mon	SHA	Mer.pass
Venus	175°44.20	13:31
Mars Jupiter	271°52.26 281°45.04	07:06 06:26
	281°45.04 11°33.97	06:26
Saturn	00.01	00.21
Saturn		
	ntal parallax	0.1
	ntal parallax Venus: Mars:	0.1 0.1

Stars

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.28	N08°32.21	212°36.63	10.9'	N23°53.36	-8.7'	55.3'
1	194°55.47	31.30	227°6.55	11.0'	23°44.62	-8.8'	55.3'
2	209°55.67 224°55.87	30.40	241°36.56 256°6.67	11.1' 11.2'	23°35.78 23°26.82	-9.0' -9.1'	55.2' 55.2'
4	239°56.06	28.59	270°36.87	11.3'	23° 17.76	-9.2'	55.2'
5	254°56.26	27.69	$285^{\circ}7.16$	11.4'	23°8.59	-9.3'	55.2'
6	269°56.45	N08° 26.79	299°37.54	11.5'	N22°59.32 22°49.95	-9.4'	55.2'
7 8	284°56.65 299°56.84	25.88 24.98	314°8.02 328°38.59	11.6' 11.7'	22°49.95 22°40.48	-9.5' -9.6'	55.2' 55.1'
9	314°57.04	24.07	343°9.25	11.8'	22°30.91	-9.7'	55.1'
10	329°57.24	23.17	357°40.01	11.8'	22°21.24	-9.8'	55.1'
11 12	344°57.43 359°57.63	22.26 N08°21.36	12°10.85 26°41.79	11.9' 12.0'	22°11.47 N22°1.61	-9.9' -10.0'	55.1' 55.1'
13	14°57.83	20.45	41°12.82	12.1'	21°51.65	-10.0	55.0'
14	29°58.02	19.55	55° 43.94	12.2'	21°41.60	-10.1	55.0'
15	44°58.22	• • 18.64	70° 15.15	12.3'	21°31.46	-10.2'	55.0'
16 17	59°58.42 74°58.62	17.73 16.83	84°46.45 99°17.84	12.4' 12.5'	21°21.22 21°10.90	-10.3' -10.4'	55.0' 55.0'
18	89°58.81	N08° 15.92	113°49.32	12.6'	N21°0.48	-10.4	55.0'
19	104°59.01	15.01	128°20.89	12.7'	20°49.98	-10.6'	54.9'
20	119°59.21	14.11	142° 52.55	12.7'	20°39.39	-10.7'	54.9'
21 22	134°59.41 149°59.60	· · 13.20 12.29	157°24.29 171°56.13	12.8' 12.9'	20°28.72 20°17.96	-10.8' -10.8'	54.9' 54.9'
23	164°59.80	12.29	171 50.13 186°28.05	13.0'	20 17.96 20°7.12	-10.8 -10.9'	54.9'
	SD = 15.8'	d = -0.9'			D = 15.1'		
				JI			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°0.00 195°0.20	N08° 10.48 9.57	201°0.06 215°32.15	13.1' 13.2'	N19° 56.20 19° 45.20	-11.0' -11.1'	54.9' 54.8'
2	210°0.40	9.57 8.66	215° 32.15 230° 4.33	13.2	19° 45.20 19° 34.11	-11.1 -11.2'	54.8'
3	225°0.60	• • 7.75	244°36.60	13.3'	19°22.95	-11.2'	54.8'
4	240°0.79	6.84	259°8.95	13.4'	19° 11.71	-11.3'	54.8'
5 6	255°0.99 270°1.19	5.93 N08°5.02	273°41.38 288°13.90	13.5' 13.6'	19°0.40 N18°49.01	-11.4' -11.5'	54.8' 54.8'
7	285°1.39	4.11	302°46.50	13.7'	18° 37.54	-11.5'	54.8'
8	300°1.59	3.20	317° 19.18	13.8'	18°26.01	-11.6'	54.7'
9	315°1.79	· · 2.29	331°51.95	13.8'	18° 14.40	-11.7'	54.7'
10 11	330°1.99 345°2.19	1.38 08°0.47	346°24.79 0°57.71	13.9' 14.0'	18°2.72 17°50.97	-11.7' -11.8'	54.7' 54.7'
12	0°2.39	N07°59.56	15°30.72	14.1'	N17°39.16	-11.9	54.7
13	15°2.59	58.65	$30^{\circ}3.80$	14.2'	$17^{\circ}27.27$	-11.9'	54.7'
14	30°2.79 45°2.99	57.74	44°36.96 59°10.20	14.2' 14.3'	17°15.32	-12.0'	54.7'
15 16	45°2.99 60°3.19	· · 56.83 55.92	73° 43.52	14.3 14.4'	17°3.31 16°51.23	-12.1' -12.1'	54.6' 54.6'
17	75°3.39	55.01	88° 16.91	14.5'	16°39.09	-12.2'	54.6'
18	90°3.59	N07°54.09	102°50.37	14.5'	N16°26.88	-12.3'	54.6'
19 20	105°3.79 120°3.99	53.18 52.27	117°23.91 131°57.53	14.6' 14.7'	16°14.62 16°2.29	-12.3'	54.6' 54.6'
21	135°4.19	• • 51.36	146°31.21	14.7	10 2.29 15°49.91	-12.4'	54.6
22	150°4.39	50.44	$161^{\circ}4.97$	14.8'	$15^{\circ}37.47$	-12.5'	54.5'
23	165°4.59	49.53	175°38.80	14.9'	15°24.97	-12.6'	54.5'
	SD = 15.8'	d = -0.9'		SI	O = 15.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°4.79	N07°48.62	190° 12.70	15.0'	N15°12.42	-12.6'	54.5'
1	195°5.00	47.70	204° 46.67	15.0'	14°59.81	-12.7'	54.5'
2	210°5.20 225°5.40	46.79 •• 45.87	219°20.71 233°54.81	15.1' 15.2'	14°47.15 14°34.44	-12.7' -12.8'	54.5' 54.5'
4	240°5.60	44.96	248°28.98	15.2'	14°21.67	-12.8'	54.5
5	255°5.80	44.05	263°3.22	15.3'	$14^{\circ}8.86$	-12.9'	54.5'
6	270°6.00 285°6.21	N07°43.13	277°37.53	15.4'	N13°55.99 13°43.08	-12.9'	54.4'
7 8	285°6.21 300°6.41	42.22 41.30	292°11.89 306°46.32	15.4' 15.5'	13°43.08 13°30.12	-13.0' -13.0'	54.4' 54.4'
9	315°6.61	40.39	321°20.82	15.6'	13° 17.11	-13.1	54.4
10	330°6.81	39.47	335°55.37	15.6'	13°4.05	-13.1'	54.4'
11 12	345°7.01 0°7.22	38.55 N07°37.64	350°29.99 5°4.66	15.7' 15.7'	12°50.96 N12°37.81	-13.1' -13.2'	54.4' 54.4'
13	15°7.42	36.72	19°39.40	15.7° 15.8'	12° 24.63	-13.2' -13.2'	54.4' 54.4'
14	30°7.62	35.81	$34^{\circ}14.19$	15.8'	12°11.40	-13.3'	54.3'
15	45°7.83	• • 34.89	48°49.04	15.9'	11°58.14	-13.3'	54.3'
16 17	60°8.03 75°8.23	33.97 33.05	63°23.95 77°58.91	16.0' 16.0'	11°44.83 11°31.48	-13.3' -13.4'	54.3' 54.3'
18	75°8.23 90°8.43	33.05 N07°32.14	92°33.92	16.1'	N11° 18.10	-13.4'	54.3'
19	105°8.64	31.22	107°8.99	16.1'	11°4.68	-13.5'	54.3'
20	120°8.84	30.30	121°44.11	16.2'	10°51.22	-13.5'	54.3'
21 22	135°9.04 150°9.25	· · 29.38 28.47	136° 19.28 150° 54.50	16.2' 16.3'	10°37.73 10°24.20	-13.5' -13.6'	54.3' 54.3'
23	150 9.25 165°9.45	28.47 27.55	165° 29.78	16.3'	10° 24.20° 10.64	-13.6'	54.3'
	SD = 15.8'	d = -0.9'			D = 14.9'		

Lat.	Twilight		Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	////	02:34	04:04	19:53	21:20	////
N 70°	////	03:02	04:17	19:40	20:53	23:28
68°	01:35	03:22	04:28	19:29	20:34	22:17
66°	02:12	03:38	04:37	19:21	20:19	21:42
64°	02:38	03:51	04:44	19:14	20:06	21:18
62°	02:57	04:02	04:50	19:08	19:56	21:00
60°	03:13	04:11	04:56	19:02	19:47	20:45
N 58°	03:25	04:19	05:01	18:57	19:39	20:32
56°	03:36	04:26	05:05	18:53	19:32	20:22
54°	03:46	04:32	05:09	18:50	19:27	20:12
52°	03:54	04:37	05:12	18:46	19:21	20:04
50°	04:01	04:42	05:16	18:43	19:17	19:57
45°	04:16	04:52	05:22	18:36	19:07	19:43
N 40°	04:27	05:00	05:28	18:31	18:59	19:32
35°	04:37	05:07	05:33	18:26	18:52	19:22
30°	04:44	05:13	05:37	18:22	18:46	19:15
20°	04:56	05:22	05:44	18:15	18:37	19:03
N 10°	05:05	05:30	05:51	18:09	18:30	18:55
0°	05:11	05:36	05:57	18:03	18:24	18:48
S 10°	05:17	05:41	06:02	17:58	18:19	18:43
20°	05:20	05:46	06:08	17:52	18:14	18:40
30°	05:23	05:51	06:15	17:45	18:09	18:37
35°	05:24	05:53	06:19	17:42	18:07	18:36
40°	05:24	05:56	06:23	17:37	18:05	18:36
45°	05:24	05:58	06:28	17:33	18:02	18:36
S 50°	05:24	06:01	06:34	17:27	17:59	18:37
52°	05:23	06:02	06:36	17:24	17:58	18:37
54°	05:23	06:04	06:39	17:21	17:57	18:38
56°	05:22	06:05	06:42	17:18	17:56	18:39
58°	05:21	06:06	06:46	17:15	17:54	18:40
S 60°	05:20	06:08	06:50	17:11	17:53	18:41

Lat.		Moonris	e		Moonset		
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°			01:46		21:14	20:16	
N 70°			02:20		20:38	19:59	
68°		00:26	02:44	20:58	20:12	19:46	
66°		01:05	03:03	20:18	19:52	19:34	
64°		01:32	03:18	19:50	19:36	19:25	
62°	00:06	01:53	03:30	19:28	19:22	19:17	
60°	00:33	02:09	03:40	19:10	19:11	19:10	
N 58°	00:53	02:23	03:50	18:56	19:01	19:04	
56°	01:10	02:35	03:57	18:43	18:52	18:58	
54°	01:25	02:46	04:04	18:32	18:44	18:53	
52°	01:37	02:55	04:11	18:22	18:37	18:49	
50°	01:48	03:03	04:16	18:13	18:31	18:45	
45°	02:11	03:21	04:29	17:54	18:17	18:36	
N 40°	02:29	03:35	04:39	17:39	18:06	18:28	
35°	02:45	03:47	04:47	17:26	17:56	18:22	
30°	02:58	03:57	04:55	17:14	17:47	18:16	
20°	03:20	04:15	05:07	16:55	17:32	18:06	
N 10°	03:40	04:31	05:19	16:37	17:19	17:57	
0°	03:58	04:45	05:29	16:21	17:07	17:49	
S 10°	04:16	05:00	05:39	16:05	16:54	17:41	
20°	04:35	05:15	05:50	15:47	16:41	17:32	
30°	04:57	05:32	06:03	15:27	16:25	17:21	
35°	05:10	05:42	06:10	15:15	16:16	17:15	
40°	05:25	05:54	06:18	15:01	16:06	17:09	
45°	05:42	06:07	06:28	14:45	15:54	17:00	
S 50°	06:04	06:24	06:39	14:24	15:39	16:51	
52°	06:14	06:32	06:45	14:15	15:32	16:46	
54°	06:26	06:40	06:50	14:04	15:24	16:41	
56°	06:39	06:50	06:57	13:51	15:15	16:36	
58° S 60°	06:54	07:00	07:04	13:36	15:05	16:30	
5 60°	07:12	07:13	07:12	13:19	14:54	16:22	

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	27-29
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-1%
31	00:19	00:09	12:00	10:10	22:33	
01	00:00	00:10	12:00	10:56	23:18	
02	00:19	00:29	12:00	11:39	-:-	

September 03, 04, 05 UT (Tue., Wed., Thu.)

h	Aries	Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	342°37.29	157° 14.84	S01°16.70	253°49.66	N23°22.58	264°15.13	N22° 18.28	354°15.46	507°22.22		
1	357° 39.75	172° 14.53	17.99	268°50.46	22.64	279°17.30	18.30	9°18.10	22.30	Alpheratz	357°34.75
2	12°42.22	187°14.22	19.28	283°51.27	22.70	294°19.47	18.32	24°20.74	22.38	Ankaa Schedar	353°7.01 349°30.91
3	27°44.68	202°13.90	• • 20.57	298°52.07	• • 22.76	309°21.63	• • 18.34	39°23.38	• • 22.46	Diphda	349° 30.91 348° 47.29
4	42°47.15	217° 13.59	21.86	313°52.88	22.82	324°23.80	18.36	54°26.02	22.53	Achernar	335°19.93
5	57°49.61	232°13.28	23.15	328°53.68	22.87	339°25.97	18.38	69°28.66	22.61	Hamal	
6	72°52.07	247°12.96	S01°24.44	343°54.49	N23°22.93	354°28.14	N22° 18.40	84°31.30	S07°22.69	Polaris	313°59.39
7	87°54.54	262°12.65	25.72	358°55.30	22.99	9°30.31	18.42	99°33.94	22.77	Acamar	315°11.79
8 9	102°57.00 117°59.47	277°12.34 292°12.03	27.01 •• 28.30	13°56.10 28°56.91	23.05 •• 23.10	24°32.48 39°34.65	18.44 •• 18.46	114°36.58 129°39.22	22.84 •• 22.92	Menkar	$314^{\circ}6.31$
10	133°1.93	307° 11.71	29.59	43°57.72	23.16	54°36.82	18.48	144°41.86	23.00	Mirfak	308°28.52
11	148°4.39	322°11.40	30.88	58°58.53	23.21	69°38.99	18.50	159°44.50	23.07	Aldebaran	290°39.94
12	163°6.86	337°11.09	S01°32.17	73°59.33	N23°23.27	84°41.16	N22° 18.53	174°47.14	S07°23.15	Rigel	281°4.19
13	178°9.32	352°10.77	33.46	89°0.14	23.33	99°43.33	18.55	189°49.78	23.23	Capella	280°22.38
14	193°11.79	7°10.46	34.75	104°0.95	23.38	114°45.50	18.57	204°52.42	23.31	Bellatrix	278°23.24 278°2.30
15	208° 14.25	$22^{\circ}10.15$	• • 36.03	$119^{\circ}1.76$	• • 23.44	129°47.68	• • 18.59	219°55.06	• • 23.38	Elnath Alnilam	276 2.30 275°38.09
16	223°16.71	37°9.83	37.32	134°2.57	23.49	144°49.85	18.61	234°57.70	23.46	Betelgeuse	270°52.49
17	238° 19.18	52°9.52	38.61	149°3.38	23.54	159°52.02	18.63	250°0.34	23.54	Canopus	263°52.75
18	253°21.64	67°9.21	S01°39.90	164° 4.19	N23°23.60	174°54.19	N22° 18.65	265°2.98	S07°23.61	Sirius	258°26.66
19 20	268°24.11 283°26.57	82°8.90 97°8.58	41.19 42.48	179°5.00 194°5.81	23.65 23.71	189°56.37 204°58.54	18.67 18.69	280°5.62 295°8.26	23.69 23.77	Adhara	255°6.30
21	298° 29.03	112°8.27	• • 43.77	209° 6.62	23.76	220° 0.71	18.71	310°10.90	• • 23.85	Procyon	244°51.35
22	313°31.50	127°7.96	45.05	224°7.43	23.81	235° 2.89	18.73	325°13.54	23.92	Pollux	243°17.91
23	328° 33.96	142°7.64	46.34	239°8.24	23.86	250° 5.06	18.75	340°16.18	24.00	Avior	234°15.40
Mari	pass. 01:09	0 2 [/] d1	.3′ m-3.86	10 0/ 40	.1′ m0.69	1/2 2/ 40	.0′ m-2.27		.1′ m0.60	Suhail Miaplacidus	222°46.95 221°39.26
ivier.p	Dass. 01:09	ν-0.5 α1.	.3 111-3.00	νο.ο αο.	.1 mu.09	ν2.2 do.	.U m-2.21	ν2.0 d0	.1 1110.00	Alphard	221 39.20 217°48.35
										Regulus	207°35.06
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.96
0	343°36.43	157°7.33	S01°47.63	254° 9.05	N23°23.92	265°7.23	N22° 18.77	355°18.82	S07°24.08	Denebola	182°25.55
1	358° 38.89	172°7.02	48.92	269° 9.86	23.97	280° 9.41	18.79	10°21.46	24.16	Gienah	$175^{\circ}44.20$
2	13° 41.35 28° 43.82	187°6.70 202°6.39	50.21 •• 51.50	284°10.67 299°11.49	24.02 •• 24.07	295°11.58 310°13.76	18.81 •• 18.83	25°24.10 40°26.74	24.23 •• 24.31	Acrux	$173^{\circ}1.12$
4	43°46.28	202 0.39 217°6.08	52.78	314° 12.30	24.07	325°15.94	18.85	55°29.38	24.31	1	171°52.54
5	58° 48.75	232°5.76	54.07	329°13.11	24.18	340°18.11	18.87	70°32.02	24.46	Alioth	166°13.65
6	73°51.21	247°5.45	S01°55.36	344°13.92	N23°24.23	355°20.29	N22° 18.89	85°34.66	S07°24.54	Spica	158°22.85 152°52.53
7	88°53.68	262°5.14	56.65	359°14.74	24.28	10°22.46	18.91	100°37.30	24.62	Alkaid Hadar	152 52.53 148°36.87
8	103°56.14	277°4.82	57.94	$14^{\circ}15.55$	24.33	25°24.64	18.93	115°39.94	24.70		147°58.22
9	118° 58.60	292°4.51	01°59.22	29°16.36	• • 24.38	40°26.82	• • 18.95	130°42.58	• • 24.77	Arcturus	145°48.37
10	134°1.07	307°4.19	02°0.51	44°17.18	24.43	55°28.99	18.97	145°45.22	24.85	Rigil Kent.	139°41.09
11	149°3.53 164°6.00	322°3.88 337°3.57	1.80 \$02°3.09	59°17.99 74°18.81	24.48	70°31.17	18.99	160°47.86	24.93 \$07°25.00	Kochab	$137^{\circ}20.25$
12 13	104 6.00 179°8.46	352°3.25	4.38	74 18.81 89°19.62	N23°24.52 24.57	85°33.35 100°35.53	N22°19.01 19.03	175°50.50 190°53.14	25.08	Zuben'ubi	136°56.49
14	179 8.40 194° 10.92	7°2.94	5.66	104° 20.43	24.57	115°37.71	19.05	205°55.78	25.16	Alphecca	126°4.08
15	209° 13.39	22°2.63	• • 6.95	119°21.25	• • 24.67	130°39.89	. 19.07	220°58.42	25.24	Antares	112°16.21
16	224° 15.85	37°2.31	8.24	134°22.07	24.72	145°42.06	19.09	236°1.06	25.31	Atria	107°10.66
17	239°18.32	52°2.00	9.53	149°22.88	24.77	160°44.24	19.11	251°3.70	25.39	Sabik Shaula	102°3.07 96°10.67
18	254° 20.78	67°1.68	S02°10.82	164°23.70	N23°24.81	175°46.42	N22°19.13	266°6.34	507°25.47	Rasalhague	95°58.74
19	269°23.24	82°1.37	12.10	179°24.51	24.86	190°48.60	19.15	281°8.98	25.54	Eltanin	90°42.15
20	284°25.71	97°1.06	13.39	194°25.33	24.91	205°50.78	19.17	296°11.62	25.62	Kaus Aust.	83°32.72
21	299°28.17	112°0.74	• • 14.68	209°26.15	• • 24.95	220°52.96	• • 19.19	311°14.26	• • 25.70	Vega	80°33.23
22	314°30.64 329°33.10	127°0.43	15.97	224°26.96	25.00	235°55.15	19.21	326°16.90	25.78	Nunki	75°47.91
23	329 33.10	142°0.11	17.25	239°27.78	25.05	250°57.33	19.23	341°19.54	25.85	Altair	62°0.01
Mer.p	pass. 01:05	ν -0.3′ $d1$.	.3′ m-3.86	ν 0.8′ d0.	.1' m 0.68	$\nu 2.2' \ d0.$.0′ m-2.28	ν 2.6 $^{\prime}$ d0	$.1^\prime$ m0.59	Peacock	53°5.67
										Deneb	49°25.63
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.77
0	344°35.56	156°59.80	S02°18.54	254°28.60	N23°25.09	265°59.51	N22° 19.25	356°22.18	507°25.93	Al Na'ir Fomalhaut	27°32.78 15°14.45
1	359°38.03	171°59.49	19.83	269°29.42	25.14	281°1.69	19.26	11°24.82	26.01	Scheat	13°45.14
2	14°40.49	$186^{\circ}59.17$	21.12	284°30.23	25.18	296° 3.87	19.28	$26^{\circ}27.46$	26.09	Markab	13°29.87
3	29° 42.96	201°58.86	• • 22.40	299°31.05	• • 25.23	311°6.05	• • 19.30	41°30.10	• • 26.16		
4	44° 45.42	216°58.54	23.69	314°31.87	25.27	326° 8.24	19.32	56°32.74	26.24	Sep 03 Tue	SHA
5	59° 47.88	231°58.23	24.98	329°32.69	25.32	341°10.42	19.34	71°35.38	26.32		174°37.55 271°12.37
6	74°50.35	246°57.91		344°33.51	N23°25.36	356°12.60	N22°19.36		S07°26.39		271 12.37 281°37.84
7 8	89°52.81 104°55.28	261°57.60 276°57.29	27.55 28.84	359°34.33 14°35.15	25.41 25.45	11°14.79 26°16.97	19.38 19.40	101°40.66 116°43.30	26.47 26.55	Saturn	11°38.17
9	119° 57.74	291°56.97	. 30.13	29°35.97	25.49	41°19.15	. 19.42	131°45.95	. 26.63		
10	135°0.20	306° 56.66	31.41	44°36.79	25.54	56°21.34	19.44	146°48.59	26.70	Sep 04 Wed	SHA
11	150°2.67	321°56.34	32.70	59°37.61	25.58	71°23.52	19.46	161°51.23	26.78		173°30.90
12	165°5.13		S02°33.99	74°38.43	N23°25.62	86°25.71	N22°19.48		S07°26.86		270°32.62 281°30.81
13	180°7.60	351°55.71	35.27	89°39.25	25.66	101°27.89	19.50	191°56.51	26.93	Saturn	201 30.01 11°42.39
14	195° 10.06	6°55.40	36.56	104°40.07	25.71	116°30.08	19.51	206°59.15	27.01		
15 16	210°12.52	21°55.08	• • 37.85	119°40.89	· · 25.75	131°32.26	10.53	222°1.79	•• 27.09	Sep 05 Thu	SHA
16 17	225° 14.99 240° 17.45	36°54.77 51°54.45	39.13 40.42	134°41.72 149°42.54	25.79 25.83	146°34.45 161°36.64	19.55 19.57	237°4.43 252°7.07	27.16 27.24		172°24.24
18	255° 19.92		\$02°41.71	164° 43.36	25.65 N23°25.87	176°38.82	N22° 19.59		\$07°27.32		269°53.03 281°23.94
19	270°22.38	81°53.82	42.99	179°44.18	25.91	191°41.01	19.61	282°12.35	27.40	Saturn	261 23.94 11°46.62
20	285°24.84	96°53.51	44.28	194°45.01	25.95	206°43.20	19.63	297°14.99	27.47		
21	300°27.31	111°53.19	•• 45.56	209°45.83	•• 25.99	221°45.39	• 19.65	312°17.63	•• 27.55	Horizor	ntal parallax
22	315°29.77	126°52.88	46.85	224°46.65	26.03	236°47.57	19.67	327°20.27	27.63		Venus: Mars:
23	330°32.24	141°52.56	48.14	239°47.48	26.07	251°49.76	19.68	342°22.91	27.70		iviars:
Mer.p	bass. 01:01	ν -0.3′ $d1$.	.3′ m-3.86	ν 0.8′ d0.	.0′ m0.67	ν 2.2′ d0.	.0′ m-2.29	ν 2.6′ d0	.1′ m0.59		

Dec

29°13.65 -42°10.12

56°40.30

-17°50.90

 $-57^{\circ}6.42$

23°34.77

89°21.81

-40°12.03

49°56.79

16°33.59 -8°10.17

 $46^{\circ}1.24$

 $6^{\circ}22.45$

28°37.68

 $-1^{\circ}10.99$

 $7^{\circ}24.83$

-52°42.14

-16°44.74

 $-29^{\circ}0.03$

-59°35.01

-43°31.69

-69°48.87

-8°45.75

11°50.94

 $61^{\circ}37.18$

 $14^{\circ}26.21$

-17°40.64

-63°14.21

-57°15.12

55°49.76

-11°17.33

49°11.64

-60°29.66

-36°29.53

-60°56.41

 $19^{\circ}3.42$

74°3.47

-16°8.63

26°38.10

-26°29.25

-69°4.55

 $-15^{\circ}45.31$

 $-37^{\circ}7.40$

 $12^{\circ}32.67$

51°29.37

-34°22.44

38°48.59 -26°15.99

8°56.12 -56°39.43

 $45^{\circ}22.25$

-46°50.46

-29°29.39

28°13.08

15°20.38

Mer.pass

13:31

07:04

06:22

00:23

13:32

07:03

06:19

00:19

13:32

07:02

06:15

00:14

0.1

0.1

Mer.pass

Mer.pass

9°59.39

5°9.85 27°58.03

4°11.32

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°9.66	$N07^{\circ}26.63$	180°5.10	16.4'	N09°57.04	-13.6'	54.2'
1	195°9.86	25.71	194°40.46	16.4	09°43.42	-13.7'	54.2'
2	210° 10.06 225° 10.27	24.79 •• 23.87	209°15.88 223°51.34	16.5' 16.5'	09°29.76 09°16.08	-13.7' -13.7'	54.2' 54.2'
4	240° 10.47	22.95	238°26.84	16.5'	09°2.36	-13.7'	54.2'
5	$255^{\circ}10.68$	22.03	253°2.39	16.6'	$08^{\circ}48.62$	-13.8'	54.2'
6	270° 10.88 285° 11.09	N07°21.11	267°37.98	16.6'	N08°34.85	-13.8'	54.2'
7 8	300°11.29	20.19 19.27	282°13.61 296°49.29	16.7' 16.7'	08°21.05 08°7.23	-13.8' -13.8'	54.2' 54.2'
9	315° 11.50	• • 18.35	311°25.00	16.8'	07°53.39	-13.9'	54.2'
10	330°11.70	17.43	326°0.75	16.8'	07°39.51	-13.9'	54.1'
11 12	345°11.91 0°12.11	16.51 N07°15.59	340°36.54 355°12.37	16.8' 16.9'	07°25.62 N07°11.70	-13.9' -13.9'	54.1' 54.1'
13	15° 12.32	14.67	9°48.23	16.9	06°57.77	-13.9 -14.0'	54.1'
14	30° 12.52	13.75	24°24.13	16.9'	06°43.81	-14.0'	54.1'
15	45°12.73	• • 12.83	39°0.06	17.0'	06°29.83	-14.0'	54.1'
16 17	60° 12.93 75° 13.14	11.90 10.98	53°36.02 68°12.02	17.0' 17.0'	06°15.83 06°1.82	-14.0' -14.0'	54.1' 54.1'
18	90° 13.35	N07°10.06	82°48.04	17.1'	N05°47.79	-14.0'	54.1'
19	105°13.55	9.14	97°24.10	17.1'	05°33.74	-14.1'	54.1'
20	120°13.76	8.21	112°0.18 126°36.29	17.1'	05°19.68	-14.1'	54.1'
21 22	135°13.96 150°14.17	· · 7.29 6.37	126° 36.29 141° 12.43	17.1' 17.2'	05°5.60 04°51.50	-14.1' -14.1'	54.1' 54.1'
23	165° 14.38	5.44	155°48.60	17.2'	04°37.40	-14.1'	54.0'
	SD = 15.8'	d = -0.9'		SI	D = 14.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180° 14.58 195° 14.79	N07°4.52 3.60	170°24.79 185°1.00	17.2' 17.2'	N04°23.28 04°9.15	-14.1' -14.1'	54.0' 54.0'
2	210° 15.00	2.67	199°37.24	17.2	04 9.15 03°55.01	-14.1 -14.2'	54.0'
3	225° 15.20	• • 1.75	214°13.49	17.3'	03°40.86	-14.2'	54.0'
4	240° 15.41	07°0.83	228°49.77	17.3'	03°26.69 03°12.53	-14.2'	54.0'
5 6	255° 15.62 270° 15.82	06°59.90 N06°58.98	243°26.07 258°2.39	17.3' 17.3'	N02°58.35	-14.2' -14.2'	54.0' 54.0'
7	285° 16.03	58.05	272°38.72	17.4	02°44.16	-14.2	54.0'
8	300° 16.24	57.13	287°15.07	17.4'	02°29.97	-14.2'	54.0'
9 10	315° 16.45 330° 16.65	· · 56.20 55.28	301°51.44 316°27.82	17.4' 17.4'	02°15.78 02°1.58	-14.2' -14.2'	54.0' 54.0'
11	345°16.86	54.35	331°4.22	17.4'	02 1.36 01°47.37	-14.2'	54.0'
12	0°17.07	N06°53.42	345°40.62	17.4'	N01°33.17	-14.2'	54.0'
13	15° 17.28	52.50	0°17.04	17.4'	01°18.96	-14.2'	54.0'
14 15	30°17.49 45°17.69	51.57 •• 50.65	14°53.47 29°29.91	17.4' 17.4'	01°4.74 00°50.53	-14.2' -14.2'	54.0' 54.0'
16	60° 17.90	49.72	44°6.36	17.5	00°36.32	-14.2'	54.0'
17	75° 18.11	48.79	58°42.81	17.5'	$00^{\circ}22.11$	-14.2'	54.0'
18	90°18.32	N06°47.86	73°19.28	17.5'	N00°7.90 S00°6.31	-14.2'	54.0'
19 20	105° 18.53 120° 18.74	46.94 46.01	87°55.74 102°32.21	17.5' 17.5'	00°20.52	14.2' 14.2'	53.9' 53.9'
21	135° 18.94	• • 45.08	117°8.69	17.5'	00°34.72	14.2	53.9'
22	150° 19.15	44.15	131°45.17	17.5'	00°48.92	14.2'	53.9'
23	165°19.36	43.23	146°21.65	17.5'	01°3.11	14.2'	53.9'
	SD = 15.9'	d = -0.9'		SI	D = 14.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 19.57	N06°42.30	160°58.12	17.5'	S01°17.30	14.2'	53.9'
1	195°19.78	41.37	175°34.60	17.5'	01°31.48	14.2'	53.9'
2	210° 19.99 225° 20.20	40.44 •• 39.51	190°11.08 204°47.55	17.5' 17.5'	01°45.65 01°59.82	14.2' 14.2'	53.9' 53.9'
4	240° 20.41	38.58	219°24.02	17.5	01° 39.02 02° 13.98	14.1'	53.9
5	255° 20.62	37.66	234°0.49	17.5'	02°28.13	14.1'	53.9'
6 7	270°20.83 285°21.04	N06°36.73 35.80	248°36.95 263°13.40	17.5' 17.4'	\$02°42.26 02°56.39	14.1' 14.1'	53.9' 53.9'
<i>1</i> 8	285°21.04 300°21.25	35.80 34.87	263°13.40 277°49.85	17.4' 17.4'	02°56.39 03°10.50	14.1	53.9' 53.9'
9	315°21.46	• • 33.94	292°26.28	17.4'	$03^{\circ}24.61$	14.1'	53.9'
10	330°21.67	33.01	307°2.71	17.4	03°38.70	14.1'	53.9'
11 12	345°21.88 0°22.09	32.08 N06°31.15	321°39.13 336°15.53	17.4' 17.4'	03°52.77 \$04°6.83	14.1' 14.0'	53.9' 53.9'
13	15°22.30	30.22	350°51.92	17.4' 17.4'	04°20.88	14.0'	53.9'
14	30°22.51	29.28	5°28.30	17.4'	04°34.91	14.0'	53.9'
15	45°22.72	• • 28.35	20°4.66	17.3'	04°48.92	14.0'	53.9'
16 17	60°22.93 75°23.14	27.42 26.49	34°41.01 49°17.34	17.3' 17.3'	05°2.92 05°16.90	14.0' 14.0'	53.9' 53.9'
18	90°23.35	N06°25.56	63°53.65	17.3'	\$05°30.86	13.9'	53.9
19	105°23.56	24.63	78°29.94	17.3'	05°44.80	13.9'	53.9'
20	120°23.77 135°23.98	23.70	93°6.21	17.3'	05°58.72	13.9'	53.9'
21 22	135°23.98 150°24.19	· · 22.76 21.83	107°42.46 122°18.69	17.2' 17.2'	06°12.61 06°26.49	13.9' 13.9'	53.9' 53.9'
23	165° 24.41	20.90	136°54.89	17.2'	06°40.34	13.8'	53.9'
	SD = 15.9'	d = -0.9'		SI	D = 14.7'		

Lat.	Twi	Twilight		Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Juliset	Civil	Naut.
N 72°	////	02:55	04:18	19:36	20:58	////
N 70°	01:10	03:18	04:30	19:25	20:36	22:36
68°	01:59	03:36	04:39	19:17	20:19	21:52
66°	02:29	03:50	04:46	19:09	20:05	21:24
64°	02:51	04:01	04:53	19:03	19:54	21:03
62°	03:08	04:11	04:58	18:58	19:45	20:47
60°	03:22	04:19	05:03	18:53	19:37	20:33
N 58°	03:34	04:26	05:07	18:49	19:30	20:22
56°	03:44	04:32	05:11	18:46	19:24	20:12
54°	03:52	04:37	05:14	18:42	19:19	20:04
52°	04:00	04:42	05:17	18:39	19:14	19:57
50°	04:06	04:47	05:20	18:37	19:10	19:50
45°	04:20	04:56	05:26	18:31	19:01	19:37
N 40°	04:30	05:03	05:31	18:26	18:54	19:26
35°	04:39	05:09	05:35	18:22	18:48	19:18
30°	04:46	05:15	05:39	18:18	18:43	19:11
20°	04:57	05:23	05:45	18:12	18:35	19:00
N 10°	05:05	05:29	05:51	18:07	18:28	18:53
0°	05:11	05:35	05:56	18:02	18:23	18:47
S 10°	05:15	05:39	06:00	17:57	18:18	18:43
20°	05:18	05:43	06:06	17:52	18:15	18:40
30°	05:20	05:47	06:11	17:47	18:11	18:39
35°	05:20	05:49	06:15	17:44	18:09	18:38
40°	05:20	05:51	06:18	17:40	18:07	18:39
45°	05:19	05:53	06:22	17:36	18:06	18:40
S 50°	05:18	05:55	06:27	17:31	18:04	18:41
52°	05:17	05:56	06:29	17:29	18:03	18:42
54°	05:16	05:57	06:32	17:27	18:02	18:43
56°	05:15	05:57	06:35	17:24	18:01	18:44
58°	05:13	05:58	06:38	17:21	18:01	18:46
S 60°	05:11	05:59	06:41	17:18	18:00	18:48

Lat.	Moonrise				Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	04:11	06:13	08:10	19:38	19:06	18:33
N 70°	04:26	06:17	08:05	19:31	19:06	18:41
68°	04:37	06:21	08:01	19:25	19:06	18:48
66°	04:46	06:23	07:58	19:20	19:06	18:53
64°	04:54	06:26	07:55	19:16	19:07	18:58
62°	05:01	06:28	07:53	19:12	19:07	19:02
60°	05:07	06:29	07:51	19:09	19:07	19:05
N 58°	05:12	06:31	07:49	19:06	19:07	19:08
56°	05:16	06:32	07:48	19:03	19:07	19:11
54°	05:20	06:34	07:46	19:01	19:07	19:14
52°	05:24	06:35	07:45	18:58	19:07	19:16
50°	05:27	06:36	07:44	18:56	19:07	19:18
45°	05:34	06:38	07:41	18:52	19:07	19:23
N 40°	05:40	06:40	07:39	18:49	19:08	19:27
35°	05:45	06:41	07:37	18:45	19:08	19:30
30°	05:50	06:43	07:36	18:43	19:08	19:33
20°	05:57	06:45	07:33	18:38	19:08	19:38
N 10°	06:04	06:47	07:30	18:33	19:08	19:43
0°	06:10	06:49	07:28	18:29	19:08	19:47
S 10°	06:16	06:52	07:26	18:25	19:08	19:51
20°	06:23	06:54	07:24	18:21	19:08	19:56
30°	06:30	06:56	07:21	18:15	19:08	20:01
35°	06:35	06:57	07:20	18:13	19:08	20:04
40°	06:40	06:59	07:18	18:09	19:09	20:08
45°	06:45	07:01	07:16	18:05	19:09	20:12
S 50°	06:52	07:03	07:14	18:00	19:09	20:16
52°	06:55	07:04	07:13	17:58	19:09	20:19
54°	06:58	07:05	07:12	17:56	19:09	20:21
56°	07:02	07:06	07:10	17:53	19:09	20:24
58°	07:06	07:08	07:09	17:50	19:09	20:27
S 60°	07:11	07:09	07:07	17:47	19:09	20:30

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.	
	00 ^h	12 ^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-3%
03	00:39	00:48	11:59	12:20	00:00	
04	00:58	01:08	11:59	12:59	00:39	
05	01:18	01:28	11:59	13:38	01:18	

September 06, 07, 08 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	345°34.70	156°52.25 S02°49.42	254°48.30 N23°26.11	266°51.95 N22°19.70	357°25.55 \$07°27.78	
1	0°37.16	171°51.93 50.71	269°49.13 26.15	281°54.14 19.72	12°28.20 27.86	Alpheratz 357°34.74 29°13.66
2	15°39.63	186°51.62 51.99	284°49.95 26.19	296°56.33 19.74	27°30.84 27.94	Ankaa 353°7.00 -42°10.13
3	30°42.09	201°51.30 · · 53.28	299°50.78 · · 26.23	311°58.52 · · 19.76	42°33.48 · · 28.01	Schedar 349°30.90 56°40.31 Diphda 348°47.28 -17°50.91
4	45° 44.56	216°50.98 54.57	314°51.60 26.27	327°0.71 19.78	57°36.12 28.09	Achernar 335°19.91 -57°6.43
5	60°47.02	231°50.67 55.85	329°52.43 26.31	342°2.90 19.80	72°38.76 28.17	Hamal 327°51.30 23°34.78
6	75°49.48	246°50.35 S02°57.14	344°53.25 N23°26.34	357°5.09 N22°19.81	87°41.40 \$07°28.24	Polaris 313°58.01 89°21.82
7	90°51.95 105°54.41	261°50.04 58.42	359°54.08 26.38	12°7.28 19.83	102°44.04 28.32	Acamar 315°11.77 -40°12.03
8 9	105 54.41 120° 56.88	276°49.72 02°59.71 291°49.40 03°0.99	14°54.91 26.42 29°55.73 · · · 26.46	27° 9.47 19.85 42° 11.66 •• 19.87	117°46.68 28.40 132°49.32 • 28.47	Menkar 314°6.30 4°11.32
10	135° 59.34	306°49.09 2.28	44°56.56 26.49	57°13.85 19.89	147°51.96 28.55	Mirfak 308°28.50 49°56.79
11	151°1.80	321°48.77 3.56	59°57.39 26.53	72°16.04 19.91	162°54.60 28.63	Aldebaran 290°39.92 16°33.59
12	166°4.27	336°48.46 \$03°4.85	74°58.21 N23°26.56	87°18.24 N22°19.93	177°57.24 \$07°28.71	Rigel 281°4.17 -8°10.17 Capella 280°22.36 46°1.24
13	181°6.73	351°48.14 6.13	89°59.04 26.60	102°20.43 19.94	192°59.89 28.78	Bellatrix 278°23.23 6°22.45
14	196°9.20	6°47.82 7.42	104°59.87 26.64	117°22.62 19.96	208°2.53 28.86	Elnath 278°2.28 28°37.68
15	211° 11.66	21°47.51 · · 8.70 36°47.19 9.99	120°0.70 · · 26.67	132°24.81 · · 19.98	223°5.17 · · 28.94	Alnilam 275°38.07 -1°10.99
16 17	226° 14.12 241° 16.59	36°47.19 9.99 51°46.87 11.27	135°1.53 26.71 150°2.36 26.74	147°27.01 20.00 162°29.20 20.02	238°7.81 29.01 253°10.45 29.09	Betelgeuse 270°52.48 7°24.83
18	256° 19.05	66°46.56 \$03°12.56	165°3.19 N23°26.78	177°31.40 N22°20.03	268°13.09 \$07°29.17	Canopus 263°52.72 -52°42.13
19	271°21.52	81°46.24 13.84	180° 4.02 26.81	192°33.59 20.05	283°15.73 29.24	Sirius 258°26.64 -16°44.74
20	286° 23.98	96°45.92 15.13	195° 4.85 26.84	207°35.78 20.07	298°18.37 29.32	Adhara 255°6.28 -29°0.02
21	301°26.45	111°45.61 · · 16.41	210°5.68 · · 26.88	222°37.98 · · 20.09	313°21.01 · · 29.40	Procyon 244°51.34 5°9.85 Pollux 243°17.89 27°58.03
22	$316^{\circ}28.91$	126°45.29 17.69	225° 6.51 26.91	237°40.17 20.11	328°23.65 29.48	Pollux 243°17.89 27°58.03 Avior 234°15.38 -59°35.00
23	331°31.37	141°44.97 18.98	240°7.34 26.95	252°42.37 20.13	343°26.29 29.55	Suhail 222°46.94 -43°31.68
Mer.	pass. 00:58	ν-0.3' d1.3' m-3.86	ν 0.8' d0.0' m0.67	ν 2.2' d 0.0' m-2.29	$\nu 2.6' \ d0.1' \ m0.58$	Miaplacidus 221°39.23 -69°48.86
						Alphard 217°48.34 -8°45.75
C-4	CHA	CUA De-	CHA De-	CHA De-	CHA De-	Regulus 207°35.06 11°50.94
Sat 0	GHA 346°33.84	GHA Dec 156°44.66 S 03°20.26	GHA Dec 255° 8.17 N23° 26.98	GHA Dec 267°44.56 N22°20.14	GHA Dec 358°28.94 S 07°29.63	Dubhe 193°41.96 61°37.17
1	1° 36.30	171°44.34 21.55	270°9.00 27.01	282°46.76 20.16	13°31.58 29.71	Denebola 182°25.55 14°26.21
2	16° 38.77	186°44.02 22.83	285°9.83 27.04	297°48.96 20.18	28°34.22 29.78	Gienah 175°44.20 -17°40.64
3	31°41.23	201°43.70 · · 24.11	300°10.66 · · 27.08	312°51.15 · · 20.20	43°36.86 · · 29.86	Acrux 173°1.14 -63°14.19 Gacrux 171°52.55 -57°15.11
4	46°43.69	216°43.39 25.40	315°11.49 27.11	327°53.35 20.22	58°39.50 29.94	Gacrux 171°52.55 -57°15.11 Alioth 166°13.66 55°49.75
5	61°46.16	231°43.07 26.68	330°12.33 27.14	342°55.55 20.23	73°42.14 30.01	Spica 158°22.86 -11°17.32
6	76°48.62	246°42.75 \$03°27.96	345°13.16 N23°27.17	357°57.75 N22°20.25	88°44.78 S 07°30.09	Alkaid 152°52.55 49°11.63
7	91°51.09	261°42.43 29.25	0°13.99 27.20	12°59.94 20.27	103°47.42 30.17	Hadar 148°36.90 -60°29.65
8	106° 53.55	276° 42.12 30.53 291° 41.80 · · 31.81	15°14.83 27.23	28° 2.14 20.29	118°50.06 30.24	Menkent 147°58.24 -36°29.52
9 10	121° 56.01 136° 58.48	291°41.80 · · 31.81 306°41.48 33.10	30°15.66 · · 27.26 45°16.49 27.29	43° 4.34 · · · 20.30 58° 6.54 20.32	133°52.71 · · 30.32 148°55.35 30.40	Arcturus 145°48.38 19°3.41
11	150 56.46 152°0.94	321°41.16 34.38	60°17.33 27.32	73°8.74 20.34	163°57.99 30.48	Rigil Kent. 139°41.12 -60°56.40
12	167°3.41	336°40.84 S03°35.66	75°18.16 N23°27.35	88°10.94 N22°20.36	179°0.63 S07°30.55	Kochab 137°20.30 74°3.47
13	182°5.87	351°40.53 36.95	90°19.00 27.38	103°13.14 20.37	194°3.27 30.63	Zuben'ubi 136°56.51 -16°8.62
14	197°8.33	6°40.21 38.23	105°19.83 27.41	118°15.34 20.39	209°5.91 30.71	Alphecca 126°4.10 26°38.10 Antares 112°16.23 -26°29.24
15	$212^{\circ}10.80$	21°39.89 · · 39.51	120°20.67 · · 27.44	133°17.54 · · 20.41	224°8.55 · · 30.78	Atria 107°10.71 -69°4.55
16	227° 13.26	36°39.57 40.79	135°21.50 27.47	148°19.74 20.43	239°11.19 30.86	Sabik 102°3.09 -15°45.31
17	242° 15.73	51°39.25 42.08	150°22.34 27.50	163°21.94 20.44	254°13.83 30.94	Shaula 96°10.69 -37°7.40
18 19	257° 18.19 272° 20.65	66°38.93 \$03°43.36 81°38.61 44.64	165°23.17 N23°27.53	178°24.14 N22°20.46 193°26.34 20.48	269°16.47 S07°31.01 284°19.12 31.09	Rasalhague 95°58.76 12°32.67
20	272 20.05 287°23.12	81°38.61 44.64 96°38.30 45.92	180°24.01 27.56 195°24.85 27.58	193°26.34 20.48 208°28.54 20.50	284°19.12 31.09 299°21.76 31.17	Eltanin 90°42.18 51°29.37
21	302° 25.58	111°37.98 · · 47.20	210°25.68 · · 27.61	223°30.74 · · 20.51	314°24.40 · · 31.24	Kaus Aust. 83°32.74 -34°22.45
22	317°28.05	126°37.66 48.49	225°26.52 27.64	238°32.95 20.53	329°27.04 31.32	Vega 80°33.25 38°48.60 Nunki 75°47.93 -26°15.99
23	332°30.51	141°37.34 49.77	240°27.36 27.67	253°35.15 20.55	344°29.68 31.40	Nunki 75°47.93 -26°15.99 Altair 62°0.02 8°56.13
Mer	pass. 00:54	ν-0.3' d1.3' m-3.86	ν 0.8' d0.0' m0.66	ν2.2' d0.0' m-2.30	ν2.6' d0.1' m0.58	Peacock 53°5.69 -56°39.44
- IVICI	pass. 00.54	ν-0.5 d1.5 iii-5.00				Deneb 49°25.64 45°22.26
_						Enif 33°38.78 9°59.40
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.79 -46°50.47
0 1	347°32.97 2°35.44	156°37.02 \$03°51.05 171°36.70 52.33	255°28.20 N23°27.69 270°29.03 27.72	268°37.35 N22°20.57 283°39.56 20.58	359°32.32	Fomalhaut 15°14.45 -29°29.40
2	17° 37.90	186°36.38 53.61	285°29.87 27.74	298°41.76 20.60	29°37.60 31.63	Scheat 13°45.14 28°13.09
3	32°40.37	201°36.06 · · 54.89	300°30.71 · · 27.77	313°43.96 · · 20.62	44°40.25 · · 31.70	Markab 13°29.86 15°20.38
4	47°42.83	216°35.74 56.17	315°31.55 27.80	328°46.17 20.64	59°42.89 31.78	Sep 06 Fri SHA Mer.pass
5	62°45.30	231°35.42 57.46	330°32.39 27.82	343°48.37 20.65	74°45.53 31.86	Venus 171°17.55 13:33
6	77° 47.76	246°35.10 \$03°58.74	345°33.23 N23°27.85	358°50.58 N22°20.67	89°48.17 S 07°31.93	Mars 269°13.60 07:00
7	92°50.22	261°34.78 04°0.02	0°34.07 27.87	13°52.78 20.69	104°50.81 32.01	Jupiter 281°17.25 06:12
8 9	107° 52.69 122° 55.15	276°34.46 1.30 291°34.14 • 2.58	15°34.91 27.90 30°35.75 · · 27.92	28°54.99 20.70 43°57.19 · · 20.72	119°53.45 32.09 134°56.09 · · 32.16	Saturn 11°50.85 00:10
10	122°55.15 137°57.62	291°34.14 · · 2.58 306°33.82 3.86	45°36.59 27.95	43°57.19 · · 20.72 58°59.40 20.74	134°56.09 · · 32.16 149°58.73 32.24	Sep 07 Sat SHA Mer.pass
11	157 57.02 153°0.08	321°33.50 5.14	60°37.43 27.97	74° 1.61 20.75	165°1.37 32.32	Venus 170°10.82 13:33
12	168°2.54	336°33.18 S04°6.42	75°38.27 N23°27.99	89°3.81 N22°20.77	180°4.02 S07°32.39	Mars 268°34.33 06:59
13	183°5.01	351°32.86 7.70	90°39.12 28.02	104°6.02 20.79	195°6.66 32.47	Jupiter 281°10.73 06:08
14	198°7.47	6°32.54 8.98	105°39.96 28.04	119° 8.23 20.81	210°9.30 32.55	Saturn 11°55.10 00:06
15	213°9.94	21°32.22 · · 10.26	120°40.80 · · 28.06	134°10.43 · · 20.82	225°11.94 · · 32.62	Sep 08 Sun SHA Mer.pass
16	228° 12.40	36°31.90 11.54	135°41.64 28.09	149°12.64 20.84	240°14.58 32.70	Venus 169°4.04 13:34
17	243° 14.86	51°31.58 12.82	150°42.48 28.11	164°14.85 20.86	255°17.22 32.78	Mars 267°55.22 06:58
18 19	258° 17.33 273° 19.79	66°31.26 \$04°14.10 81°30.93 15.38	165°43.33 N23°28.13 180°44.17 28.15	179°17.06 N22°20.87 194°19.27 20.89	270°19.86 S07°32.85 285°22.50 32.93	Jupiter 281°4.38 06:05
20	273 19.79 288° 22.26	96°30.61 16.66	195°45.01 28.17	209°21.48 20.91	300°25.15 33.01	Saturn 11°59.35 00:02
21	303°24.72	111°30.29 · · 17.93	210°45.86 · · 28.19	224°23.69 · · 20.92	315°27.79 · · 33.08	Horizontal parallax
22	318°27.18	126°29.97 19.21	225°46.70 28.22	239°25.90 20.94	330°30.43 33.16	Venus: 0.1
23	333° 29.65	141°29.65 20.49	240°47.55 28.24	254°28.11 20.96	345°33.07 33.24	Mars: 0.1
Mer	pass. 00:50	ν-0.3' d1.3' m-3.86	ν 0.8' d0.0' m0.65	ν2.2' d0.0' m-2.31	ν2.6' d0.1' m0.57	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 24.62	$N06^{\circ}19.97$	151°31.08	17.2'	S06°54.17	13.8'	53.9'
1	195°24.83 210°25.04	19.03	166°7.23 180°43.36	17.1' 17.1'	07°7.98 07°21.76	13.8'	53.9'
2	210° 25.04 225° 25.25	18.10 •• 17.17	180°43.36 195°19.47	17.1' 17.1'	07°21.76	13.8' 13.7'	53.9' 53.9'
4	240°25.46	16.23	209°55.54	17.0'	07°49.24	13.7	53.9'
5	255° 25.67	15.30	224°31.59	17.0'	08°2.95	13.7'	53.9'
6	270°25.89	N06°14.37	239° 7.60	17.0'	S08°16.62	13.6'	53.9'
7	285°26.10	13.43	253°43.58 268°19.54	17.0'	08°30.27	13.6'	53.9'
8 9	300°26.31 315°26.52	12.50 •• 11.57	282°55.45	16.9' 16.9'	08°43.88 08°57.47	13.6' 13.6'	53.9' 53.9'
10	330°26.73	10.63	297°31.34	16.8'	00°37.47	13.5'	53.9'
11	345°26.95	9.70	312°7.19	16.8'	09°24.55	13.5'	53.9'
12	0°27.16	N06°8.76	326°43.00	16.8'	S09°38.04	13.5'	54.0'
13 14	15°27.37 30°27.58	7.83 6.89	341°18.78 355°54.51	16.7' 16.7'	09°51.50 10°4.93	13.4' 13.4'	54.0' 54.0'
14 15	45° 27.80	• 5.96	10° 30.21	16.7	10 4.93 10°18.32	13.4	54.0'
16	60°28.01	5.02	25° 5.87	16.6'	10°31.68	13.3'	54.0'
17	75°28.22	4.09	39°41.48	16.6'	$10^{\circ}44.99$	13.3'	54.0'
18	90°28.44	N06°3.15	54°17.06	16.5'	\$10°58.28	13.2'	54.0'
19 20	105°28.65 120°28.86	2.21 1.28	68°52.59 83°28.07	16.5' 16.4'	11°11.52 11°24.73	13.2' 13.2'	54.0' 54.0'
20	120 28.86 135°29.08	1.28 06°0.34	98° 3.51	16.4	11 24.73 11°37.89	13.1	54.0'
22	150°29.29	05°59.40	112°38.91	16.3'	11°51.02	13.1'	54.0'
23	$165^{\circ}29.50$	58.47	$127^{\circ}14.26$	16.3'	$12^{\circ}4.11$	13.0'	54.0'
	SD = 15.9'	d = -0.9'		SE	0 = 14.7'		
_							
Sat 0	GHA 180° 29.72	Dec N05°57.53	GHA 141°49.55	u 16.2'	Dec \$12° 17.15	d 13.0'	HP 54.0'
1	195° 29.93	56.59	156° 24.80	16.2'	12°30.15	13.0'	54.0'
2	210°30.14	55.66	171°0.00	16.1'	12°43.11	12.9'	54.0'
3	225°30.36	• • 54.72	185°35.15	16.1'	$12^{\circ}56.03$	12.9'	54.0'
4	240°30.57	53.78	200°10.25	16.0'	13°8.90	12.8'	54.0'
5 6	255°30.78 270°31.00	52.84 N05°51.91	214°45.29 229°20.28	16.0' 15.9'	13°21.72 \$13°34.50	12.8' 12.7'	54.1' 54.1'
7	285°31.21	50.97	243°55.21	15.9'	13°47.23	12.7'	54.1
8	300°31.43	50.03	258°30.09	15.8'	13°59.91	12.6'	54.1'
9	315°31.64	• • 49.09	273°4.91	15.8'	$14^{\circ}12.54$	12.6'	54.1'
10	330°31.85	48.15	287°39.67	15.7'	14°25.13	12.5'	54.1'
11 12	345°32.07 0°32.28	47.22 N05°46.28	302°14.38 316°49.02	15.6' 15.6'	14°37.66 \$14°50.14	12.5' 12.4'	54.1' 54.1'
13	15°32.50	45.34	331° 23.60	15.5'	15° 2.57	12.4	54.1'
14	30°32.71	44.40	345°58.12	15.5'	15°14.94	12.3'	54.1'
15	45°32.93	• • 43.46	0°32.58	15.4'	15°27.26	12.3'	54.1'
16	60°33.14 75°33.36	42.52 41.58	15° 6.98 29° 41.31	15.3' 15.3'	15°39.53 15°51.74	12.2' 12.2'	54.2' 54.2'
17 18	90°33.57	N05°40.64	44° 15.57	15.2'	\$16°3.89	12.1	54.2
19	105°33.79	39.70	58°49.77	15.1'	16°15.99	12.0'	54.2'
20	120°34.00	38.76	73°23.90	15.1'	$16^{\circ}28.02$		54.2'
21	135°34.22	• • 37.82	87°57.96	15.0'	16°40.00	11.9'	54.2'
22 23	150°34.43 165°34.65	36.88 35.94	102°31.96 117°5.88	14.9' 14.9'	16°51.92 17°3.77	11.9' 11.8'	54.2' 54.2'
20	SD = 15.9'	d = -0.9'			0 = 14.7'	11.0	
	3D = 13.9	u = -0.9		JL	7 — 14.7		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°34.86 195°35.08	N05°35.00 34.06	131°39.74 146°13.52	14.8' 14.7'	\$17°15.57 17°27.30	11.7' 11.7'	54.2' 54.3'
2	210° 35.29	34.06	146°13.52 160°47.23	14.7 14.6'	17°27.30 17°38.96	11.7 11.6'	54.3'
3	225°35.51	• • 32.17	175°20.86	14.6'	17°50.56	11.5'	54.3'
4	240°35.73	31.23	189°54.43	14.5'	18°2.10	11.5'	54.3'
5	255°35.94	30.29	204°27.91	14.4'	18°13.57	11.4'	54.3'
6 7	270°36.16 285°36.37	N05°29.35 28.41	219°1.32 233°34.66	14.3' 14.3'	\$18°24.97 18°36.30	11.3' 11.3'	54.3' 54.3'
8	300°36.59	27.47	248°7.92	14.2'	18°47.56	11.2'	54.4'
9	315°36.81	• • 26.52	262°41.10	14.1'	18°58.75	11.1'	54.4'
10	330°37.02	25.58	277°14.20	14.0'	19°9.87	11.0'	54.4'
11 12	345°37.24 0°37.45	24.64 N05°23.70	291°47.22 306°20.16	13.9' 13.9'	19°20.92 \$19°31.89	11.0' 10.9'	54.4' 54.4'
13	0 37.45 15°37.67	22.75	300 20.10 320°53.02	13.8'	19°42.79	10.9	54.4' 54.4'
14	30° 37.89	21.81	335°25.79	13.7'	19°53.61	10.7	54.4
15	45°38.10	• • 20.87	349°58.49	13.6'	20°4.36	10.7'	54.5
16	60°38.32	19.92	4°31.10	13.5'	20°15.03	10.6'	54.5'
17 18	75°38.54 90°38.75	18.98 N05°18.04	19°3.62 33°36.07	13.4' 13.4'	20°25.62 \$20°36.13	10.5' 10.4'	54.5' 54.5'
19	105°38.97	17.09	48°8.42	13.4	20°46.56	10.4	54.5
20	120°39.19	16.15	62°40.69	13.2'	20°56.91	10.3'	54.5'
21	135°39.41	15.21	77°12.88	13.1'	21°7.17	10.2'	54.6'
22 23	150°39.62 165°39.84	14.26 13.32	91°44.97 106°16.98	13.0' 12.9'	21°17.35 21°27.45	10.1' 10.0'	54.6' 54.6'
23			100 10.96			10.0	J4.U
	SD = 15.9'	d = -0.9'		SL	0 = 14.8'		

Naut. Civil Vaut. N 72° 00:15 03:13 04:32 19:20 20:38 23:09 N 70° 01:43 03:33 04:42 19:11 20:19 22:05 68° 02:20 03:48 04:50 19:04 20:04 21:31 66° 02:45 04:01 04:56 18:58 19:53 21:07 64° 03:04 04:11 05:01 18:52 19:43 20:49 62° 03:19 04:19 05:06 18:48 19:35 20:49 62° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70° 01:43 03:33 04:42 19:11 20:19 22:05 68° 02:20 03:48 04:50 19:04 20:04 21:31 66° 02:45 04:01 04:56 18:58 19:53 21:07 64° 03:04 04:11 05:01 18:52 19:43 20:49 62° 03:19 04:19 05:06 18:48 19:35 20:34 60° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:30 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:07 19:49 50° 04:11 04:51	Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
68° 02:20 03:48 04:50 19:04 20:04 21:31 66° 02:45 04:01 04:56 18:58 19:53 21:07 64° 03:04 04:11 05:01 18:52 19:43 20:49 62° 03:19 04:19 05:06 18:48 19:35 20:34 60° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:30 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06	N 72°	00:15	03:13	04:32	19:20	20:38	23:09
66° 02:45 04:01 04:56 18:58 19:53 21:07 64° 03:04 04:11 05:01 18:52 19:43 20:49 62° 03:19 04:19 05:06 18:48 19:35 20:34 60° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12	N 70°	01:43	03:33	04:42	19:11	20:19	22:05
64° 03:04 04:11 05:01 18:52 19:43 20:49 62° 03:19 04:19 05:06 18:48 19:35 20:34 60° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:24 05:40 18:15 18:39 19:07 19:49 19:09 04:43 05:06 05:37 18:18 18:43 19:13 30° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:58 N 10° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41 06:03 17:53 18:15 18:41 30° 05:16 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 S 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:29 17:27 18:07 18:52	68°	02:20	03:48	04:50	19:04	20:04	21:31
62° 03:19 04:19 05:06 18:48 19:35 20:34 60° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:45 18:01 18:22 18:46 S 10° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:15 05:41 06:03 17:57 18:18 18:43 20° 05:15 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 S 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:29 17:27 18:07 18:52		02:45	04:01	04:56	18:58	19:53	21:07
60° 03:31 04:26 05:10 18:44 19:27 20:22 N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:43 19:13 30° 04:42 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34							
N 58° 03:42 04:33 05:14 18:41 19:21 20:12 56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:16 05:34 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38							
56° 03:51 04:38 05:17 18:38 19:16 20:03 54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:16 05:37 18:18 18:49 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38	1	03:31	04:26	05:10	18:44	19:27	20:22
54° 03:59 04:43 05:20 18:35 19:11 19:55 52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41		03:42	04:33	05:14	18:41	19:21	20:12
52° 04:05 04:48 05:22 18:32 19:07 19:49 50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41 06:03 17:53 18:15 18:41 30° 05:16 05:45		03:51	04:38	05:17	18:38	19:16	20:03
50° 04:11 04:51 05:25 18:30 19:03 19:43 45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:40 18:15 18:39 19:07 20° 04:58 05:29 05:50 18:05 18:26 18:51 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41 06:03 17:48 18:15 18:41 30° 05:16 05:44							
45° 04:24 05:00 05:30 18:25 18:55 19:31 N 40° 04:34 05:06 05:34 18:21 18:49 19:21 35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41 06:03 17:57 18:18 18:43 30° 05:16 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46							
$\begin{array}{c} \textbf{N} \ 40^{\circ} \\ 35^{\circ} \ 04:34 \\ 35^{\circ} \ 04:42 \\ 05:12 \\ 05:12 \\ 05:37 \\ 18:18 \\ 18:43 \\ 19:13 \\ 30^{\circ} \ 04:48 \\ 05:16 \\ 05:40 \\ 01:48 \\ 05:24 \\ 05:40 \\ 01:48 \\ 05:24 \\ 05:40 \\ 01:48 \\ 05:24 \\ 05:40 \\ 01:48 \\ 05:29 \\ 05:50 \\ 05:50 \\ 05:50 \\ 05:10 \\ 05:34 \\ 05:55 \\ 05:10 \\ 05:10 \\ 05:34 \\ 05:55 \\ 05:10 \\ 05:13 \\ 05:34 \\ 05:55 \\ 05:14 \\ 06:03 \\ 17:57 \\ 18:18 \\ 18:22 \\ 18:46 \\ \textbf{S} \ 10^{\circ} \ 05:13 \\ 05:38 \\ 05:59 \\ 17:57 \\ 18:18 \\ 18:43 \\ 20^{\circ} \ 05:15 \\ 05:41 \\ 06:03 \\ 17:43 \\ 18:15 \\ 18:41 \\ 30^{\circ} \ 05:16 \\ 05:44 \\ 06:08 \\ 17:48 \\ 18:12 \\ 18:40 \\ 35^{\circ} \ 05:16 \\ 05:45 \\ 05:16 \\ 05:46 \\ 06:13 \\ 17:43 \\ 18:10 \\ 18:41 \\ 45^{\circ} \ 05:14 \\ 05:47 \\ 06:17 \\ 17:40 \\ 18:09 \\ 18:43 \\ \textbf{S} \ 50^{\circ} \ 05:11 \\ 05:49 \\ 06:23 \\ 17:34 \\ 18:08 \\ 18:47 \\ 54^{\circ} \ 05:09 \\ 05:49 \\ 06:25 \\ 17:32 \\ 18:07 \\ 18:48 \\ 56^{\circ} \ 05:07 \\ 05:50 \\ 05:50 \\ 06:29 \\ 17:27 \\ 18:07 \\ 18:52 \\ \end{array}$		-					
35° 04:42 05:12 05:37 18:18 18:43 19:13 30° 04:48 05:16 05:40 18:15 18:39 19:07 20° 04:58 05:24 05:46 18:10 18:32 18:58 N 10° 05:05 05:29 05:50 18:05 18:26 18:51 0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41 06:03 17:57 18:18 18:43 30° 05:16 05:44 06:08 17:48 18:15 18:40 35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 50° 05:10 05:49	45°	04:24	05:00	05:30	18:25	18:55	19:31
$\begin{array}{cccccccccccccccccccccccccccccccccccc$					-	18:49	-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		-					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
0° 05:10 05:34 05:55 18:01 18:22 18:46 S 10° 05:13 05:38 05:59 17:57 18:18 18:43 20° 05:15 05:41 06:03 17:53 18:15 18:41 30° 05:16 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 5 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:50 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50							
$\begin{array}{cccccccccccccccccccccccccccccccccccc$							
20° 05:15 05:41 06:03 17:53 18:15 18:41 30° 05:16 05:44 06:08 17:48 18:12 18:40 35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 \$ 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52		05:10	05:34	05:55	18:01	18:22	18:46
$\begin{array}{cccccccccccccccccccccccccccccccccccc$							
35° 05:16 05:45 06:10 17:46 18:11 18:41 40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 \$ 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52							-
40° 05:15 05:46 06:13 17:43 18:10 18:41 45° 05:14 05:47 06:17 17:40 18:09 18:43 \$ 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:52 58° 05:05 05:50 06:29 17:27 18:07 18:52							
45° 05:14 05:47 06:17 17:40 18:09 18:43 \$ 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52							-
S 50° 05:11 05:49 06:21 17:36 18:08 18:45 52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52							
52° 05:10 05:49 06:23 17:34 18:08 18:47 54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52		05:14	05:47	06:17	17:40	18:09	18:43
54° 05:09 05:49 06:25 17:32 18:07 18:48 56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52							
56° 05:07 05:50 06:27 17:30 18:07 18:50 58° 05:05 05:50 06:29 17:27 18:07 18:52							
58° 05:05 05:50 06:29 17:27 18:07 18:52							
> nu= un·u< Un·n Un·32 17·25 18·06 18·55							
2 00 03.03 03.31 00.32 17.23 10.00 10.33	5 60°	05:03	05:51	06:32	17:25	18:06	18:55

Lat.		Moonris	e		Moonset	
Ldl.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	10:12	12:37		17:55	16:55	
N 70°	09:56	12:01		18:13	17:33	
68°	09:44	11:36	13:54	18:27	18:00	17:12
66°	09:34	11:17	13:14	18:38	18:20	17:54
64°	09:26	11:02	12:46	18:48	18:37	18:22
62°	09:19	10:49	12:25	18:56	18:51	18:44
60°	09:13	10:38	12:08	19:04	19:02	19:02
N 58°	09:08	10:29	11:54	19:10	19:13	19:17
56°	09:03	10:21	11:41	19:16	19:22	19:30
54°	08:59	10:14	11:31	19:21	19:29	19:41
52°	08:55	10:07	11:21	19:25	19:37	19:51
50°	08:52	10:01	11:13	19:30	19:43	20:00
45°	08:44	09:49	10:55	19:39	19:57	20:19
N 40°	08:38	09:39	10:41	19:46	20:09	20:34
35°	08:33	09:30	10:29	19:53	20:18	20:48
30°	08:28	09:23	10:19	19:59	20:27	20:59
20°	08:21	09:10	10:01	20:09	20:42	21:19
N 10°	08:14	08:58	09:45	20:18	20:56	21:36
0°	08:07	08:48	09:31	20:26	21:08	21:52
S 10°	08:01	08:37	09:16	20:35	21:20	22:09
20°	07:54	08:26	09:01	20:44	21:34	22:26
30°	07:47	08:14	08:44	20:54	21:49	22:46
35°	07:42	08:06	08:33	21:00	21:58	22:58
40°	07:37	07:58	08:22	21:07	22:09	23:12
45°	07:32	07:49	08:09	21:15	22:21	23:28
S 50°	07:25	07:37	07:52	21:25	22:36	23:48
52°	07:22	07:32	07:45	21:30	22:43	23:58
54°	07:18	07:26	07:36	21:35	22:50	
56°	07:15	07:20	07:27	21:40	22:59	
58°	07:10	07:13	07:16	21:46	23:09	
S 60°	07:06	07:05	07:04	21:54	23:20	

		Sun		Moon		
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	8-20%
06	01:38	01:49	11:58	14:17	01:57	
07	01:59	02:09	11:58	14:58	02:37	
08	02:19	02:30	11:58	15:41	03:19	

September 09, 10, 11 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	348°32.11	156°29.33 \$04°21.77	255°48.39 N23°28.26	269°30.32 N22°20.97	0°35.71 S 07°33.31	
1	3°34.58	171°29.00 23.05	270°49.24 28.28	284°32.53 20.99	15°38.35 33.39	Alpheratz 357°34.73 29°13.67 Ankaa 353°6.99 -42°10.14
2	18° 37.04	186°28.68 24.33	285°50.08 28.30	299°34.74 21.01	30°40.99 33.47	Schedar 349°30.88 56°40.33
3	33°39.51	201°28.36 · · 25.61	300°50.93 · · 28.32	314°36.95 · · 21.02	45°43.63 · · · 33.54	Diphda 348°47.27 -17°50.91
4	48° 41.97	216°28.04 26.88 231°27.72 28.16	315°51.78 28.34	329°39.16 21.04 344°41.37 21.05	60°46.27 33.62 75°48.92 33.69	Achernar 335°19.89 -57°6.44
5 6	63° 44.43 78° 46.90	231°27.72 28.16 246°27.39 \$04°29.44	330°52.62 28.36 345°53.47 N23°28.38	344°41.37 21.05 359°43.58 N22°21.07	75°48.92 33.69 90°51.56 \$07°33.77	Hamal 327°51.28 23°34.79
7	93°49.36	261°27.07 30.72	0°54.32 28.39	14°45.80 21.09	105°54.20 33.85	Polaris 313°56.44 89°21.83
8	108°51.83	276°26.75 31.99	15°55.16 28.41	29°48.01 21.10	120°56.84 33.92	Acamar 315°11.75 -40°12.03
9	123°54.29	291°26.42 · · 33.27	30°56.01 · · 28.43	44°50.22 · · 21.12	135°59.48 · · 34.00	Menkar 314°6.28 4°11.32 Mirfak 308°28.46 49°56.80
10	$138^{\circ}56.75$	306°26.10 34.55	45°56.86 28.45	59°52.44 21.14	151°2.12 34.08	Aldebaran 290°39.90 16°33.60
11	153° 59.22	321°25.78 35.83	60°57.71 28.47	74°54.65 21.15	166° 4.76 34.15	Rigel 281°4.15 -8°10.17
12 13	169°1.68 184°4.15	336°25.46	75°58.56 N23°28.48 90°59.40 28.50	89°56.86 N22°21.17 104°59.08 21.19	181°7.40 S07°34.23 196°10.05 34.31	Capella 280°22.33 46°1.24
13	199°6.61	351°25.13 38.38 6°24.81 39.66	90°59.40 28.50 106°0.25 28.52	104°59.08 21.19 120°1.29 21.20	196°10.05 34.31 211°12.69 34.38	Bellatrix 278°23.20 6°22.45
15	214°9.07	21°24.49 · · 40.93	121°1.10 · · 28.54	135° 3.51 · · 21.22	226°15.33 · · 34.46	Elnath 278°2.25 28°37.68
16	$229^{\circ}11.54$	36°24.16 42.21	136°1.95 28.55	150° 5.72 21.23	241°17.97 34.53	Alnilam 275°38.05 -1°10.99
17	$244^{\circ}14.00$	51°23.84 43.48	151°2.80 28.57	$165^{\circ}7.94$ 21.25	256°20.61 34.61	Betelgeuse 270°52.46 7°24.83 Canopus 263°52.69 -52°42.13
18	259° 16.47	66°23.51 S 04°44.76	166°3.65 N23°28.58	180°10.15 N22°21.27	271°23.25 S 07°34.69	Sirius 258°26.62 -16°44.74
19	274° 18.93	81°23.19 46.04	181°4.50 28.60	195°12.37 21.28	286°25.89 34.76	Adhara 255°6.26 -29°0.02
20	289°21.40	96°22.87 47.31	196° 5.35 28.62	210°14.59 21.30 225°16.80 · · 21.31	301°28.53 34.84	Procyon 244°51.32 5°9.85
21 22	304°23.86 319°26.32	111°22.54 · · 48.59 126°22.22 49.86	211°6.21 · · 28.63 226°7.06 28.65	225°16.80 · · 21.31 240°19.02 21.33	316°31.17 · · 34.92 331°33.82 34.99	Pollux 243°17.87 27°58.02
23	334°28.79	141°21.89 51.14	241°7.91 28.66	255°21.24 21.35	346°36.46 35.07	Avior 234°15.35 -59°34.99
_						Suhail 222°46.92 -43°31.67
ιVIer.μ	pass. 00:46	ν-0.3' d1.3' m-3.87	ν 0.8′ d 0.0′ m 0.65	ν2.2' d0.0' m-2.31	$\nu 2.6' \ d0.1' \ \text{m}0.57$	Miaplacidus 221°39.20 -69°48.84 Alphard 217°48.33 -8°45.75
						Regulus 207°35.05 11°50.93
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.96 61°37.15
0	349°31.25	156°21.57 S04°52.41	256°8.76 N23°28.68	270°23.46 N22°21.36	1°39.10 S07°35.14	Denebola 182°25.55 14°26.20
1	4°33.72 19°36.18	171°21.24 53.69 186°20.92 54.96	271°9.61 28.69 286°10.47 28.70	285°25.67 21.38 300°27.89 21.39	16°41.74 35.22 31°44.38 35.30	Gienah 175°44.20 -17°40.63
2	19 30.18 34°38.64	186°20.92 54.96 201°20.59 · · 56.24	286°10.47 28.70 301°11.32 · · 28.72	300°27.89 21.39 315°30.11 · · 21.41	31°44.38 35.30 46°47.02 · · 35.37	Acrux 173°1.14 -63°14.18
4	49°41.11	216°20.27 57.51	316°12.17 28.73	330°32.33 21.43	61°49.66 35.45	Gacrux 171°52.55 -57°15.10
5	64° 43.57	231°19.94 04°58.79	331°13.03 28.74	345°34.55 21.44	76°52.30 35.53	Alioth 166°13.67 55°49.73 Spica 158°22.87 -11°17.32
6	79°46.04	246°19.62 S 05°0.06	346°13.88 N23°28.76	0°36.77 N22°21.46	91°54.95 S 07°35.60	Spica 158°22.87 -11°17.32 Alkaid 152°52.56 49°11.62
7	94°48.50	261°19.29 1.33	1°14.73 28.77	15°38.99 21.47	106°57.59 35.68	Hadar 148°36.91 -60°29.64
8	109° 50.97	276°18.96 2.61	16°15.59 28.78	30°41.21 21.49	122°0.23 35.75	Menkent 147°58.25 -36°29.51
9	124°53.43	291°18.64 · · 3.88	31°16.44 · · 28.79	45°43.43 · · 21.50	137°2.87 · · 35.83	Arcturus 145°48.39 19°3.41
10 11	139° 55.89 154° 58.36	306°18.31 5.16 321°17.99 6.43	46°17.30 28.81 61°18.15 28.82	60°45.65 21.52 75°47.87 21.54	152°5.51 35.91 167°8.15 35.98	Rigil Kent. 139°41.14 -60°56.39
12	170°0.82	336°17.66 \$05°7.70	76°19.01 N23°28.83	90°50.09 N22°21.55	182°10.79 \$07°36.06	Kochab 137°20.36 74°3.46
13	185°3.29	351°17.33 8.98	91°19.87 28.84	105°52.31 21.57	197°13.43 36.13	Zuben'ubi 136°56.52 -16°8.62
14	200°5.75	6°17.01 10.25	106°20.72 28.85	120°54.54 21.58	212°16.07 36.21	Alphecca 126°4.11 26°38.10 Antares 112°16.24 -26°29.24
15	215°8.21	21°16.68 · · 11.52	121°21.58 · · 28.86	135°56.76 · · 21.60	227°18.71 · · 36.29	Atria 107°10.75 -69°4.55
16	230° 10.68	36°16.35 12.79	136°22.44 28.87	150°58.98 21.61	242°21.36 36.36	Sabik 102°3.10 -15°45.31
17 18	245° 13.14 260° 15.61	51°16.03 14.07 66°15.70 \$05°15.34	151°23.29 28.88 166°24.15 N23°28.89	166°1.20 21.63 181°3.43 N22°21.64	257°24.00 36.44 272°26.64 \$07°36.52	Shaula 96°10.71 -37°7.40
19	275° 18.07	81°15.37 16.61	181°25.01 28.90	196° 5.65 21.66	287°29.28 36.59	Rasalhague 95°58.77 12°32.67
20	290°20.54	96°15.04 17.88	196°25.87 28.91	211°7.87 21.67	302°31.92 36.67	Eltanin 90°42.21 51°29.38
21	305°23.00	111°14.72 · · 19.15	211°26.73 · · 28.92	226°10.10 · · 21.69	317°34.56 · · 36.74	Kaus Aust. 83°32.76 -34°22.45 Vega 80°33.27 38°48.61
22	$320^{\circ}25.46$	126°14.39 20.42	226°27.58 28.93	241°12.32 21.71	332°37.20 36.82	Nunki 75°47.94 -26°15.99
23	335°27.93	141°14.06 21.70	241°28.44 28.94	256°14.55 21.72	347°39.84 36.89	Altair 62°0.03 8°56.13
Mer.	pass. 00:42	ν -0.3' d1.3' m-3.87	$\nu 0.9' \ d0.0' \ m0.64$	$\nu 2.2' \ d0.0' \ \text{m-}2.32$	$\nu 2.6' \ d0.1' \ \text{m}0.58$	Peacock 53°5.70 -56°39.45
						Deneb 49°25.66 45°22.27
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.78 9°59.41
0	350°30.39	156°13.73 S05°22.97	256°29.30 N23°28.95	271°16.77 N22°21.74	2°42.48 \$07°36.97	Al Na'ir 27°32.79 -46°50.48 Fomalhaut 15°14.45 -29°29.40
1	5°32.86	171°13.40 24.24	271°30.16 28.96	286°19.00 21.75	17°45.13 37.05	Scheat 13°45.13 28°13.10
2	20° 35.32	186°13.07 25.51	286°31.02 28.97	301°21.23 21.77	32°47.77 37.12	Markab 13°29.86 15°20.39
3	35°37.78	201°12.75 · · 26.78	301°31.88 · · 28.97	316°23.45 · · 21.78	47°50.41 · · 37.20	
4	50° 40.25	216°12.42 28.05 231°12.09 29.32	316°32.74 28.98	331°25.68 21.80	62°53.05 37.27	Sep 09 Mon SHA Mer.pass Venus 167°57.21 13:34
5 6	65° 42.71 80° 45.18	231°12.09 29.32 246°11.76 \$05°30.59	331°33.60 28.99 346°34.47 N23°29.00	346°27.90 21.81 1°30.13 N22°21.83	77°55.69 37.35 92°58.33 \$07°37.43	Mars 267°16.28 06:56
7	95° 47.64	261°11.43 31.86	1°35.33 29.00	16°32.36 21.84	108° 0.97 37.50	Jupiter 280°58.20 06:01
8	110° 50.10	276°11.10 33.13	16°36.19 29.01	31°34.59 21.86	123°3.61 37.58	Saturn 12°3.60 23:53
9	125°52.57	291°10.77 · · 34.40	31°37.05 · · 29.02	46°36.81 · · 21.87	138°6.25 · · 37.65	Sep 10 Tue SHA Mer.pass
10	140°55.03	306°10.44 35.67	46°37.91 29.02	61°39.04 21.89	153°8.89 37.73	Sep 10 Tue SHA Mer.pass Venus 166°50.31 13:35
11	155° 57.50	321°10.11 36.94	61°38.78 29.03	76°41.27 21.90	168°11.54 37.81	Mars 266°37.51 06:55
12 13	170°59.96 186°2.43	336°9.78 S05°38.21 351°9.45 39.47	76°39.64 N23°29.03 91°40.50 29.04	91°43.50 N22°21.92 106°45.73 21.93	183°14.18	Jupiter 280°52.20 05:58
13 14	201°4.89	351°9.45 39.47 6°9.12 40.74	106°41.37 29.04	106°45.73 21.93 121°47.96 21.95	213°19.46 38.03	Saturn 12°7.85 23:49
15	216°7.35	21°8.79 · · 42.01	121°42.23 · · 29.05	136°50.19 · · 21.96	228°22.10 · · 38.11	Sep 11 Wed SHA Mer.pass
16	231°9.82	36°8.46 43.28	136°43.10 29.05	151°52.42 21.98	243°24.74 38.18	Venus 165°43.34 13:35
17	$246^{\circ}12.28$	51°8.13 44.55	151°43.96 29.06	166°54.65 21.99	258°27.38 38.26	Mars 265°58.91 06:54
18	261°14.75	66°7.80 S05°45.82	166°44.83 N23°29.06	181°56.88 N22°22.01	273°30.02 S07°38.34	Jupiter 280°46.38 05:54
19	276° 17.21	81°7.47 47.08	181°45.69 29.07	196°59.11 22.02	288°32.66 38.41	Saturn 12°12.09 23:45
20 21	291°19.68 306°22.14	96°7.14 48.35 111°6.81 · · 49.62	196°46.56 29.07 211°47.42 •• 29.07	212°1.34 22.04 227°3.58 •• 22.05	303°35.30 38.49 318°37.94 · · 38.56	Horizontal parallax
22	321°24.60	126°6.47 50.88	226°48.29 29.08	242°5.81 22.06	333°40.58 38.64	Venus: 0.1
23	336° 27.07	141°6.14 52.15	241°49.16 29.08	257° 8.04 22.08	348°43.23 38.71	Mars: 0.1
Merr	pass. 00:38	ν-0.3' d1.3' m-3.87	ν0.9' d0.0' m0.63	ν2.2' d0.0' m-2.32	ν2.6' d0.1' m0.58	
.,,,,,						

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°40.06	$N05^{\circ}12.37$	120°48.90	12.8'	S21°37.46	9.9'	54.6'
1	195° 40.27	11.43	135°20.74	12.7'	21°47.38	9.8'	54.6'
2	210° 40.49 225° 40.71	10.48 •• 9.54	149°52.48 164°24.13	12.7' 12.6'	21°57.22 22°6.96	9.7' 9.7'	54.7' 54.7'
4	240° 40.93	8.59	178°55.69	12.5'	22°16.62	9.6'	54.7'
5	255°41.14	7.65	193°27.16	12.4'	22°26.18	9.5'	54.7'
6 7	270°41.36 285°41.58	N05° 6.70 5.76	207°58.54 222°29.83	12.3' 12.2'	\$22°35.65 22°45.03	9.4' 9.3'	54.7' 54.8'
8	300°41.80	4.81	237°1.02	12.1'	22°54.31	9.3 9.2'	54.8'
9	315°42.02	• • 3.87	251°32.12	12.0'	$23^{\circ}3.50$	9.1'	54.8'
10	330° 42.23	2.92	266°3.13 280°34.04	11.9'	23°12.59	9.0' 8.9'	54.8'
11 12	345° 42.45 0° 42.67	1.97 N05° 1.03	280° 34.04 295° 4.86	11.8' 11.7'	23°21.58 523°30.48	8.8'	54.8' 54.9'
13	15°42.89	05°0.08	309°35.59	11.6'	23°39.27	8.7'	54.9'
14	30°43.11	04°59.13	324°6.22	11.5'	23°47.96	8.6'	54.9'
15 16	45° 43.32 60° 43.54	· · 58.19 57.24	338°36.76 353°7.20	11.4' 11.3'	23°56.55 24°5.03	8.5' 8.4'	54.9' 54.9'
17	75° 43.76	56.29	7°37.55	11.3'	24° 13.41	8.3'	55.0'
18	90°43.98	N04°55.35	22°7.80	11.2'	S24°21.69	8.2'	55.0'
19	105°44.20 120°44.42	54.40	36°37.96	11.1' 11.0'	24°29.85 24°37.91	8.1'	55.0' 55.0'
20 21	120°44.42 135°44.63	53.45 •• 52.50	51°8.02 65°37.98	10.9'	24° 37.91 24° 45.86	7.9' 7.8'	55.0 55.1'
22	150° 44.85	51.56	80°7.85	10.8'	24°53.70	7.7'	55.1'
23	165°45.07	50.61	94°37.62	10.7'	25°1.43	7.6'	55.1'
	SD = 15.9'	d = -0.9'		SD	= 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 45.29	N04°49.66	109°7.30	10.6'	\$25°9.04	7.5'	55.1'
1	195° 45.51	48.71	123°36.88	10.5'	25°16.54	7.4'	55.2'
2	210° 45.73 225° 45.95	47.76 • • 46.82	138°6.36 152°35.75	10.4' 10.3'	25°23.93 25°31.19	7.3' 7.2'	55.2' 55.2'
3 4	225 45.95 240°46.17	45.87	167° 5.04	10.3	25 31.19 25°38.35	7.2 7.0'	55.2'
5	255° 46.39	44.92	181°34.24	10.1'	25°45.38	6.9'	55.3'
6	270°46.61	N04°43.97	196°3.34	10.0'	\$25°52.29	6.8'	55.3'
7 8	285°46.82 300°47.04	43.02 42.07	210°32.35 225°1.26	9.9' 9.8'	25°59.08 26°5.75	6.7' 6.5'	55.3' 55.3'
9	315° 47.26	• • 41.12	239°30.07	9.7'	26°12.29	6.4	55.4
10	330° 47.48	40.17	253°58.80	9.6'	26°18.71	6.3'	55.4'
11 12	345°47.70 0°47.92	39.22 N04°38.27	268°27.42 282°55.96	9.5' 9.4'	26°25.01 \$26°31.17	6.2' 6.0'	55.4' 55.5'
13	15°48.14	37.32	297°24.40	9.4 9.3'	26°37.21	5.9'	55.5'
14	30°48.36	36.37	311°52.74	9.3'	$26^{\circ}43.12$	5.8'	55.5'
15	45° 48.58 60° 48.80	• • 35.42	326°21.00 340°49.16	9.2' 9.1'	26°48.90 26°54.55	5.6'	55.5'
16 17	75°49.02	34.47 33.52	340 49.16 355°17.23	9.1 9.0'	20 54.55 27°0.06	5.5' 5.4'	55.6' 55.6'
18	90°49.24	N04°32.57	9°45.21	8.9'	S27°5.45	5.2'	55.6'
19	105°49.46	31.62	24°13.10	8.8'	27°10.69	5.1' 5.0'	55.7'
20 21	120°49.68 135°49.90	30.67 •• 29.72	38° 40.89 53° 8.60	8.7' 8.6'	27°15.80 27°20.77	5.0° 4.8'	55.7' 55.7'
22	150° 50.12	28.77	67°36.22	8.5'	27°25.61	4.7'	55.7'
23	165°50.34	27.82	82° 3.76	8.4'	27°30.30	4.6'	55.8'
	SD = 15.9'	d = -0.9'		SD	= 15.0′		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.56	N04°26.87	96°31.20	8.4'	S27°34.86	4.4'	55.8'
1 2	195°50.78 210°51.00	25.92 24.96	110°58.56 125°25.84	8.3' 8.2'	27°39.27 27°43.54	4.3' 4.1'	55.8' 55.9'
3	210 51.00 225°51.22	. 24.90	125 25.84 139°53.03	8.2 8.1'	27 43.54 27°47.66	4.1 4.0'	55.9'
4	240°51.44	23.06	154°20.13	8.0'	$27^{\circ}51.64$	3.8'	55.9'
5	255°51.66	22.11 N04°21.16	168°47.16	7.9'	27°55.47	3.7'	56.0'
6 7	270°51.88 285°52.10	20.21	183°14.10 197°40.96	7.9' 7.8'	\$27°59.16 28°2.70	3.5' 3.4'	56.0' 56.0'
8	300°52.33	19.25	212°7.74	7.7'	28°6.09	3.2'	56.1'
9	315°52.55	• • 18.30	226°34.44	7.6'	28°9.32	3.1'	56.1'
10 11	330°52.77 345°52.99	17.35 16.40	241°1.07 255°27.62	7.5' 7.5'	28°12.41 28°15.35	2.9' 2.8'	56.1' 56.2'
12	0°53.21	N04°15.44	269°54.09	7.4'	S28°18.13	2.6'	56.2'
13	15°53.43	14.49	284°20.49	7.3'	28°20.75	2.5'	56.2'
14 15	30°53.65 45°53.87	13.54 •• 12.58	298°46.82 313°13.08	7.3' 7.2'	28°23.23 28°25.54	2.3' 2.2'	56.3' 56.3'
15 16	45 53.87 60°54.09	11.63	313 13.08 327°39.27	7.2 7.1'	28°27.70	2.2'	56.3'
17	75°54.31	10.68	342°5.38	7.1'	$28^{\circ}29.70$	1.8'	56.4'
18	90°54.54	N04° 9.72	356°31.43	7.0'	\$28°31.54	1.7'	56.4'
19 20	105°54.76 120°54.98	8.77 7.82	10°57.42 25°23.34	6.9' 6.9'	28°33.22 28°34.74	1.5' 1.4'	56.4' 56.5'
21	135°55.20	• • 6.86	39°49.20	6.8'	28°36.10	1.2'	56.5'
22	150° 55.42	5.91	54°14.99	6.7'	28°37.29	1.0'	56.5'
23	165°55.64	4.95	68°40.73	6.7'	28°38.33	0.9'	56.6'
	SD = 15.9'	d = -1.0'		SD	= 15.2'		

N 72° N 70° 68° 66°	Naut. 01:21 02:08 02:38 02:59 03:16	O3:31 03:47 04:01 04:11	04:46 04:54 05:00	19:04 18:57	20:19 20:03	Naut. 22:22
N 70° 68°	02:08 02:38 02:59 03:16	03:47 04:01	04:54			22:22
68°	02:38 02:59 03:16	04:01		18:57	20.02	
	02:59 03:16		05:00		∠0:03	21:39
66°	03:16	04.11		18:51	19:50	21:11
		01.11	05:06	18:46	19:40	20:51
64°		04:20	05:10	18:42	19:31	20:35
62°	03:29	04:28	05:14	18:38	19:24	20:22
60°	03:40	04:34	05:17	18:35	19:18	20:11
N 58°	03:50	04:40	05:20	18:32	19:12	20:02
56°	03:58	04:44	05:23	18:30	19:08	19:54
54°	04:05	04:49	05:25	18:27	19:03	19:47
52°	04:11	04:53	05:27	18:25	19:00	19:41
50°	04:17	04:56	05:29	18:24	18:56	19:36
45°	04:28	05:03	05:33	18:20	18:49	19:25
N 40°	04:37	05:09	05:37	18:16	18:44	19:16
35°	04:44	05:14	05:40	18:14	18:39	19:09
30°	04:50	05:18	05:42	18:11	18:35	19:03
20°	04:58	05:24	05:46	18:07	18:29	18:55
N 10°	05:05	05:29	05:50	18:03	18:24	18:49
0°	05:09	05:33	05:54	18:00	18:21	18:45
S 10°	05:11	05:36	05:57	17:57	18:18	18:42
20°	05:13	05:38	06:00	17:54	18:16	18:41
30°	05:12	05:40	06:04	17:50	18:14	18:42
35°	05:12	05:41	06:06	17:48	18:13	18:43
40°	05:10	05:41	06:08	17:46	18:13	18:44
45°	05:08	05:42	06:11	17:43	18:13	18:47
S 50°	05:05	05:42	06:14	17:40	18:12	18:50
52°	05:03	05:42	06:16	17:39	18:12	18:52
54°	05:01	05:42	06:17	17:37	18:13	18:54
56°	04:59	05:42	06:19	17:36	18:13	18:56
58°	04:56	05:42	06:21	17:34	18:13	18:59
S 60°	04:53	05:42	06:23	17:32	18:13	19:02

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°	14:49			17:56	10.00	
62° 60°	14:10	16:12	16:55	18:36	18:20	10.22
	13:43	15:22		19:04	19:10	19:32
N 58° 56°	13:22	14:52	16:13	19:25	19:41	20:14
56° 54°	13:05 12:50	14:28 14:09	15:44 15:22	19:43 19:58	20:05 20:24	20:43 21:05
54 52°	12:30	14:09	15:22 15:04	20:11	20:24	21:05
50°	12:27	13:40	14:48	20:11	20:54	21:39
45°	12:04	13:12	14:17	20:47	21:23	22:10
N 40°	11:45	12:50	13:53	21:06	21:45	22:34
35°	11:30	12:32	13:33	21:22	22:04	22:54
30°	11:17	12:16	13:17	21:36	22:20	23:12
20°	10:54	11:50	12:48	22:00	22:47	23:40
N 10°	10:35	11:28	12:24	22:21	23:11	
0°	10:17	11:07	12:01	22:40	23:32	
S 10°	09:59	10:46	11:38	23:00	23:54	
20°	09:40	10:24	11:14	23:21		00:18
30° 35°	09:18	09:58	10:46	23:45		00:45
40°	09:05 08:51	09:43 09:26	10:29 10:10		00:00 00:16	01:02 01:21
45°	08:33	09:20	09:47		00:10	01:44
S 50°	08:12	08:39	09:17		01:02	02:13
52°	08:12	08:39	09:17		01:02	02:13
54°	07:50	08:12	09:02	00:09	01:14	02:26
56°	07:38	07:55	08:24	00:21	01:45	03:05
58°	07:23	07:35	07:58	00:35	02:04	03:30
S 60°	07:05	07:09	07:23	00:52	02:29	04:06

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
5	00 ^h	12 ^h	Pass	Upper	Lower	6-8
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	29-48%
09	02:40	02:51	11:57	16:28	04:04	
10	03:01	03:12	11:57	17:20	04:53	
11	03:22	03:33	11:56	18:14	05:47	

September 12, 13, 14 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$351^{\circ}29.53$	156°5.81 \$05°53.42	256°50.02 N23°29.08	272°10.27 N22°22.09	3°45.87 S 07°38.79	Alpheratz 357°34.72 29°13.68
1	6°32.00	171°5.48 54.68	271°50.89 29.08	287°12.51 22.11	18°48.51 38.86	Ankaa 353°6.98 -42°10.15
2	21°34.46	186°5.15 55.95	286°51.76 29.09	302°14.74 22.12	33°51.15 38.94	Schedar 349°30.86 56°40.35
3 4	36°36.92 51°39.39	201° 4.81 · · 57.22 216° 4.48 58.48	301°52.63 · · 29.09 316°53.49	317°16.97 · · · 22.14 332°19.21	48°53.79 · · 39.02 63°56.43 39.09	Diphda 348°47.25 -17°50.91
5	66° 41.85	231°4.15 05°59.75	331°54.36 29.09	347°21.44 22.17	78°59.07 39.17	Achernar 335°19.87 -57°6.45
6	81°44.32	246°3.82 S06°1.01	346°55.23 N23°29.09	2°23.68 N22°22.18	94°1.71 S07°39.24	Hamal 327°51.26 23°34.80
7	96°46.78	261°3.48 2.28	1°56.10 29.09	17°25.91 22.20	109°4.35 39.32	Polaris 313°54.85 89°21.84 Acamar 315°11.72 -40°12.04
8	111°49.25	276°3.15 3.54	16°56.97 29.10	32°28.15 22.21	124°6.99 39.39	Acamar 315°11.72 -40°12.04 Menkar 314°6.25 4°11.33
9	126°51.71	291°2.82 · · 4.81	31°57.84 · · 29.10	47°30.38 · · 22.22	139°9.63 · · 39.47	Mirfak 308°28.43 49°56.81
10	141°54.17	306°2.48 6.07	46°58.71 29.10	62°32.62 22.24	154°12.27 39.54	Aldebaran 290°39.87 16°33.60
11 12	156° 56.64 171° 59.10	321°2.15 7.34 336°1.81 \$06°8.60	61°59.58 29.10 77°0.45 N23°29.10	77°34.85 22.25 92°37.09 N22°22.27	169°14.91 39.62 184°17.55 \$07°39.69	Rigel 281°4.12 -8°10.17
13	187°1.57	351°1.48 9.87	92°1.32 29.10	107°39.33 22.28	199°20.20 39.77	Capella 280°22.29 46°1.24
14	202°4.03	6°1.15 11.13	107°2.19 29.09	122°41.56 22.30	214°22.84 39.85	Bellatrix 278°23.18 6°22.46 Elnath 278°2.22 28°37.68
15	217°6.49	21°0.81 · · 12.39	122°3.06 · · 29.09	137°43.80 · · 22.31	229°25.48 · · 39.92	Elnath 278°2.22 28°37.68 Alnilam 275°38.03 -1°10.99
16	232°8.96	36°0.48 13.66	137°3.94 29.09	152°46.04 22.32	244°28.12 40.00	Betelgeuse 270°52.43 7°24.83
17 18	247°11.42	51°0.14 14.92 65°59.81 S06°16.18	152°4.81 29.09 167°5.68 N23°29.09	167°48.28 22.34 182°50.52 N22°22.35	259°30.76 40.07 274°33.40 \$07°40.15	Canopus 263°52.66 -52°42.12
19	262°13.89 277°16.35	65°59.81 S06°16.18 80°59.47 17.45	167° 5.68 N23° 29.09 182° 6.55 29.09	182°50.52 N22°22.35 197°52.76 22.37	274°33.40 S07°40.15 289°36.04 40.22	Sirius 258°26.59 -16°44.73
20	292° 18.82	95°59.14 18.71	197° 7.43 29.09	212°54.99 22.38	304°38.68 40.30	Adhara 255°6.23 -29°0.02
21	307°21.28	110°58.80 · · 19.97	212°8.30 · · 29.08	227°57.23 · · 22.39	319°41.32 · · 40.37	Procyon 244°51.30 5°9.85
22	322°23.74	125°58.46 21.23	227°9.17 29.08	242°59.47 22.41	334°43.96 40.45	Pollux 243°17.84 27°58.02 Avior 234°15.32 -59°34.98
23	337°26.21	140°58.13 22.49	242°10.05 29.08	258° 1.71 22.42	349°46.60 40.52	Suhail 222°46.90 -43°31.66
Mer.	pass. 00:34	ν-0.3' d1.3' m-3.87	ν0.9' d0.0' m0.62	ν2.2' d0.0' m-2.33	ν2.6' d0.1' m0.58	Miaplacidus 221°39.17 -69°48.83
						Alphard 217°48.31 -8°45.75
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.03 11°50.93
0	352°28.67	155°57.79 \$06°23.76	257°10.92 N23°29.08	273°3.95 N22°22.44	4°49.24 S 07°40.60	Dubhe 193°41.95 61°37.13 Denebola 182°25.54 14°26.19
1	7°31.14	170°57.46 25.02	272°11.80 29.07	288° 6.19 22.45	19°51.88 40.67	Gienah 175°44.20 -17°40.63
2	22°33.60	185°57.12 26.28	287°12.67 29.07	303°8.44 22.46	34°54.52 40.75	Acrux 173°1.14 -63°14.17
3	37°36.06	200°56.78 · · 27.54	302°13.55 · · 29.07	318°10.68 · · 22.48	49°57.16 · · 40.82	Gacrux 171°52.55 -57°15.09
4 5	52° 38.53 67° 40.99	215°56.45 28.80 230°56.11 30.06	317°14.43 29.06 332°15.30 29.06	333°12.92 22.49 348°15.16 22.51	64°59.80 40.90 80°2.44 40.97	Alioth 166°13.68 55°49.72
6	82° 43.46	245°55.77 \$06°31.32	347°16.18 N23°29.05	3°17.40 N22°22.52	95°5.08 S07°41.05	Spica 158°22.87 -11°17.32
7	97°45.92	260°55.44 32.58	2°17.05 29.05	18°19.65 22.53	110°7.72 41.12	Alkaid 152°52.57 49°11.61 Hadar 148°36.92 -60°29.63
8	112°48.39	275°55.10 33.84	17°17.93 29.04	33°21.89 22.55	125°10.36 41.20	Menkent 147°58.25 -36°29.51
9	127°50.85	290°54.76 · · 35.10	32°18.81 · · 29.04	48°24.13 · · 22.56	140°13.00 · · 41.27	Arcturus 145°48.39 19°3.40
10	142°53.31	305°54.42 36.36	47°19.69 29.03	63°26.38 22.58 78°28.62 22.59	155°15.64 41.35	Rigil Kent. 139°41.15 -60°56.38
11 12	157° 55.78 172° 58.24	320°54.08 37.62 335°53.75 \$06°38.88	62°20.56 29.03 77°21.44 N23°29.02	78°28.62 22.59 93°30.86 N22°22.60	170°18.28 41.42 185°20.93 \$07°41.50	Kochab 137°20.41 74°3.44
13	188° 0.71	350°53.41 40.14	92°22.32 29.02	108°33.11 22.62	200°23.57 41.57	Zuben'ubi 136°56.52 -16°8.62
14	203°3.17	5°53.07 41.39	107°23.20 29.01	123°35.35 22.63	215°26.21 41.65	Alphecca 126°4.12 26°38.10 Antares 112°16.25 -26°29.24
15	218°5.63	20°52.73 · · 42.65	122°24.08 · · 29.00	138°37.60 · · 22.64	230°28.85 · · 41.72	Atria 107°10.77 -69°4.55
16	233°8.10	35°52.39 43.91	137°24.96 29.00	153°39.84 22.66	245°31.49 41.80	Sabik 102°3.11 -15°45.31
17 18	248° 10.56 263° 13.03	50°52.05 45.17 65°51.71 S06°46.43	152°25.84 28.99 167°26.72 N23°28.98	168°42.09 22.67 183°44.34 N22°22.68	260°34.13 41.87 275°36.77 \$07°41.95	Shaula 96°10.71 -37°7.40
19	278° 15.49	80°51.37 47.68	182°27.60 28.97	198°46.58 22.70	290°39.41 42.02	Rasalhague 95°58.78 12°32.67
20	293° 17.96	95°51.03 48.94	197°28.48 28.97	213°48.83 22.71	305°42.05 42.10	Eltanin 90°42.23 51°29.38 Kaus Aust. 83°32.77 -34°22.45
21	308°20.42	110°50.69 · · 50.20	212°29.36 · · 28.96	228°51.08 · · 22.72	320°44.69 · · 42.17	Kaus Aust. 83°32.77 -34°22.45 Vega 80°33.28 38°48.61
22	323°22.88	125°50.35 51.45	227°30.24 28.95	243°53.32 22.74	335°47.33 42.25	Nunki 75°47.95 -26°15.99
23	338°25.35	140°50.01 52.71	242°31.13 28.94	258°55.57 22.75	350°49.97 42.32	Altair 62°0.03 8°56.14
Mer.	pass. 00:30	ν -0.3 $'$ d1.3 $'$ m-3.87	$ u 0.9' \ d$ -0.0' m0.62	$\nu 2.2' \ d0.0' \ \text{m-}2.34$	$ u 2.6' \ d0.1' \ m0.59$	Peacock 53°5.71 -56°39.46
						Deneb 49°25.66 45°22.28
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.78 9°59.41 Al Na'ir 27°32.79 -46°50.48
0	$353^{\circ}27.81$	155°49.67 \$06°53.97	257°32.01 N23°28.93	273°57.82 N22°22.76	5°52.61 S 07°42.40	Fomalhaut 15°14.44 -29°29.40
1	8°30.28	170°49.33 55.22	272°32.89 28.92	289° 0.07 22.78	20°55.25 42.47	Scheat 13°45.13 28°13.11
2	23°32.74	185°48.99 56.48 200°48.65 • 57.73	287°33.77 28.92 302°34.66 •• 28.91	304°2.32 22.79 319°4.57 · · · 22.80	35°57.89 42.55	Markab 13°29.85 15°20.40
3 4	38°35.20 53°37.67	200° 48.65 · · · 57.73 215° 48.31 · · · 6° 58.99	302°34.66 · · 28.91 317°35.54 28.90	319° 4.57 · · · 22.80 334° 6.81	51°0.53 · · 42.62 66°3.17 42.70	Sep 12 Thu SHA Mer.pass
5	68° 40.13	230°47.96 07°0.24	332°36.43 28.89	349° 9.06 22.83	81°5.81 42.77	Venus 164°36.28 13:36
6	83° 42.60	245°47.62 S 07°1.50	347°37.31 N23°28.88	4°11.31 N22°22.84	96°8.45 \$07°42.85	Mars 265°20.49 06:52
7	98° 45.06	260°47.28 2.75	2°38.19 28.87	19°13.56 22.86	111°11.09 42.92	Jupiter 280°40.74 05:50
8	113° 47.53	275°46.94 4.01	17°39.08 28.86	34°15.82 22.87	126°13.73 43.00	Saturn 12°16.33 23:41
9	128° 49.99	290°46.59 · · 5.26	32°39.96 · · 28.85	49°18.07 · · 22.88	141°16.37 · · 43.07 156°19.01 43.15	Sep 13 Fri SHA Mer.pass
10 11	143° 52.45 158° 54.92	305°46.25 6.51 320°45.91 7.77	47°40.85 28.83 62°41.74 28.82	64°20.32 22.90 79°22.57 22.91	156°19.01 43.15 171°21.65 43.22	Venus 163°29.12 13:36
12	173° 57.38	335°45.57 S07°9.02	77°42.62 N23°28.81	94°24.82 N22°22.92	186°24.29 S07°43.29	Mars 264°42.25 06:51
13	$188^{\circ}59.85$	350°45.22 10.27	92°43.51 28.80	109°27.07 22.94	201°26.93 43.37	Jupiter 280°35.28 05:47 Saturn 12°20.57 23:37
14	204°2.31	5°44.88 11.53	107°44.39 28.79	124°29.33 22.95	216°29.57 43.44	
15	219°4.77	20°44.54 · · 12.78	122°45.28 · · 28.78	139°31.58 · · 22.96	231°32.20 · · 43.52	Sep 14 Sat SHA Mer.pass
16 17	234°7.24 249°9.70	35°44.19 14.03 50°43.85 15.28	137°46.17 28.76 152°47.06 28.75	154°33.83 22.97 169°36.09 22.99	246°34.84 43.59 261°37.48 43.67	Venus 162°21.86 13:37
18	249 9.70 264° 12.17	65°43.50 S07°16.53	167°47.95 N23°28.74	184°38.34 N22°23.00	276°40.12 S07°43.74	Mars 264°4.20 06:49 Jupiter 280°30.01 05:43
19	279° 14.63	80°43.16 17.78	182°48.83 28.73	199°40.59 23.01	291°42.76 43.82	Saturn 12°24.79 23:32
20	294° 17.10	95°42.81 19.04	197°49.72 28.71	214°42.85 23.03	306°45.40 43.89	
21	309° 19.56	110°42.47 · · 20.29	212°50.61 · · 28.70	229°45.10 · · 23.04	321°48.04 · · 43.96	Horizontal parallax Venus: 0.1
22 23	324°22.02 339°24.49	125° 42.12 21.54 140° 41.78 22.79	227°51.50 28.68 242°52.39 28.67	244°47.36 23.05 259°49.61 23.06	336°50.68 44.04 351°53.32 44.11	Venus: 0.1 Mars: 0.1
Mer.	pass. 00:26	ν-0.3′ d1.3′ m-3.87	ν0.9' d-0.0' m0.61	ν2.2′ d0.0′ m-2.34	$\nu 2.6' \ d0.1' \ \text{m}0.59$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.86 195°56.09	N04°4.00	83°6.40 97°32.02	6.6'	\$28°39.19	0.7'	56.6'
1 2	210°56.31	3.05 2.09	97°32.02 111°57.59	6.6' 6.5'	28°39.90 28°40.44	0.5' 0.4'	56.6' 56.7'
3	225°56.53	• • 1.14	126°23.10	6.5'	28°40.81	0.2'	56.7'
4	240°56.75	04°0.18	140°48.56	6.4	28°41.01	0.0'	56.8'
5 6	255°56.97 270°57.19	03°59.23 N03°58.27	155°13.97 169°39.33	6.4' 6.3'	28°41.05 528°40.92	-0.1' -0.3'	56.8' 56.8'
7	285°57.42	57.32	184°4.64	6.3	28° 40.62	-0.5'	56.9
8	300°57.64	56.36	$198^{\circ}29.91$	6.2'	$28^{\circ}40.14$	-0.6'	56.9'
9 10	315°57.86 330°58.08	· · 55.41 54.45	212°55.13 227°20.32	6.2' 6.1'	28°39.50 28°38.69	-0.8' -1.0'	56.9' 57.0'
11	345°58.30	53.50	241°45.46	6.1	28° 37.71	-1.0	57.0'
12	0°58.53	N03°52.54	256°10.56	6.1'	S28°36.55	-1.3'	57.1'
13	15°58.75	51.58	270°35.63	6.0'	28°35.22	-1.5'	57.1'
14 15	30°58.97 45°59.19	50.63 •• 49.67	285°0.66 299°25.66	6.0' 6.0'	28°33.72 28°32.05	-1.7' -1.8'	57.1' 57.2'
16	60°59.41	48.72	313°50.63	5.9'	28°30.20	-2.0'	57.2'
17	75°59.64	47.76	328°15.57	5.9'	28°28.17	-2.2'	57.2'
18 19	90°59.86 106°0.08	N03°46.80 45.85	342°40.49 357°5.37	5.9' 5.9'	\$28°25.98 28°23.60	-2.4' -2.5'	57.3' 57.3'
20	121° 0.30	44.89	11°30.24	5.8'	28°21.05	-2.7'	57.4'
21	136° 0.53	• • 43.93	$25^{\circ}55.08$	5.8'	$28^{\circ}18.33$	-2.9'	57.4'
22	151°0.75 166°0.97	42.98	40°19.90 54°44.70	5.8'	28° 15.43 28° 12.35	-3.1'	57.4'
23		42.02	54 44.7U ————————————————————————————————————	5.8'		-3.3'	57.5'
	SD = 15.9'	d = -1.0'		5	D = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181° 1.19 196° 1.42	N03°41.06 40.11	69°9.49 83°34.26	5.8' 5.8'	\$28°9.10 28°5.67	-3.4' -3.6'	57.5' 57.6'
2	211° 1.64	39.15	97°59.02	5.0 5.7'	28°2.06	-3.8'	57.6'
3	226°1.86	• • 38.19	112°23.77	5.7'	27°58.28	-4.0'	57.6'
4	241°2.08	37.23	126°48.52	5.7'	27°54.32	-4.1'	57.7'
5 6	256° 2.31 271° 2.53	36.28 N03°35.32	141°13.25 155°37.98	5.7' 5.7'	27°50.18 \$27°45.87	-4.3' -4.5'	57.7' 57.8'
7	286° 2.75	34.36	170°2.70	5.7'	27°41.37	-4.7'	57.8'
8	301°2.97	33.40	184°27.43	5.7'	27°36.71	-4.8'	57.8'
9 10	316° 3.20 331° 3.42	· · 32.45 31.49	198°52.15 213°16.88	5.7' 5.7'	27°31.86 27°26.84	-5.0' -5.2'	57.9' 57.9'
11	346° 3.64	30.53	217°41.60	5.7'	27°21.64	-5.4'	58.0'
12	1°3.87	N03°29.57	242°6.34	5.7'	\$27°16.26	-5.6'	58.0'
13 14	16° 4.09 31° 4.31	28.61 27.65	256°31.08 270°55.83	5.8' 5.8'	27°10.71 27°4.98	-5.7' -5.9'	58.0' 58.1'
15	46° 4.54	26.69	285°20.59	5.8'	26°59.07	-6.1'	58.1
16	61°4.76	25.74	299°45.37	5.8'	26°52.99	-6.3'	58.2'
17 18	76° 4.98 91° 5.20	24.78 N03°23.82	314°10.15 328°34.96	5.8' 5.8'	26°46.73 S 26°40.30	-6.4' -6.6'	58.2' 58.2'
19	106° 5.43	22.86	342°59.78	5.8'	26° 33.69	-6.8'	58.3
20	121°5.65	21.90	$357^{\circ}24.62$	5.9'	$26^{\circ}26.91$	-7.0'	58.3'
21 22	136° 5.87 151° 6.10	· · 20.94 19.98	11°49.47 26°14.36	5.9' 5.9'	26° 19.95 26° 12.82	-7.1' -7.3'	58.4' 58.4'
23	166° 6.32	19.98	40°39.26	5.9'	26°5.52	-7.5'	58.4
	SD = 15.9'	d = -1.0'		S	D = 15.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	181° 6.54	N03°18.06	55°4.19	ν 6.0'	\$25°58.04	-7.6'	58.5'
1	196° 6.77	17.10	69°29.14	6.0'	25°50.39	-7.8'	58.5'
2	211° 6.99 226° 7.21	16.14 •• 15.18	83°54.12 98°19.14	6.0' 6.0'	25°42.57 25°34.58	-8.0' -8.2'	58.6' 58.6'
4	241°7.44	14.22	96 19.14 112°44.18	6.1	25° 26.42	-8.3'	58.6'
5	256°7.66	13.26	$127^{\circ}9.25$	6.1'	$25^{\circ}18.09$	-8.5'	58.7'
6	271°7.88 286°8.11	N03°12.30	141°34.36 155°59.50	6.1'	\$25°9.59 25°0.92	-8.7' -8.8'	58.7'
7 8	286°8.11 301°8.33	11.34 10.38	155°59.50 170°24.67	6.2' 6.2'	25°0.92 24°52.08	-8.8° -9.0'	58.8' 58.8'
9	316° 8.56	• • 9.42	184°49.88	6.2'	24°43.08	-9.2'	58.8'
10	331°8.78	8.46	199°15.13	6.3'	24°33.91	-9.3'	58.9'
11 12	346° 9.00 1° 9.23	7.50 N03°6.54	213°40.42 228°5.75	6.3' 6.4'	24°24.58 S 24°15.08	-9.5' -9.7'	58.9' 59.0'
13	16° 9.45	5.58	242°31.12	6.4	24°5.41	-9.8'	59.0'
14	31°9.67	4.62	256°56.53	6.5'	23°55.59	-10.0'	59.0'
15 16	46° 9.90 61° 10.12	· · 3.66 2.70	271°21.98 285°47.48	6.5' 6.5'	23°45.60 23°35.45	-10.1' -10.3'	59.1' 59.1'
17	76°10.35	1.73	300°13.02	6.6'	23°25.14	-10.5'	59.1 59.2'
18	91°10.57	N03°0.77	314°38.61	6.6'	\$23°14.67	-10.6'	59.2'
19 20	106°10.79 121°11.02	02°59.81 58.85	329°4.24 343°29.93	6.7' 6.7'	23°4.05 22°53.27	-10.8' -10.9'	59.2' 59.3'
21	121 11.02 136°11.24	58.85	343 29.93 357°55.65	6.8'	22° 42.33	-10.9 -11.1'	59.3'
22	151°11.46	56.93	12°21.43	6.8'	22°31.23	-11.2'	59.4'
23	166°11.69	55.97	26°47.26	6.9'	22°19.99	-11.4'	59.4'
	SD = 15.9'	d = -1.0'	-	S	D = 15.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juillise	Juliset	Civil	Naut.
N 72°	01:54	03:47	05:00	18:49	20:01	21:50
N 70°	02:29	04:01	05:06	18:43	19:47	21:17
68°	02:54	04:12	05:11	18:38	19:36	20:54
66°	03:12	04:22	05:15	18:34	19:27	20:36
64°	03:27	04:29	05:19	18:31	19:20	20:22
62°	03:39	04:36	05:22	18:28	19:14	20:10
60°	03:49	04:42	05:24	18:26	19:08	20:00
N 58°	03:57	04:46	05:26	18:24	19:04	19:52
56°	04:05	04:51	05:28	18:22	18:59	19:45
54°	04:11	04:54	05:30	18:20	18:56	19:39
52°	04:17	04:58	05:32	18:18	18:53	19:33
50°	04:22	05:01	05:33	18:17	18:50	19:28
45°	04:32	05:07	05:37	18:14	18:43	19:18
N 40°	04:40	05:12	05:39	18:11	18:39	19:11
35°	04:46	05:16	05:42	18:09	18:35	19:04
30°	04:52	05:20	05:44	18:07	18:31	18:59
20°	04:59	05:25	05:47	18:04	18:26	18:52
N 10°	05:04	05:29	05:50	18:01	18:22	18:47
0°	05:08	05:32	05:53	17:59	18:20	18:44
S 10°	05:10	05:34	05:55	17:57	18:18	18:42
20°	05:10	05:36	05:58	17:54	18:16	18:42
30°	05:09	05:36	06:00	17:52	18:16	18:43
35°	05:07	05:37	06:02	17:50	18:15	18:45
40°	05:05	05:37	06:04	17:49	18:16	18:47
45°	05:02	05:36	06:05	17:47	18:16	18:50
S 50°	04:58	05:36	06:08	17:45	18:17	18:54
52°	04:56	05:35	06:09	17:44	18:17	18:57
54°	04:54	05:35	06:10	17:43	18:18	18:59
56°	04:51	05:34	06:11	17:41	18:18	19:02
58°	04:48	05:34	06:13	17:40	18:19	19:05
S 60°	04:44	05:33	06:14	17:39	18:20	19:09
Lat.		Moonris	ie	Moonset		
∟ aι.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°		_	_			

Lat.		Moonris	е		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°			19:57			22:36
64°			19:10			23:23
62°		18:52	18:39		21:38	23:53
60°	17:51	18:10	18:16	20:36	22:20	
N 58°	17:10	17:41	17:57	21:17	22:48	
56°	16:42	17:19	17:41	21:45	23:10	
54°	16:20	17:01	17:27	22:07	23:28	
52°	16:02	16:45	17:15	22:25	23:43	
50°	15:47	16:32	17:05	22:40	23:56	
45°	15:16	16:04	16:42	23:11		00:23
N 40°	14:51	15:42	16:24	23:35		00:45
35°	14:32	15:24	16:09	23:54		01:02
30°	14:14	15:08	15:56		00:11	01:17
20°	13:46	14:41	15:33	•• ••	00:39	01:43
N 10°	13:21	14:18	15:14	00:05	01:04	02:04
0°	12:58	13:57	14:55	00:28	01:26	02:25
S 10°	12:35	13:35	14:36	00:51	01:49	02:45
20°	12:11	13:12	14:16	01:16	02:13	03:06
30°	11:42	12:45	13:53	01:45	02:40	03:31
35°	11:25	12:29	13:40	02:02	02:57	03:46
40°	11:05	12:10	13:24	02:21	03:16	04:02
45°	10:41	11:48	13:05	02:46	03:39	04:22
S 50°	10:10	11:19	12:41	03:17	04:08	04:47
52°	09:54	11:05	12:30	03:32	04:23	04:59
54°	09:36	10:48	12:17	03:50	04:40	05:13
56°	09:14	10:29	12:02	04:12	05:00	05:28
58°	08:46	10:04	11:44	04:41	05:24	05:47
S 60°	08:04	09:31	11:22	05:22	05:58	06:09

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
_ Day	00 ^h	12 ^h	Pass	Upper	Lower	9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-78%
12	03:43	03:54	11:56	19:12	06:43	
13	04:05	04:15	11:56	20:11	07:41	
14	04:26	04:37	11:55	21:09	08:40	

September 15, 16, 17 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	354° 26.95	155°41.43 S07°24.04	257°53.28 N23°28.66	274°51.87 N22°23.08	6°55.96 S 07°44.19	
1	9°29.42	170°41.09 25.29	272°54.17 28.64	289°54.13 23.09	21°58.60 44.26	Alpheratz 357°34.71 29°13.70 Ankaa 353°6.96 -42°10.16
2	24°31.88	185° 40.74 26.54	287°55.06 28.63	304°56.38 23.10	37°1.24 44.34	Schedar 349°30.84 56°40.36
3	39°34.34	200°40.39 · · 27.79	302°55.95 · · 28.61	319°58.64 · · 23.12	52°3.88 · · 44.41	Diphda 348°47.24 -17°50.91
4 5	54° 36.81 69° 39.27	215° 40.05 29.03 230° 39.70 30.28	317°56.85 28.60 332°57.74 28.58	335° 0.90 23.13 350° 3.15 23.14	67°6.52 44.49 82°9.16 44.56	Achernar 335°19.84 -57°6.45
6	84° 41.74	245°39.35 \$07°31.53	347°58.63 N23°28.57	5° 5.41 N22° 23.15	97°11.80 S07°44.63	Hamal 327°51.24 23°34.81
7	99° 44.20	260°39.01 32.78	2°59.52 28.55	20°7.67 23.17	112°14.44 44.71	Polaris 313°53.54 89°21.85
8	114°46.66	275°38.66 34.03	18° 0.41 28.54	35°9.93 23.18	127°17.08 44.78	Acamar 315°11.69 -40°12.04
9	129°49.13	290°38.31 · · 35.28	33°1.31 · · 28.52	50°12.19 · · 23.19	142°19.72 · · 44.86	Menkar 314°6.23 4°11.34 Mirfak 308°28.39 49°56.82
10	144°51.59	305°37.96 36.52	48° 2.20 28.50	65°14.45 23.20	157°22.36 44.93	Aldebaran 290°39.84 16°33.61
11	159° 54.06	320°37.61 37.77 335°37.27 \$07°39.02	63°3.09 28.49 78°3.99 N23°28.47	80°16.70 23.22	172°24.99 45.00	Rigel 281°4.09 -8°10.16
12 13	174° 56.52 189° 58.99	335°37.27 S07°39.02 350°36.92 40.26	78°3.99 N23°28.47 93°4.88 28.45	95°18.96 N22°23.23 110°21.22 23.24	187°27.63 \$07°45.08 202°30.27 45.15	Capella 280°22.25 46°1.25
14	205°1.45	5° 36.57 41.51	108° 5.78 28.43	125°23.48 23.25	217°32.91 45.23	Bellatrix 278°23.15 6°22.46
15	220°3.91	20°36.22 · · 42.76	123°6.67 · · 28.42	140°25.75 · · 23.27	232°35.55 · · 45.30	Elnath 278°2.19 28°37.68
16	$235^{\circ}6.38$	35°35.87 44.00	138°7.57 28.40	155°28.01 23.28	247°38.19 45.38	Alnilam 275°38.00 -1°10.98 Betelgeuse 270°52.40 7°24.83
17	250°8.84	50°35.52 45.25	153°8.46 28.38	170°30.27 23.29	262°40.83 45.45	Canopus 263°52.63 -52°42.12
18	265°11.31	65°35.17 S07°46.49	168° 9.36 N23° 28.36	185°32.53 N22°23.30	277°43.47 S07°45.52	Sirius 258°26.57 -16°44.73
19 20	280° 13.77 295° 16.23	80°34.82 47.74 95°34.47 48.98	183°10.26 28.34 198°11.15 28.33	200°34.79 23.31 215°37.05 23.33	292°46.11 45.60 307°48.75 45.67	Adhara 255°6.21 -29°0.01
21	310° 18.70	110°34.12 · · 50.23	213°12.05 · · 28.31	230°39.32 · · 23.34	322°51.39 · · 45.75	Procyon 244°51.27 5°9.85
22	325°21.16	125°33.77 51.47	228°12.95 28.29	245°41.58 23.35	337°54.02 45.82	Pollux 243°17.82 27°58.01
23	340°23.63	140°33.42 52.71	243°13.85 28.27	260°43.84 23.36	352°56.66 45.89	Avior 234°15.30 -59°34.97 Suhail 222°46.88 -43°31.65
Merr	pass. 00:22	ν-0.3' d1.2' m-3.87	ν0.9' d-0.0' m0.60	ν2.3' d0.0' m-2.35	ν2.6' d0.1' m0.60	Miaplacidus 221°39.15 -69°48.82
14161.		- 0.5 U1.2 III-J.07	νο.σ α-σ.σ πισ.σσ	ν 2.5 αυ.υ III-2.55	ν Δ.Ο UO.1 IIIU.UU	Alphard 217°48.29 -8°45.74
	CIIA	CUA D	CUA D	CIIA	CUA D	Regulus 207°35.02 11°50.92
Mon 0	GHA 355°26.09	GHA Dec 155°33.07 \$07°53.96	GHA Dec 258°14.74 N23°28.25	GHA Dec 275°46.11 N22°23.37	GHA Dec 7°59.30 S 07°45.97	Dubhe 193°41.93 61°37.11
1	10°28.55	170°32.72 55.20	273°15.64 28.23	290°48.37 23.39	23°1.94 46.04	Denebola 182°25.53 14°26.19
2	25°31.02	185°32.36 56.44	288°16.54 28.21	305°50.63 23.40	38°4.58 46.11	Gienah 175°44.19 -17°40.63
3	40°33.48	200°32.01 · · 57.69	303°17.44 · · 28.19	320°52.90 · · 23.41	53°7.22 · · 46.19	Acrux 173°1.15 -63°14.16 Gacrux 171°52.56 -57°15.08
4	55° 35.95	215°31.66 07°58.93	318°18.34 28.17	335°55.16 23.42	68°9.86 46.26	Alioth 166°13.68 55°49.70
5	70°38.41	230°31.31 08°0.17	333°19.24 28.15	350°57.43 23.44	83°12.50 46.34	Spica 158°22.87 -11°17.32
6	85° 40.87	245°30.96	348°20.14 N23°28.13	5°59.70 N22°23.45	98°15.14 \$07°46.41	Alkaid 152°52.58 49°11.59
7 8	100° 43.34 115° 45.80	260°30.60 2.65 275°30.25 3.90	3°21.04 28.11 18°21.94 28.08	21°1.96 23.46 36°4.23 23.47	113°17.77 46.48 128°20.41 46.56	Hadar 148°36.94 -60°29.63
9	130°48.27	290°29.90 · · 5.14	33°22.84 · · 28.06	51°6.49 · · 23.48	143°23.05 · · 46.63	Menkent 147°58.26 -36°29.50
10	145°50.73	305°29.54 6.38	48°23.74 28.04	66°8.76 23.49	158°25.69 46.70	Arcturus 145°48.40 19°3.40 Rigil Kent. 139°41.17 -60°56.37
11	160°53.20	320°29.19 7.62	63°24.65 28.02	81°11.03 23.51	173°28.33 46.78	Rigil Kent. 139°41.17 -60°56.37 Kochab 137°20.45 74°3.43
12	175°55.66	335°28.84 S 08°8.86	78°25.55 N23°28.00	96°13.30 N22°23.52	188°30.97 S 07°46.85	Zuben'ubi 136°56.53 -16°8.62
13	190°58.12	350°28.48 10.10	93°26.45 27.97	111°15.56 23.53	203°33.61 46.93	Alphecca 126°4.13 26°38.09
14	206°0.59	5°28.13 11.34	108°27.35 27.95	126°17.83 23.54	218°36.24 47.00	Antares 112°16.26 -26°29.24
15 16	221°3.05 236°5.52	20°27.77 · · 12.58 35°27.42 13.81	123°28.26 ·· 27.93 138°29.16 27.91	141°20.10 · · 23.55 156°22.37 23.57	233°38.88 · · 47.07 248°41.52 47.15	Atria 107°10.81 -69°4.55
17	251°7.98	50°27.06 15.05	153°30.06 27.88	171°24.64 23.58	263°44.16 47.22	Sabik 102°3.12 -15°45.31
18	266° 10.44	65°26.71 S08°16.29	168°30.97 N23°27.86	186°26.91 N22°23.59	278°46.80 S07°47.29	Shaula 96°10.73 -37°7.40 Rasalhague 95°58.79 12°32.67
19	281°12.91	80°26.35 17.53	183°31.87 27.83	201°29.18 23.60	293°49.44 47.37	Eltanin 90°42.25 51°29.38
20	296° 15.37	95°25.99 18.77	198°32.78 27.81	216°31.45 23.61	308°52.08 47.44	Kaus Aust. 83°32.78 -34°22.45
21	311° 17.84	110°25.64 · · 20.00	213°33.68 · · 27.79	231°33.72 · · 23.62	323°54.71 · · 47.51	Vega 80°33.30 38°48.61
22 23	326°20.30 341°22.76	125°25.28 21.24 140°24.93 22.48	228°34.59 27.76 243°35.49 27.74	246°35.99 23.63 261°38.26 23.65	338°57.35 47.59 353°59.99 47.66	Nunki 75°47.96 -26°15.99
				-		Altair 62°0.04 8°56.14
Mer.p	pass. 00:18	ν-0.4' d1.2' m-3.87	ν 0.9′ <i>d</i> -0.0′ m0.59	ν2.3' d0.0' m-2.36	$\nu 2.6' \ d0.1' \ m0.60$	Peacock 53°5.72 -56°39.47 Deneb 49°25.68 45°22.29
						Deneb 49°25.68 45°22.29 Enif 33°38.78 9°59.42
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.78 -46°50.49
0	356°25.23	155°24.57	258°36.40 N23°27.71	276°40.53 N22°23.66	9°2.63 S07°47.73	Fomalhaut 15°14.43 -29°29.41
1 2	11°27.69 26°30.16	170°24.21 24.95 185°23.85 26.19	273°37.31 27.69 288°38.21 27.66	291°42.80 23.67 306°45.08 23.68	24°5.27 47.81 39°7.91 47.88	Scheat 13°45.12 28°13.12
3	41°32.62	200°23.50 · · 27.42	303°39.12 · · 27.64	300°45.08 23.68 321°47.35 •• 23.69	54°10.54 · · 47.95	Markab 13°29.85 15°20.41
4	56° 35.08	215°23.14 28.66	318°40.03 27.61	336°49.62 23.70	69°13.18 48.03	Sep 15 Sun SHA Mer.pass
5	71°37.55	230°22.78 29.89	333°40.94 27.58	351°51.90 23.71	84°15.82 48.10	Venus 161°14.48 13:38
6	86°40.01	245°22.42 \$08°31.13	348°41.84 N23°27.56	6°54.17 N22°23.73	99°18.46 \$07°48.17	Mars 263°26.33 06:48
7	101°42.48	260°22.06 32.36	3°42.75 27.53	21°56.44 23.74	114°21.10 48.25	Jupiter 280°24.92 05:40
8 9	116° 44.94 131° 47.40	275°21.70 33.60 290°21.34 · · 34.83	18°43.66 27.51 33°44.57 •• 27.48	36°58.72 23.75 52°0.99 · · 23.76	129°23.73 48.32 144°26.37 • 48.39	Saturn 12°29.01 23:28
10	131°47.40 146°49.87	290°21.34 · · 34.83 305°20.98 36.06	33°44.57 · · 27.48 48°45.48 27.45	52°0.99 · · 23.76 67°3.27 23.77	159°29.01 48.47	Sep 16 Mon SHA Mer.pass
11	161°52.33	320°20.63 37.30	63°46.39 27.42	82°5.54 23.78	174°31.65 48.54	Venus 160°6.98 13:38
12	176°54.80	335°20.27 S 08°38.53	78°47.30 N23°27.40	97°7.82 N22°23.79	189°34.29 S 07°48.61	Mars 262°48.65 06:47 Jupiter 280°20.02 05:36
13	191°57.26	350°19.90 39.76	93°48.21 27.37	112°10.09 23.80	204°36.92 48.69	Jupiter 280°20.02 05:36 Saturn 12°33.21 23:24
14	206°59.72	5°19.54 40.99	108°49.12 27.34	127°12.37 23.82	219°39.56 48.76	
15 16	222°2.19 237°4.65	20°19.18 · · 42.23 35°18.82 43.46	123°50.03 ·· 27.31 138°50.95 27.28	142°14.65 · · 23.83 157°16.92 23.84	234°42.20 · · 48.83 249°44.84 48.91	Sep 17 Tue SHA Mer.pass
17	252°7.12	50°18.46 44.69	153°51.86 27.26	157 16.92 23.84 172°19.20 23.85	264°47.47 48.98	Venus 158°59.34 13:39 Mars 262°11.17 06:45
18	267°9.58	65°18.10 S08°45.92	168°52.77 N23°27.23	187°21.48 N22°23.86	279°50.11 S07°49.05	Jupiter 280°15.30 05:32
19	282° 12.04	80° 17.74 47.15	183°53.68 27.20	202°23.75 23.87	294°52.75 49.12	Saturn 12°37.40 23:20
20	297°14.51	95°17.38 48.38	198°54.60 27.17	217°26.03 23.88	309°55.39 49.20	
21	312°16.97	110°17.01 · · 49.61	213°55.51 · · 27.14	232°28.31 · · 23.89	324°58.02 · · 49.27	Horizontal parallax Venus: 0.1
22 23	327° 19.44 342° 21.90	125°16.65 50.84 140°16.29 52.07	228°56.42 27.11 243°57.34 27.08	247°30.59 23.90 262°32.87 23.91	340°0.66 49.34 355°3.30 49.42	Mars: 0.1
Mer.p	pass. 00:14	ν-0.4' d1.2' m-3.88	ν0.9' d-0.0' m0.58	ν2.3′ d0.0′ m-2.36	ν2.6′ d0.1′ m0.60	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°11.91	$N02^{\circ}55.00$	41°13.13	6.9'	S22°8.59	-11.6'	59.4'
1	196° 12.14	54.04	55°39.06	7.0'	21°57.04	-11.7'	59.5'
2	211° 12.36 226° 12.58	53.08 •• 52.12	70°5.04 84°31.07	7.0' 7.1'	21°45.34 21°33.49	-11.8' -12.0'	59.5' 59.5'
4	241° 12.81	51.16	98°57.15	7.1'	21°21.49	-12.1'	59.6'
5	256°13.03	50.19	113°23.28	7.2'	$21^{\circ}9.35$	-12.3'	59.6'
6	271°13.26	N02°49.23	127°49.46	7.2'	\$20°57.06	-12.4'	59.6'
7 8	286°13.48 301°13.70	48.27 47.31	142°15.70 156°42.00	7.3' 7.3'	20°44.63 20°32.06	-12.6' -12.7'	59.7' 59.7'
9	316° 13.93	• • 46.34	171°8.34	7.4'	20°19.34	-12.9'	59.8'
10	331°14.15	45.38	185°34.74	7.5'	20°6.49	-13.0'	59.8'
11	346°14.38 1°14.60	44.42 N02°43.45	200°1.19 214°27.70	7.5' 7.6'	19°53.50 \$19°40.37	-13.1' -13.3'	59.8' 59.9'
12 13	1 14.00 16°14.82	NU2 43.45 42.49	214 27.70 228°54.26	7.6'	19°27.10	-13.3 -13.4'	59.9' 59.9'
14	31° 15.05	41.53	243°20.88	7.7'	19°13.70	-13.5'	59.9'
15	46° 15.27	• • 40.56	257°47.55	7.7'	19°0.17	-13.7'	60.0'
16	61° 15.50 76° 15.72	39.60	272°14.27 286°41.05	7.8'	18°46.51 18°32.72	-13.8'	60.0'
17 18	91° 15.72	38.64 N02°37.67	286°41.05 301°7.89	7.8' 7.9'	18° 32.72 \$18° 18.80	-13.9' -14.0'	60.0' 60.1'
19	106° 16.17	36.71	315°34.77	7.9'	18°4.75	-14.2'	60.1
20	121°16.39	35.75	330° 1.72	8.0'	17°50.58	-14.3'	60.1'
21	136° 16.62	• • 34.78	344°28.71	8.0'	17°36.28	-14.4'	60.2'
22 23	151° 16.84 166° 17.07	33.82 32.86	358°55.76 13°22.87	8.1' 8.2'	17°21.87 17°7.33	-14.5' -14.7'	60.2' 60.2'
	SD = 15.9'	d = -1.0'			D = 16.2'		
	JD = 15.9′	u = -1.0			D = 10.2°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°17.29	N02°31.89	27°50.02	8.2'	\$16°52.68	-14.8'	60.3'
1 2	196° 17.52 211° 17.74	30.93 29.96	42°17.23 56°44.49	8.3' 8.3'	16°37.90 16°23.02	-14.9' -15.0'	60.3' 60.3'
3	226° 17.96	• • 29.00	71°11.81	8.4'	16°23.02	-15.0 -15.1'	60.4
4	241°18.19	28.04	85°39.18	8.4'	$15^{\circ}52.91$	-15.2'	60.4'
5	256° 18.41	27.07	100°6.60	8.5'	15° 37.68	-15.3'	60.4
6 7	271° 18.64 286° 18.86	N02°26.11 25.14	114°34.06 129°1.59	8.5' 8.6'	\$15°22.35 15°6.92	-15.4' -15.5'	60.4' 60.5'
8	301°19.09	24.18	143°29.16	8.6'	14°51.38	-15.6'	60.5
9	$316^{\circ}19.31$	• • 23.21	157°56.78	8.7'	14°35.73	-15.7'	60.5'
10	331°19.53	22.25	172°24.45	8.7'	14° 19.98	-15.8'	60.6
11 12	346°19.76 1°19.98	21.28 N02°20.32	186°52.16 201°19.93	8.8' 8.8'	14°4.14 \$13°48.20	-15.9' -16.0'	60.6' 60.6'
13	16° 20.21	19.35	215°47.74	8.9'	13° 32.16	-16.1	60.6
14	31°20.43	18.39	230°15.60	8.9'	$13^{\circ}16.02$	-16.2'	60.7'
15	46°20.66	• • 17.42	244°43.51	9.0'	12°59.80 12°43.48	-16.3'	60.7'
16 17	61° 20.88 76° 21.11	16.46 15.49	259°11.46 273°39.46	9.0' 9.0'	12° 43.48 12° 27.08	-16.4' -16.5'	60.7' 60.7'
18	91°21.33	N02°14.53	288° 7.50	9.1'	\$12°10.59	-16.6'	60.8
19	106°21.55	13.56	302°35.58	9.1'	11°54.01	-16.7'	60.8'
20	121°21.78	12.60	317°3.71		11°37.36 11°20.62		60.8'
21 22	136°22.00 151°22.23	· · 11.63 10.66	331°31.87 346°0.08	9.2' 9.2'	11° 20.62 11° 3.80	-16.8' -16.9'	60.8' 60.9'
23	166° 22.45	9.70	0°28.33	9.3'	10°46.91	-17.0'	60.9'
	SD = 15.9'	d = -1.0'		S	D = 16.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181°22.68 196°22.90	N02°8.73 7.77	14°56.61 29°24.94	9.3' 9.4'	\$10°29.94 10°12.89	-17.0' -17.1'	60.9' 60.9'
2	211°23.12	6.80	43°53.30	9.4	09°55.78	-17.1	60.9
3	226°23.35	• • 5.83	58°21.70	9.4'	09°38.59	-17.3'	61.0'
4	241°23.57 256°23.80	4.87	72°50.13 87°18.60	9.5'	09°21.34 09°4.03	-17.3'	61.0'
5 6	256°23.80 271°24.02	3.90 N02°2.94	87°18.60 101°47.10	9.5' 9.5'	09°4.03 \$08°46.65	-17.4' -17.4'	61.0' 61.0'
7	286° 24.25	1.97	116°15.63	9.6'	08° 29.21	-17.5	61.0'
8	301°24.47	1.00	130°44.19	9.6'	08°11.71	-17.6'	61.0'
9	316°24.70 331°24.92	02°0.04 01°59.07	145°12.79 159°41.41	9.6' 9.7'	07°54.15 07°36.54	-17.6'	61.1'
10 11	331 24.92 346° 25.14	58.10	159°41.41 174°10.07	9.7' 9.7'	07°36.54 07°18.87	-17.7' -17.7'	61.1' 61.1'
12	1°25.37	N01°57.14	188°38.75	9.7'	S07°1.16	-17.8'	61.1'
13	16°25.59	56.17	203°7.45	9.7'	06°43.39	-17.8'	61.1'
14 15	31°25.82 46°26.04	55.20 •• 54.24	217°36.18 232°4.94	9.8' 9.8'	06°25.58 06°7.72	-17.9' -17.9'	61.1' 61.1'
15 16	46° 26.04 61° 26.27	53.27	232° 4.94 246° 33.72	9.8'	05°49.82	-17.9' -17.9'	61.2
17	76° 26.49	52.30	261°2.52	9.8'	05°31.88	-18.0'	61.2
18	91°26.71	N01°51.34	275°31.34	9.8'	S05°13.90	-18.0'	61.2'
19 20	106°26.94 121°27.16	50.37 49.40	290°0.18 304°29.03	9.9' 9.9'	04°55.88 04°37.83	-18.1' -18.1'	61.2' 61.2'
20	121°27.16 136°27.39	49.40 •• 48.43	304°29.03 318°57.91	9.9'	04° 37.83 04° 19.74	-18.1'	61.2
22	151°27.61	47.47	333°26.80	9.9'	04°1.63	-18.1'	61.2
23	166°27.84	46.50	347°55.71	9.9'	03°43.48	-18.2'	61.2'
	SD = 15.9'	d = -1.0'		S	D = 16.6'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:19	04:02	05:14	18:33	19:43	21:24
N 70°	02:48	04:14	05:18	18:29	19:32	20:57
68°	03:09	04:24	05:22	18:26	19:23	20:37
66°	03:25	04:32	05:25	18:23	19:15	20:21
64°	03:38	04:39	05:27	18:21	19:09	20:09
62°	03:48	04:44	05:29	18:19	19:03	19:59
60°	03:57	04:49	05:31	18:17	18:59	19:50
N 58°	04:05	04:53	05:33	18:15	18:55	19:43
56°	04:11	04:57	05:34	18:14	18:51	19:36
54°	04:17	05:00	05:36	18:13	18:48	19:31
52°	04:22	05:03	05:37	18:11	18:45	19:26
50°	04:27	05:05	05:38	18:10	18:43	19:21
45°	04:36	05:11	05:40	18:08	18:38	19:12
N 40°	04:43	05:15	05:42	18:06	18:34	19:05
35°	04:49	05:19	05:44	18:05	18:30	19:00
30°	04:53	05:21	05:45	18:04	18:28	18:55
20°	05:00	05:26	05:48	18:01	18:23	18:49
N 10°	05:04	05:29	05:50	18:00	18:21	18:45
0°	05:07	05:31	05:51	17:58	18:19	18:43
S 10°	05:08	05:32	05:53	17:56	18:17	18:42
20°	05:07	05:33	05:55	17:55	18:17	18:42
30°	05:05	05:33	05:57	17:53	18:17	18:45
35°	05:03	05:32	05:58	17:52	18:18	18:47
40°	05:00	05:32	05:59	17:51	18:18	18:50
45°	04:57	05:31	06:00	17:50	18:20	18:54
S 50°	04:51	05:29	06:01	17:49	18:21	18:59
52°	04:49	05:28	06:02	17:48	18:22	19:02
54°	04:46	05:27	06:03	17:48	18:23	19:04
56°	04:43	05:26	06:03	17:47	18:24	19:08
58°	04:39	05:25	06:04	17:46	18:26	19:12
S 60°	04:35	05:24	06:05	17:46	18:27	19:16

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	21:19	19:33	18:44	23:17		02:58
N 70°	20:12	19:13	18:37		00:22	03:14
68°	19:35	18:58	18:32		00:57	03:27
66°	19:09	18:45	18:27	•• ••	01:22	03:38
64°	18:48	18:34	18:23	•• ••	01:41	03:47
62°	18:31	18:25	18:19		01:57	03:54
60°	18:17	18:17	18:16	00:15	02:10	04:01
N 58°	18:05	18:10	18:13	00:33	02:21	04:07
56°	17:54	18:03	18:10	00:48	02:30	04:12
54°	17:45	17:58	18:08	01:01	02:39	04:16
52°	17:37	17:53	18:06	01:13	02:46	04:20
50°	17:29	17:48	18:04	01:23	02:53	04:24
45°	17:13	17:38	18:00	01:44	03:07	04:31
N 40°	17:00	17:30	17:56	02:01	03:19	04:38
35°	16:48	17:22	17:53	02:15	03:29	04:43
30°	16:38	17:16	17:51	02:27	03:38	04:48
20°	16:21	17:05	17:46	02:48	03:53	04:57
N 10°	16:06	16:55	17:42	03:05	04:05	05:04
0°	15:51	16:46	17:38	03:22	04:17	05:10
S 10°	15:37	16:36	17:34	03:39	04:29	05:17
20°	15:22	16:26	17:30	03:56	04:42	05:24
30°	15:04	16:15	17:25	04:16	04:56	05:32
35°	14:54	16:08	17:22	04:28	05:04	05:36
40°	14:42	16:00	17:19	04:41	05:13	05:41
45°	14:27	15:52	17:15	04:56	05:24	05:47
S 50°	14:10	15:41	17:11	05:15	05:37	05:54
52°	14:02	15:36	17:09	05:24	05:43	05:57
54°	13:53	15:30	17:07	05:34	05:49	06:01
56°	13:42	15:24	17:04	05:45	05:57	06:05
58°	13:30	15:17	17:02	05:58	06:05	06:09
S 60°	13:16	15:09	16:59	06:13	06:14	06:13

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 ^h	12 ^h	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	86-98%
15	04:48	04:58	11:55	22:04	09:37	
16	05:09	05:20	11:55	22:58	10:32	
17	05:31	05:41	11:54	23:50	11:24	

September 18, 19, 20 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	357°24.36	155°15.92 \$08°53.30	258°58.25 N23°27.05	277°35.15 N22°23.93	10°5.94 \$07°49.49	
1	$12^{\circ}26.83$	170°15.56 54.53	273°59.17 27.02	292°37.43 23.94	25°8.57 49.56	Alpheratz 357°34.71 29°13.70 Ankaa 353°6.96 -42°10.17
2	27°29.29	185° 15.20 55.75	289° 0.08 26.99	307°39.71 23.95	40°11.21 49.63	Schedar 349°30.84 56°40.38
3	42°31.76	200°14.83 · · 56.98	304°1.00 · · 26.96	322°41.99 · · 23.96	55°13.85 · · 49.71	Diphda 348°47.23 -17°50.91
4 5	57° 34.22 72° 36.68	215°14.47 58.21 230°14.10 08°59.44	319° 1.91 26.93 334° 2.83 26.90	337°44.27 23.97 352°46.55 23.98	70°16.49 49.78 85°19.12 49.85	Achernar 335°19.82 -57°6.46
6	87°39.15	245°13.74 S09°0.66	349°3.75 N23°26.86	7°48.83 N22°23.99	100°21.76 \$07°49.92	Hamal 327°51.23 23°34.82
7	102°41.61	260°13.37 1.89	4°4.66 26.83	22°51.11 24.00	115°24.40 50.00	Polaris 313°52.42 89°21.87 Acamar 315°11.68 -40°12.04
8	117° 44.08	275°13.01 3.12	19° 5.58 26.80	37°53.40 24.01	130°27.04 50.07	Acamar 315°11.68 -40°12.04 Menkar 314°6.22 4°11.34
9	132° 46.54	290°12.64 · · 4.34	34°6.50 · · 26.77	52°55.68 · · 24.02	145°29.67 · · 50.14	Mirfak 308°28.37 49°56.83
10 11	147° 49.00 162° 51.47	305°12.28 5.57 320°11.91 6.79	49°7.42 26.74 64°8.34 26.70	67°57.96 24.03 83°0.24 24.04	160°32.31 50.22 175°34.95 50.29	Aldebaran 290°39.83 16°33.61
12	177°53.93	335°11.54 S09°8.02	79°9.25 N23°26.67	98° 2.53 N22° 24.05	190°37.58 \$07°50.36	Rigel 281°4.08 -8°10.16
13	192°56.40	350°11.18 9.24	94°10.17 26.64	113° 4.81 24.06	205°40.22 50.43	Capella 280°22.23 46°1.25
14	207°58.86	5°10.81 10.47	109°11.09 26.60	128°7.10 24.07	220°42.86 50.51	Bellatrix 278°23.13 6°22.46 Elnath 278°2.17 28°37.69
15	223°1.32	20°10.44 · · 11.69	124°12.01 · · 26.57	143°9.38 · · 24.09	235°45.49 · · 50.58	Alnilam 275°37.98 -1°10.98
16 17	238°3.79 253°6.25	35°10.08 12.92 50°9.71 14.14	139°12.93 26.54 154°13.85 26.50	158°11.67 24.10 173°13.95 24.11	250°48.13 50.65 265°50.77 50.72	Betelgeuse 270°52.38 7°24.83
18	268° 8.72	65°9.34 S09°15.36	169°14.77 N23°26.47	173°13.95 24.11 188°16.24 N22°24.12	265°50.77 50.72 280°53.41 \$07°50.80	Canopus 263°52.60 -52°42.11
19	283°11.18	80°8.97 16.58	184°15.69 26.44	203°18.52 24.13	295°56.04 50.87	Sirius 258°26.55 -16°44.73
20	298° 13.64	95°8.60 17.81	199°16.62 26.40	218°20.81 24.14	310°58.68 50.94	Adhara 255°6.19 -29°0.01 Procyon 244°51.26 5°9.85
21	313° 16.11	110°8.23 · · 19.03	214°17.54 · · 26.37	233°23.09 · · 24.15	326°1.32 · · 51.01	Procyon 244°51.26 5°9.85 Pollux 243°17.80 27°58.01
22	328° 18.57	125°7.86 20.25	229°18.46 26.33	248°25.38 24.16	341°3.95 51.08	Avior 234°15.27 -59°34.96
23	343°21.04	140°7.49 21.47	244°19.38 26.30	263°27.67 24.17	356°6.59 51.16	Suhail 222°46.87 -43°31.64
Mer.p	pass. 00:10	ν -0.4 $'$ d 1.2 $'$ m-3.88	$ u 0.9' \ d$ -0.0' m0.58	$\nu 2.3' \ d0.0' \ \text{m-}2.37$	$ u 2.6' \ d0.1' \ m0.61$	Miaplacidus 221°39.12 -69°48.81
						Alphard 217°48.28 -8°45.74
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.01 11°50.92 Dubhe 193°41.92 61°37.10
0	358°23.50	155°7.12 S09°22.69	259°20.31 N23°26.26	278°29.96 N22°24.18	11°9.23 \$07°51.23	Dubne 193 41.92 01 37.10 Denebola 182°25.53 14°26.18
1	13°25.97	170°6.75 23.91	274°21.23 26.23	293°32.24 24.19	26°11.86 51.30	Gienah 175°44.20 -17°40.62
2	28°28.43	185°6.38 25.13	289°22.15 26.19	308°34.53 24.20	41°14.50 51.37	Acrux 173°1.16 -63°14.14
3 4	43°30.89 58°33.36	200°6.01 · · 26.35 215°5.64 27.57	304°23.08 · · 26.15 319°24.00 26.12	323°36.82 · · 24.21 338°39.11 24.22	56°17.14 · · 51.45 71°19.77 51.52	Gacrux 171°52.57 -57°15.06
5	73°35.82	230°5.27 28.79	334°24.93 26.08	353°41.40 24.23	86°22.41 51.59	Alioth 166°13.68 55°49.69
6	88°38.29	245°4.90 S09°30.01	349°25.85 N23°26.05	8°43.69 N22°24.24	101°25.04 S 07°51.66	Spica 158°22.88 -11°17.31 Alkaid 152°52.59 49°11.58
7	$103^{\circ}40.75$	260°4.53 31.23	4°26.78 26.01	23°45.98 24.25	116°27.68 51.73	Hadar 148°36.96 -60°29.61
8	118° 43.21	275°4.15 32.45	19°27.70 25.97	38°48.27 24.26	131°30.32 51.81	Menkent 147°58.27 -36°29.49
9	133° 45.68	290°3.78 · · 33.66	34°28.63 · · 25.93	53°50.56 · · 24.27	146°32.95 · · 51.88 161°35.59 51.95	Arcturus 145°48.41 19°3.39
10 11	148° 48.14 163° 50.61	305°3.41 34.88 320°3.04 36.10	49°29.55 25.90 64°30.48 25.86	68°52.85 24.28 83°55.14 24.29	161°35.59 51.95 176°38.23 52.02	Rigil Kent. 139°41.20 -60°56.36
12	178°53.07	335°2.66 \$09°37.32	79°31.41 N23°25.82	98°57.43 N22°24.30	191°40.86 S07°52.09	Kochab 137°20.49 74°3.42
13	193°55.53	350°2.29 38.53	94°32.34 25.78	113°59.72 24.31	206°43.50 52.17	Zuben'ubi 136°56.54 -16°8.62 Alphecca 126°4.14 26°38.08
14	208°58.00	5°1.92 39.75	109°33.26 25.75	129°2.02 24.32	221°46.13 52.24	Antares 112° 16.28 -26° 29.24
15	224°0.46	20°1.54 · · 40.96	124°34.19 · · 25.71	144° 4.31 · · · 24.33	236°48.77 · · 52.31	Atria 107°10.85 -69°4.54
16 17	239°2.93 254°5.39	35°1.17 42.18 50°0.79 43.39	139°35.12 25.67 154°36.05 25.63	159° 6.60 24.34 174° 8.89 24.35	251°51.41 52.38 266°54.04 52.45	Sabik 102°3.13 -15°45.31
18	269°7.85	65°0.42 \$09°44.61	169°36.98 N23°25.59	189°11.19 N22°24.36	281°56.68 \$07°52.52	Shaula 96°10.75 -37°7.40
19	284° 10.32	80°0.04 45.82	184°37.91 25.55	204°13.48 24.37	296°59.31 52.60	Rasalhague 95°58.81 12°32.67 Eltanin 90°42.28 51°29.38
20	$299^{\circ}12.78$	94°59.67 47.04	199°38.84 25.51	219°15.78 24.38	312°1.95 52.67	Eltanin 90°42.28 51°29.38 Kaus Aust. 83°32.79 -34°22.45
21	314° 15.25	109°59.29 · · 48.25	214°39.77 · · 25.47	234°18.07 · · 24.39	327°4.59 · · 52.74	Vega 80°33.32 38°48.61
22	329°17.71	124°58.91 49.46	229°40.70 25.43	249°20.37 24.40	342°7.22 52.81	Nunki 75°47.97 -26°16.00
23	344°20.17	139°58.54 50.68	244°41.63 25.39	264°22.66 24.41	357°9.86 52.88	Altair 62°0.05 8°56.14
Mer.p	pass. 00:06	ν -0.4 $'$ $d1.2'$ m-3.88	$ u 0.9' \ d$ -0.0' m0.57	$\nu 2.3' \ d0.0' \ \text{m-}2.38$	$ u 2.6' \ d0.1' \ m0.61$	Peacock 53°5.74 -56°39.48
						Deneb 49°25.70 45°22.30 Enif 33°38.78 9°59.42
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.79 -46°50.50
0	359°22.64	154°58.16 S09°51.89	259°42.56 N23°25.35	279°24.96 N22°24.42	12°12.49	Fomalhaut 15°14.43 -29°29.42
1 2	14°25.10 29°27.57	169°57.78 53.10 184°57.40 54.31	274°43.49 25.31 289°44.43 25.27	294°27.25 24.43 309°29.55 24.44	27°15.13 53.03 42°17.76 53.10	Scheat 13°45.13 28°13.13
3	29 27.57 44°30.03	184°57.40 54.31 199°57.03 • 55.52	289°44.43 25.27 304°45.36 •• 25.23	324°31.85 · · 24.44	42°17.76 53.10 57°20.40 •• 53.17	Markab 13°29.85 15°20.41
4	59°32.49	214° 56.65 56.73	319°46.29 25.19	339°34.14 24.45	72°23.04 53.24	Sep 18 Wed SHA Mer.pass
5	74°34.96	229°56.27 57.95	334°47.23 25.15	354°36.44 24.46	87°25.67 53.31	Venus 157°51.56 13:39
6	89°37.42	244°55.89 S09°59.16	349°48.16 N23°25.11	9°38.74 N22°24.47	102°28.31 S07°53.38	Mars 261°33.89 06:44
7	104°39.89	259°55.51 10°0.37	4°49.09 25.06	24°41.04 24.48	117°30.94 53.45	Jupiter 280°10.78 05:29 Saturn 12°41.57 23:16
8 9	119° 42.35 134° 44.81	274°55.13 1.58 289°54.75 •• 2.78	19°50.03 25.02 34°50.96 · · 24.98	39°43.33 24.49 54°45.63 •• 24.50	132°33.58 53.53 147°36.21 · · 53.60	Saturn 12 41.57 25:10
10	149° 47.28	304°54.37 3.99	49°51.90 24.94	69°47.93 24.51	162°38.85 53.67	Sep 19 Thu SHA Mer.pass
11	164°49.74	319°53.99 5.20	64°52.83 24.90	84°50.23 24.52	177°41.48 53.74	Venus 156°43.62 13:40
12	179° 52.21	334°53.61 \$10°6.41	79°53.77 N23°24.85	99°52.53 N22°24.53	192°44.12 S 07°53.81	Mars 260°56.80 06:42 Jupiter 280°6.45 05:25
13	194°54.67	349°53.23 7.62	94°54.70 24.81	114°54.83 24.54	207°46.75 53.88	Saturn 12°45.72 23:11
14	209°57.13	4°52.85 8.82	109°55.64 24.77	129°57.13 24.55	222°49.39 53.95	
15 16	224°59.60 240°2.06	19°52.47 · · 10.03 34°52.09 11.24	124°56.58 · · 24.72 139°57.52 24.68	144°59.43 · · 24.56 160°1.73 24.57	237°52.02 · · 54.02 252°54.66 54.10	Sep 20 Fri SHA Mer.pass Venus 155°35.52 13:40
17	255°4.53	49°51.70 12.44	154°58.45 24.64	175° 4.03 24.58	267°57.29 54.17	Mars 260°19.92 06:41
18	270°6.99	64°51.32 \$10°13.65	169°59.39 N23°24.59	190°6.34 N22°24.58	282°59.93 S 07°54.24	Jupiter 280°2.32 05:22
19	285°9.46	79°50.94 14.85	185° 0.33 24.55	205° 8.64 24.59	298°2.56 54.31	Saturn 12°49.86 23:07
20	300°11.92	94°50.55 16.06	200°1.27 24.50	220°10.94 24.60	313°5.20 54.38	Horizontal parallax
21 22	315° 14.38 330° 16.85	109°50.17 · · 17.26 124°49.79 18.47	215° 2.21 · · · 24.46 230° 3.15 24.41	235°13.24 · · 24.61 250°15.55 24.62	328°7.83 · · 54.45 343°10.47 54.52	Venus: 0.1
23	345° 19.31	139°49.40 19.67	245° 4.09 24.37	265°17.85 24.63	358°13.10 54.59	Mars: 0.1
	pass. 23:59	ν-0.4' d1.2' m-3.88	ν0.9' d-0.0' m0.56	ν2.3' d0.0' m-2.39	ν2.6' d0.1' m0.61	
ivier.	pass. 23.39	ν-0. - u1.2 III-3.00	νο.σ α-σ.σ IIIσ.σσ	ν2.5 d0.0 iii-2.39	ν 2.0 αυ.1 IIIU.U1	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°28.06	N01°45.53	2°24.63	9.9'	S03°25.31	-18.2'	61.2'
1 2	196°28.28 211°28.51	44.56 43.60	16°53.56 31°22.51	9.9' 10.0'	03°7.12 02°48.90	-18.2' -18.2'	61.2' 61.3'
3	226°28.73	• • 42.63	45°51.46	10.0'	02°48.90	-18.2'	61.3
4	241°28.96	41.66	$60^{\circ}20.42$	10.0'	$02^{\circ}12.41$	-18.3'	61.3'
5	256°29.18	40.69	74°49.40	10.0'	01°54.14	-18.3'	61.3'
6 7	271°29.41 286°29.63	N01°39.72 38.76	89°18.37 103°47.36	10.0' 10.0'	\$01°35.85 01°17.56	-18.3' -18.3'	61.3' 61.3'
8	301°29.85	37.79	118°16.34	10.0'	00°59.25	-18.3	61.3
9	316°30.08	• • 36.82	$132^{\circ}45.33$	10.0'	$00^{\circ}40.94$	-18.3'	61.3'
10 11	331°30.30 346°30.53	35.85 34.88	147°14.33 161°43.32	10.0' 10.0'	00°22.62 500°4.30	-18.3' -18.3'	61.3' 61.3'
12	1°30.75	N01°33.92	101 43.32 176°12.31	10.0'	N00°14.02	18.3	61.3
13	16°30.97	32.95	190°41.30	10.0'	00°32.35	18.3'	61.3'
14	31°31.20	31.98	205°10.29	10.0'	00°50.66	18.3'	61.3'
15 16	46°31.42 61°31.65	· · 31.01 30.04	219°39.27 234°8.25	10.0' 10.0'	01°8.98 01°27.28	18.3' 18.3'	61.3' 61.3'
17	76°31.87	29.07	248°37.22	10.0'	01°45.58	18.3'	61.3'
18	91°32.09	N01°28.10	$263^{\circ}6.19$	10.0'	N02°3.87	18.3'	61.3'
19	106°32.32	27.14	277°35.14 292°4.08	9.9'	02°22.14	18.3'	61.3'
20 21	121°32.54 136°32.77	26.17 •• 25.20	292°4.08 306°33.02	9.9' 9.9'	02°40.39 02°58.63	18.2' 18.2'	61.3' 61.3'
22	151°32.99	24.23	321°1.93	9.9'	03°16.85	18.2	61.3
23	166°33.21	23.26	335°30.84	9.9'	03°35.04	18.2'	61.3'
	SD = 15.9'	d = -1.0'		SI	O = 16.7'		
Thu	GHA	Dec	GHA		Dec	d	НР
I nu O	181°33.44	N01°22.29	349°59.73	u 9.9'	N03°53.21	a 18.1'	61.3'
1	196°33.66	21.32	4°28.60	9.9'	$04^{\circ}11.36$	18.1'	61.3'
2	211°33.88	20.35	18°57.46	9.8'	04°29.48	18.1'	61.2'
3 4	226°34.11 241°34.33	· · 19.38 18.41	33°26.30 47°55.12	9.8' 9.8'	04°47.56 05°5.62	18.1' 18.0'	61.2' 61.2'
5	256°34.56	17.44	62°23.91	9.8'	05°23.63	18.0'	61.2'
6	271°34.78	N01°16.48	76°52.69	9.8'	N05°41.62	17.9'	61.2'
7	286°35.00	15.51	91°21.44	9.7'	05°59.56 06°17.46	17.9'	61.2'
8 9	301°35.23 316°35.45	14.54 •• 13.57	105°50.16 120°18.87	9.7' 9.7'	06°17.46 06°35.32	17.9' 17.8'	61.2' 61.2'
10	331°35.67	12.60	134°47.54	9.6'	06°53.14	17.8'	61.2'
11	346°35.90	11.63	149°16.19	9.6'	07°10.90	17.7'	61.2'
12 13	1°36.12 16°36.34	N01°10.66 9.69	163°44.80 178°13.39	9.6' 9.6'	N07°28.62 07°46.29	17.7' 17.6'	61.1' 61.1'
13 14	31°36.57	9.69 8.72	178 13.39 192°41.95	9.6 9.5'	07 46.29 08°3.90	17.6'	61.1
15	46°36.79	• • 7.75	207°10.47	9.5'	08°21.46	17.5'	61.1'
16	61°37.01	6.78	221°38.96	9.5'	08°38.96	17.4	61.1'
17 18	76°37.24 91°37.46	5.81 N01°4.84	236°7.42 250°35.84	9.4' 9.4'	08°56.41 N09°13.79	17.4' 17.3'	61.1' 61.1'
19	106°37.68	3.87	265°4.23	9.3'	09°31.11	17.3	61.0'
20	121°37.91	2.90	279°32.58	9.3'	09°48.36		61.0'
21	136°38.13 151°38.35	• • 1.93	294°0.89 308°29.16	9.3'	10°5.54 10°22.66	17.1'	61.0'
22 23	151 38.35 166°38.58	0.96 59.99	308° 29.16 322° 57.39	9.2' 9.2'	10°22.66 10°39.70	17.0' 17.0'	61.0' 61.0'
	SD = 15.9'	d = -1.0'		SI	D = 16.7'		
Fri 0	GHA 181°38.80	Dec N00°59.02	GHA 337°25.58	u 9.1'	Dec N10°56.67	d 16.9'	HP 61.0'
1	196°39.02	58.05	351° 53.72	9.1'	11° 13.57	16.8	60.9'
2	211°39.25	57.08	$6^{\circ}21.83$	9.1'	11°30.39	16.7'	60.9'
3 4	226°39.47 241°39.69	· · 56.11 55.13	20°49.89 35°17.90	9.0' 9.0'	11°47.13 12°3.79	16.7' 16.6'	60.9' 60.9'
4 5	241 39.69 256°39.92	55.13 54.16	49°45.87	9.0 8.9'	12°3.79 12°20.36	16.5	60.9'
6	271°40.14	N00°53.19	64°13.80	8.9'	N12°36.85	16.4'	60.8'
7	286°40.36	52.22	78°41.67	8.8'	12°53.26	16.3'	60.8'
8 9	301°40.58 316°40.81	51.25 •• 50.28	93°9.50 107°37.28	8.8' 8.7'	13°9.57 13°25.80	16.2' 16.1'	60.8' 60.8'
10	331°41.03	49.31	122°5.01	8.7'	13°41.93	16.0'	60.7'
11	346°41.25	48.34	$136^{\circ}32.69$	8.6'	13°57.97	15.9'	60.7'
12	1°41.48	N00°47.37	151°0.32	8.6'	N14°13.91	15.8'	60.7'
13 14	16°41.70 31°41.92	46.40 45.43	165°27.90 179°55.43	8.5' 8.5'	14°29.75 14°45.50	15.7' 15.6'	60.7' 60.6'
15	46°42.14	• • 44.46	194°22.90	8.4	15°1.14	15.5'	60.6
16	61°42.37	43.48	208°50.32	8.4'	15°16.68	15.4'	60.6'
17	76°42.59	42.51	223°17.69	8.3'	15°32.11	15.3'	60.6'
18 19	91°42.81 106°43.03	N00°41.54 40.57	237°45.00 252°12.26	8.3' 8.2'	N15°47.44 16°2.66	15.2' 15.1'	60.5' 60.5'
20	121°43.26	39.60	266°39.46	8.1	16° 17.77	15.0'	60.5
21	136°43.48	• • 38.63	281°6.61	8.1'	16°32.76	14.9'	60.5'
22 23	151°43.70 166°43.92	37.66 36.69	295°33.70 310°0.73	8.0' 8.0'	16°47.64 17°2.41	14.8' 14.6'	60.4' 60.4'
23			310 0.73			14.0	00.4
	SD = 15.9'	d = -1.0'		SI	D = 16.6'		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	02:41	04:17	05:27	18:18	19:27	21:00
N 70°	03:05	04:27	05:30	18:15	19:17	20:38
68°	03:23	04:35	05:32	18:13	19:09	20:21
66°	03:37	04:42	05:34	18:11	19:03	20:08
64°	03:48	04:48	05:36	18:10	18:58	19:57
62°	03:57	04:52	05:37	18:09	18:53	19:48
60°	04:05	04:56	05:38	18:08	18:49	19:40
N 58°	04:12	05:00	05:39	18:07	18:46	19:33
56°	04:18	05:03	05:40	18:06	18:43	19:28
54°	04:23	05:05	05:41	18:05	18:40	19:23
52°	04:28	05:08	05:42	18:04	18:38	19:18
50°	04:32	05:10	05:42	18:04	18:36	19:14
45°	04:40	05:14	05:44	18:03	18:32	19:06
N 40°	04:46	05:18	05:45	18:01	18:28	19:00
35°	04:51	05:21	05:46	18:01	18:26	18:55
30°	04:55	05:23	05:47	18:00	18:24	18:52
20°	05:01	05:26	05:48	17:59	18:21	18:46
N 10°	05:04	05:28	05:49	17:58	18:19	18:43
0°	05:06	05:30	05:50	17:57	18:17	18:41
S 10°	05:06	05:30	05:51	17:56	18:17	18:41
20°	05:04	05:30	05:52	17:55	18:17	18:43
30°	05:01	05:29	05:53	17:55	18:19	18:47
35°	04:59	05:28	05:53	17:55	18:20	18:49
40°	04:55	05:27	05:54	17:54	18:21	18:53
45°	04:51	05:25	05:54	17:54	18:23	18:57
S 50°	04:45	05:22	05:55	17:54	18:26	19:04
52°	04:42	05:21	05:55	17:53	18:27	19:07
54°	04:38	05:20	05:55	17:53	18:28	19:10
56°	04:35	05:18	05:55	17:53	18:30	19:14
58°	04:30	05:17	05:56	17:53	18:32	19:19
S 60°	04:25	05:15	05:56	17:53	18:34	19:24

Lat.		Moonris	e		Moonse	t
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	18:04	17:21	16:19	05:39	08:15	11:12
N 70°	18:07	17:34	16:51	05:41	08:06	10:42
68°	18:09	17:45	17:15	05:44	07:58	10:20
66°	18:11	17:54	17:34	05:46	07:52	10:03
64°	18:12	18:01	17:49	05:47	07:46	09:49
62°	18:13	18:08	18:02	05:48	07:42	09:37
60°	18:15	18:14	18:13	05:50	07:38	09:28
N 58°	18:16	18:19	18:23	05:51	07:34	09:19
56°	18:17	18:23	18:31	05:51	07:31	09:12
54°	18:18	18:27	18:39	05:52	07:28	09:05
52°	18:18	18:31	18:46	05:53	07:26	08:59
50°	18:19	18:34	18:52	05:54	07:24	08:54
45°	18:21	18:42	19:05	05:55	07:19	08:43
N 40°	18:22	18:48	19:17	05:56	07:15	08:33
35°	18:23	18:53	19:26	05:57	07:11	08:25
30°	18:24	18:58	19:35	05:58	07:08	08:18
20°	18:26	19:07	19:49	06:00	07:03	08:06
N 10° 0°	18:28	19:14	20:02	06:01	06:58	07:56
_	18:29	19:21	20:15	06:02	06:54	07:46
S 10°	18:31	19:28	20:27	06:03	06:49	07:36
20°	18:33	19:36	20:40	06:04	06:45	07:26
30° 35°	18:35	19:45	20:56	06:06	06:39	07:14
40°	18:36 18:37	19:50 19:56	21:05 21:15	06:07 06:07	06:36 06:33	07:08 07:00
45°	18:39	20:03	21:15	06:07	06:33	06:51
_						
S 50°	18:41	20:11	21:42	06:09	06:24	06:41
52° 54°	18:42 18:43	20:15 20:19	21:49 21:57	06:10 06:10	06:22 06:20	06:36 06:30
56°	18:43	20:19	21:57	06:10	06:20	06:30
58°	18:44	20:24	22:06	06:11	06:17	06:24
S 60°	18:47	20:29	22:10	06:12	06:14	06:10
_ 3 00	10.47	20.33	44.41	00.12	00.11	00.10

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
00 ^h		12 ^h	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-95%	
18	05:52	06:03	11:54	-:-	12:16		
19	06:14	06:24	11:54	00:41	13:07		
20	06:35	06:46	11:53	01:34	14:00		

September 21, 22, 23 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	0°21.78	154°49.02 \$10°20.88	260°5.03 N23°24.32	280°20.15 N22°24.64	13°15.74 \$07°54.66	
1	15°24.24	169°48.63 22.08	275° 5.97 24.28	295°22.46 24.65	28°18.37 54.73	Alpheratz 357°34.70 29°13.71
2	30°26.70	184°48.25 23.28	290°6.91 24.23	310°24.76 24.66	43°21.01 54.81	Ankaa 353°6.95 -42°10.18 Schedar 349°30.82 56°40.39
3	45°29.17	199°47.86 · · 24.48	305°7.85 · · 24.19	325°27.07 · · 24.67	58°23.64 · · 54.88	Diphda 348°47.22 -17°50.92
4	60°31.63	214°47.48 25.69	320° 8.79 24.14	340°29.37 24.68	73°26.27 54.95	Achernar 335°19.81 -57°6.48
5	75°34.10	229° 47.09 26.89	335°9.73 24.10	355°31.68 24.68	88°28.91 55.02	Hamal 327°51.21 23°34.82
6 7	90°36.56 105°39.02	244°46.70 \$10°28.09 259°46.32 29.29	350°10.68 N23°24.05 5°11.62 24.00	10°33.98 N22°24.69 25°36.29 24.70	103°31.54 S07°55.09 118°34.18 55.16	Polaris 313°51.00 89°21.88
8	120° 41.49	274°45.93 30.49	20°12.56 23.96	40°38.60 24.71	133°36.81 55.23	Acamar 315°11.66 -40°12.05
9	135° 43.95	289°45.54 · · 31.69	35°13.51 · · 23.91	55°40.90 · · 24.72	148°39.45 · · 55.30	Menkar 314°6.20 4°11.34
10	150°46.42	304°45.16 32.89	50°14.45 23.86	70°43.21 24.73	163°42.08 55.37	Mirfak 308°28.34 49°56.84
11	165°48.88	319°44.77 34.09	65°15.39 23.81	85°45.52 24.74	178°44.71 55.44	Aldebaran 290°39.80 16°33.61 Rigel 281°4.06 -8°10.16
12	180°51.34	334°44.38 \$10°35.29	80°16.34 N23°23.77	100°47.82 N22°24.75	193°47.35 S07°55.51	Capella 280°22.20 46°1.25
13	195°53.81	349°43.99 36.48	95°17.28 23.72	115°50.13 24.75	208°49.98 55.58	Bellatrix 278°23.11 6°22.46
14 15	210° 56.27 225° 58.74	4°43.60 37.68 19°43.21 · · 38.88	110°18.23 23.67 125°19.18 · · 23.62	130°52.44 24.76 145°54.75 •• 24.77	223°52.62 55.65 238°55.25 • 55.72	Elnath 278°2.15 28°37.68
16	241°1.20	34°42.82 40.08	140°20.12 23.58	160°57.06 24.78	253°57.88 55.79	Alnilam 275°37.96 -1°10.98
17	256°3.67	49°42.43 41.27	155°21.07 23.53	175°59.37 24.79	269°0.52 55.86	Betelgeuse 270°52.36 7°24.83
18	271°6.13	64°42.04 \$10°42.47	170°22.02 N23°23.48	191°1.68 N22°24.80	284°3.15 S 07°55.94	Canopus 263°52.57 -52°42.11 Sirius 258°26.53 -16°44.73
19	286°8.59	79°41.65 43.67	185°22.96 23.43	206°3.99 24.81	299°5.79 56.01	Sirius 258°26.53 -16°44.73 Adhara 255°6.17 -29°0.01
20	301°11.06	94°41.26 44.86	200°23.91 23.38	221°6.30 24.81	314°8.42 56.08	Procyon 244°51.24 5°9.85
21	316° 13.52	109°40.87 · · 46.06	215°24.86 · · 23.33	236°8.61 · · 24.82	329°11.05 · · 56.15	Pollux 243°17.78 27°58.00
22 23	331°15.99 346°18.45	124°40.48 47.25	230°25.81 23.28	251°10.92 24.83	344°13.69 56.22	Avior 234°15.24 -59°34.95
	340 18.45	139°40.09 48.45	245°26.76 23.23	266°13.23 24.84	359°16.32 56.29	Suhail 222°46.85 -43°31.64
Mer. _I	pass. 23:55	u-0.4 $'$ $d1.2'$ m-3.88	$ u 0.9' \ d$ -0.0' m0.55	$\nu 2.3' \ d0.0' \ \text{m-}2.39$	$ u 2.6' \ d0.1' \ m0.62$	Miaplacidus 221°39.09 -69°48.80
						Alphard 217°48.27 -8°45.74
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°35.00 11°50.92 Dubhe 193°41.91 61°37.08
0	1°20.91	154°39.69 \$10°49.64	260°27.70 N23°23.18	281°15.55 N22°24.85	14°18.95 S 07°56.36	Denebola 182°25.53 14°26.18
1	16°23.38	169°39.30 50.83	275°28.65 23.13	296°17.86 24.86	29°21.59 56.43	Gienah 175°44.19 -17°40.62
2	31°25.84	184°38.91 52.03	290°29.60 23.08	311°20.17 24.87	44°24.22 56.50	Acrux 173°1.15 -63°14.13
3 4	46°28.31	199°38.51 · · 53.22 214°38.12 54.41	305°30.55 · · 23.03	326°22.48 · · 24.87 341°24.80 24.88	59°26.85 · · 56.57 74°29.49	Gacrux 171°52.56 -57°15.05
5	61°30.77 76°33.24	214°38.12 54.41 229°37.73 55.60	320°31.51 22.98 335°32.46 22.93	341°24.80 24.88 356°27.11 24.89	74°29.49 56.64 89°32.12 56.71	Alioth 166°13.69 55°49.67
6	91°35.70	244°37.33 \$10°56.79	350°33.41 N23°22.88	11°29.42 N22°24.90	104°34.75 S07°56.78	Spica 158°22.88 -11°17.31
7	106°38.16	259°36.94 57.99	5°34.36 22.83	26°31.74 24.91	119°37.39 56.85	Alkaid 152°52.60 49°11.57 Hadar 148°36.97 -60°29.60
8	121°40.63	274°36.54 10°59.18	20°35.31 22.78	41°34.05 24.92	134°40.02 56.92	Hadar 148°36.97 -60°29.60 Menkent 147°58.28 -36°29.48
9	136°43.09	289°36.15 11°0.37	35°36.26 · · 22.72	56°36.37 · · 24.92	149°42.65 · · 56.99	Arcturus 145°48.42 19°3.39
10	151° 45.56	304°35.75 1.56	50°37.22 22.67	71°38.68 24.93	164°45.29 57.06	Rigil Kent. 139°41.21 -60°56.35
11	166° 48.02	319°35.35 2.75 334°34.96 \$11°3.93	65°38.17 22.62	86°41.00 24.94	179°47.92 57.13 194°50.55 \$07°57.20	Kochab 137°20.55 74°3.41
12 13	181° 50.48 196° 52.95	334°34.96	80°39.12 N23°22.57 95°40.08 22.52	101°43.32 N22°24.95 116°45.63 24.96	194°50.55 S07°57.20 209°53.19 57.27	Zuben'ubi 136°56.55 -16°8.61
14	211°55.41	4°34.16 6.31	110°41.03 22.46	131°47.95 24.96	224°55.82 57.34	Alphecca 126°4.16 26°38.08
15	226° 57.88	19°33.77 · · 7.50	125°41.99 · · 22.41	146°50.27 · · 24.97	239°58.45 · · 57.41	Antares 112°16.29 -26°29.23
16	242°0.34	34°33.37 8.69	140°42.94 22.36	161°52.58 24.98	255°1.08 57.48	Atria 107°10.89 -69°4.54 Sabik 102°3.15 -15°45.31
17	257°2.80	49°32.97 9.87	155°43.90 22.30	176°54.90 24.99	270°3.72 57.55	Shaula 96°10.76 -37°7.40
18	272°5.27	64°32.57 \$11°11.06	170°44.86 N23°22.25	191°57.22 N22°25.00	285°6.35 S07°57.62	Rasalhague 95°58.82 12°32.67
19	287°7.73	79°32.17 12.25	185°45.81 22.20	206°59.54 25.00	300°8.98 57.68	Eltanin 90°42.31 51°29.38
20 21	302°10.20 317°12.66	94°31.77 13.43 109°31.37 · · 14.62	200°46.77 22.14 215°47.73 •• 22.09	222°1.86 25.01 237°4.18 •• 25.02	315°11.61 57.75 330°14.25 • 57.82	Kaus Aust. 83°32.81 -34°22.45
22	332° 15.13	124°30.97 15.80	230°48.68 22.04	252°6.50 25.03	345°16.88 57.89	Vega 80°33.34 38°48.62
23	347° 17.59	139°30.57 16.99	245°49.64 21.98	267°8.82 25.04	0°19.51 57.96	Nunki 75°47.99 -26°16.00 Altair 62°0.07 8°56.14
Mori	pass. 23:51	ν-0.4' d1.2' m-3.89	ν0.9' d-0.1' m0.54	ν2.3' d0.0' m-2.40	ν2.6' d0.1' m0.62	Altair 62°0.07 8°56.14 Peacock 53°5.76 -56°39.48
- Ivier.	pass. 23.31	ν-0.4 U1.2 III-3.09	νο.9 α-0.1 III0.54	V2.3 U0.0 III-2.40	V2.0 U0.1 III0.02	Deneb 49°25.71 45°22.31
						Enif 33°38.79 9°59.43
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.80 -46°50.51
0 1	2°20.05 17°22.52	154°30.17 \$11°18.17 169°29.77 19.35	260°50.60 N23°21.93 275°51.56 21.87	282°11.14 N22°25.04 297°13.46 25.05	15°22.14	Fomalhaut 15°14.44 -29°29.42
2	32°24.98	184°29.37 20.54	290°52.52 21.82	312°15.78 25.06	45°27.41 58.17	Scheat 13°45.13 28°13.14 Markab 13°29.85 15°20.42
3	47° 27.45	199° 28.97 · · 21.72	305°53.48 · · 21.76	327°18.10 · · 25.07	60°30.04 · · 58.24	
4	62°29.91	214°28.57 22.90	320°54.44 21.71	342°20.42 25.08	75°32.67 58.31	Sep 21 Sat SHA Mer.pass
5	77°32.37	229°28.16 24.08	335°55.40 21.65	357°22.74 25.08	90°35.30 58.38	Venus 154°27.24 13:41
6	92°34.84	244°27.76 \$11°25.26	350°56.36 N23°21.60	12°25.07 N22°25.09	105°37.94 \$07°58.45	Mars 259°43.25 06:39
7 8	107°37.30 122°39.77	259°27.36 26.45 274°26.96 27.63	5°57.32 21.54 20°58.28 21.48	27°27.39 25.10 42°29.71 25.11	120°40.57 58.52 135°43.20 58.59	Jupiter 279°58.38 05:18 Saturn 12°53.96 23:03
9	122 39.77 137° 42.23	289°26.55 · · 28.81	35°59.24 · · 21.43	57°32.04 · · 25.11	150°45.83 · · 58.66	
10	152° 44.70	304°26.15 29.99	51°0.20 21.37	72°34.36 25.12	165°48.46 58.73	Sep 22 Sun SHA Mer.pass
11	167° 47.16	319°25.74 31.16	66°1.17 21.31	87°36.68 25.13	180°51.10 58.79	Venus 153°18.78 13:42
12	182° 49.62	334°25.34 S 11°32.34	81°2.13 N23°21.26	102°39.01 N22°25.14	195°53.73 S07°58.86	Mars 259°6.79 06:38 Jupiter 279°54.63 05:14
13	197°52.09	349°24.93 33.52	96°3.09 21.20	117°41.33 25.14	210°56.36 58.93	Saturn 12°58.04 22:59
14	212°54.55	4°24.53 34.70	111°4.06 21.14	132°43.66 25.15	225°58.99 59.00	
15 16	227° 57.02 242° 59.48	19°24.12 · · 35.88 34°23.71 37.05	126°5.02 · · 21.09 141°5.99 21.03	147°45.98 · · 25.16 162°48.31 25.17	241°1.62 · · 59.07 256°4.25 59.14	Sep 23 Mon SHA Mer.pass
17	242 59.46 258°1.95	49°23.31 38.23	156° 6.95 20.97	102 46.51 25.17 177°50.64 25.17	271°6.89 59.21	Venus 152°10.12 13:42 Mars 258°30.55 06:36
18	273°4.41	64°22.90 S11°39.41	171°7.92 N23°20.91	192°52.96 N22°25.18	286°9.52 S07°59.28	Jupiter 279°51.08 05:10
19	288°6.87	79°22.49 40.58	186°8.88 20.86	207°55.29 25.19	301°12.15 59.35	Saturn 13°2.09 22:55
20	303°9.34	94°22.09 41.76	201°9.85 20.80	222°57.62 25.20	316°14.78 59.41	
21	318° 11.80	109°21.68 · · 42.93	216°10.82 · · 20.74	237°59.94 · · 25.20	331°17.41 · · 59.48	Horizontal parallax Venus: 0.1
22 23	333° 14.27 348° 16.73	124°21.27 44.11 139°20.86 45.28	231°11.78 20.68 246°12.75 20.62	253° 2.27 25.21 268° 4.60 25.22	346°20.04 59.55 1°22.67 59.62	Venus: 0.1 Mars: 0.1
Mer.	pass. 23:47	ν-0.4' d1.2' m-3.89	ν1.0′ d-0.1′ m0.53	ν2.3' d0.0' m-2.41	$\frac{\nu 2.6' \ d0.1' \ \text{m}0.63}{}$	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°44.15	N00°35.71	$324^{\circ}27.71$	7.9'	$N17^{\circ}17.06$	14.5'	60.4'
1	196°44.37	34.74	338°54.63	7.9'	17°31.59 17°46.00	14.4'	60.3'
2	211°44.59 226°44.81	33.77 · · 32.80	353°21.49 7°48.29	7.8' 7.7'	17°46.00 18°0.28	14.3' 14.2'	60.3' 60.3'
4	241°45.03	31.83	22°15.04	7.7'	18° 14.44	14.0'	60.3
5	256°45.26	30.86	36°41.72	7.6'	18°28.48	13.9'	60.2'
6 7	271°45.48 286°45.70	N00°29.88 28.91	51°8.35 65°34.93	7.6' 7.5'	N18° 42.39 18° 56.17	13.8' 13.7'	60.2' 60.2'
8	301°45.92	27.94	80°1.44	7.5'	19°9.82	13.5'	60.1
9	316°46.14	• • 26.97	94°27.89	7.4'	$19^{\circ}23.34$	13.4'	60.1'
10	331°46.37	26.00	108°54.29	7.3'	19°36.72 19°49.97	13.2' 13.1'	60.1'
11 12	346°46.59 1°46.81	25.03 N00°24.05	123°20.62 137°46.90	7.3' 7.2'	N20°3.09	13.1	60.0' 60.0'
13	16°47.03	23.08	152°13.12	7.2	20° 16.06	12.8'	60.0'
14	31°47.25	22.11	166°39.28	7.1'	20°28.90	12.7'	59.9'
15 16	46°47.47 61°47.69	· · 21.14 20.17	181°5.39 195°31.43	7.0' 7.0'	20°41.59 20°54.15	12.6' 12.4'	59.9' 59.9'
17	76°47.92	19.19	209°57.42	6.9	21°6.56	12.3'	59.8'
18	91°48.14	N00°18.22	224°23.35	6.9'	N21°18.82	12.1'	59.8'
19	106°48.36	17.25	238°49.23 253°15.04	6.8'	21°30.94 21°42.91	12.0' 11.8'	59.8'
20 21	121°48.58 136°48.80	16.28 •• 15.30	253°15.04 267°40.80	6.8' 6.7'	21° 42.91 21° 54.73	11.8	59.7' 59.7'
22	151°49.02	14.33	282°6.51	6.7	22°6.40	11.5'	59.7'
23	166°49.24	13.36	296°32.16	6.6'	22°17.92	11.4'	59.6'
	SD = 15.9'	d = -1.0'		S	D = 16.5'		
C	CUA	D	CILA		D-:	.ı	LIP.
Sun 0	GHA 181°49.46	Dec N00°12.39	GHA 310°57.76	u 6.5'	Dec N22° 29.29	d 11.2'	HP 59.6'
1	196°49.69	11.42	325°23.30	6.5'	22°40.50	11.1'	59.6'
2	211°49.91	10.44	339°48.78	6.4	22°51.56	10.9'	59.5'
3 4	226°50.13 241°50.35	• • 9.47 8.50	354°14.22 8°39.60	6.4' 6.3'	23°2.46 23°13.20	10.7' 10.6'	59.5' 59.5'
5	256°50.57	7.53	23°4.93	6.3	23°23.79	10.4	59.4'
6	271°50.79	N00°6.55	37°30.21	6.2'	N23°34.21	10.3'	59.4'
7	286°51.01	5.58	51°55.44 66°20.63	6.2'	23°44.47 23°54.58	10.1'	59.4'
8 9	301°51.23 316°51.45	4.61 •• 3.64	80°45.76	6.1' 6.1'	23°54.58 24°4.52	9.9' 9.8'	59.3' 59.3'
10	331°51.67	2.66	95°10.85	6.0'	24°14.29	9.6'	59.2'
11	346°51.89	1.69	109°35.89	6.0'	24°23.90	9.4'	59.2'
12 13	1°52.11 16°52.33	N00°0.72 S00°0.26	124°0.88 138°25.83	6.0' 5.9'	N24°33.35 24°42.62	9.3' 9.1'	59.2' 59.1'
14	31°52.55	1.23	150° 50.74	5.9'	24° 51.73	8.9'	59.1
15	46°52.77	• • 2.20	167°15.61	5.8'	25°0.67	8.8'	59.1'
16	61°52.99 76°53.21	3.17 4.15	181°40.43 196°5.22	5.8' 5.7'	25°9.45 25°18.05	8.6' 8.4'	59.0'
17 18	91°53.21	4.15 \$00°5.12	210°29.97	5.7'	N25°26.48	8.3'	59.0' 58.9'
19	106°53.65	6.09	224°54.68	5.7'	25°34.74	8.1'	58.9'
20	121°53.87	7.07	239°19.35	5.6'	25° 42.82	7.9'	58.9'
21 22	136°54.09 151°54.31	· · 8.04 9.01	253°43.99 268°8.60	5.6' 5.6'	25°50.74 25°58.48	7.7' 7.6'	58.8' 58.8'
23	166°54.53	9.98	282°33.18	5.5'	26°6.04	7.4	58.8'
	SD = 15.9'	d = -1.0'		S	D = 16.3'		
Mon	GHA 181°54.75	Dec \$00°10.96	GHA 296°57.72	u 5.5'	Dec N26°13.43	d 7.2'	HP 58.7'
0 1	181 54.75 196°54.97	11.93	311°22.24	5.5'	26° 20.65	7.2° 7.0°	58.7' 58.7'
2	211°55.19	12.90	325°46.73	5.5'	26°27.68	6.9'	58.6'
3	226°55.41	• • 13.88	340°11.20	5.4'	26° 34.55	6.7'	58.6'
4 5	241°55.63 256°55.85	14.85 15.82	354°35.64 9°0.06	5.4' 5.4'	26°41.23 26°47.74	6.5' 6.3'	58.6' 58.5'
6	271°56.07	S00°16.80	23°24.46	5.4'	N26°54.06	6.1'	58.5'
7	286°56.29	17.77	37°48.83	5.4'	27°0.21	6.0'	58.5'
8 9	301°56.51 316°56.73	18.74 •• 19.72	52°13.20 66°37.54	5.3' 5.3'	27°6.18 27°11.98	5.8' 5.6'	58.4' 58.4'
10	331°56.95	20.69	81°1.88	5.3'	27°17.59	5.4'	58.3
11	346°57.16	21.66	95°26.20	5.3'	27° 23.02	5.3'	58.3'
12 13	1°57.38 16°57.60	\$00°22.64 23.61	109°50.51 124°14.81	5.3' 5.3'	N27°28.27 27°33.34	5.1' 4.9'	58.3' 58.2'
13 14	31°57.82	23.61	124°14.81 138°39.11	5.3'	27°33.34 27°38.24	4.9° 4.7'	58.2' 58.2'
15	46°58.04	• • 25.55	153°3.40	5.3'	$27^{\circ}42.95$	4.5'	58.2'
16	61°58.26	26.53	167°27.68	5.3'	27°47.48	4.3'	58.1'
17 18	76°58.48 91°58.69	27.50 \$00°28.47	181°51.97 196°16.26	5.3' 5.3'	27°51.83 N27°56.00	4.2' 4.0'	58.1' 58.0'
19	106°58.91	29.45	210°40.55	5.3'	27°59.98	3.8'	58.0'
20	121°59.13	30.42	225°4.84	5.3'	28°3.79	3.6'	58.0'
21 22	136°59.35 151°59.57	· · 31.40 32.37	239°29.14 253°53.45	5.3' 5.3'	28°7.42 28°10.86	3.4' 3.3'	57.9' 57.9'
23	166°59.79	33.34	268° 17.77	5.3'	28° 14.13	3.1'	57.9'
	SD = 15.9'	d = 1.0'			D = 16.0'		

Lat.	Twilight		Sunrise	Sunset	Twilight	
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	03:01	04:32	05:40	18:02	19:10	20:39
N 70°	03:21	04:40	05:42	18:01	19:02	20:20
68°	03:36	04:47	05:43	18:00	18:56	20:06
66°	03:48	04:52	05:43	18:00	18:51	19:54
64°	03:58	04:56	05:44	17:59	18:47	19:45
62°	04:06	05:00	05:45	17:59	18:43	19:37
60°	04:13	05:03	05:45	17:58	18:40	19:30
N 58°	04:19	05:06	05:46	17:58	18:37	19:24
56°	04:24	05:09	05:46	17:58	18:35	19:19
54°	04:29	05:11	05:46	17:58	18:33	19:15
52°	04:33	05:13	05:47	17:57	18:31	19:11
50°	04:36	05:15	05:47	17:57	18:29	19:07
45°	04:44	05:18	05:47	17:57	18:26	19:00
N 40°	04:49	05:21	05:48	17:56	18:23	18:55
35°	04:53	05:23	05:48	17:56	18:21	18:51
30°	04:57	05:25	05:49	17:56	18:20	18:48
20°	05:01	05:27	05:49	17:56	18:18	18:43
N 10°	05:04	05:28	05:49	17:56	18:17	18:41
0°	05:05	05:29	05:49	17:56	18:16	18:40
S 10°	05:04	05:28	05:49	17:56	18:17	18:41
20°	05:02	05:27	05:49	17:56	18:18	18:44
30°	04:57	05:25	05:49	17:56	18:20	18:48
35°	04:54	05:24	05:49	17:57	18:22	18:52
40°	04:50	05:22	05:49	17:57	18:24	18:56
45°	04:45	05:19	05:48	17:57	18:27	19:01
S 50°	04:38	05:16	05:48	17:58	18:30	19:08
52°	04:34	05:14	05:48	17:58	18:32	19:12
54°	04:31	05:12	05:48	17:59	18:34	19:16
56°	04:26	05:10	05:47	17:59	18:36	19:20
58°	04:21	05:08	05:47	17:59	18:39	19:26
S 60°	04:15	05:05	05:47	18:00	18:41	19:32

Lat.		Moonris	е	Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon	
N 72°							
N 70°							
68°	16:18			13:13			
66°	17:03			12:29			
64°	17:33	16:58		12:00	14:35		
62°	17:56	17:47	17:26	11:39	13:47	16:13	
60°	18:14	18:18	18:32	11:21	13:17	15:07	
N 58°	18:30	18:42	19:06	11:07	12:54	14:33	
56°	18:43	19:01	19:32	10:54	12:35	14:08	
54°	18:55	19:17	19:52	10:43	12:20	13:48	
52°	19:05	19:31	20:09	10:34	12:06	13:31	
50°	19:14	19:43	20:24	10:25	11:54	13:16	
45°	19:34	20:09	20:54	10:07	11:30	12:47	
N 40°	19:50	20:29	21:17	09:53	11:11	12:24	
35°	20:03	20:46	21:36	09:40	10:55	12:05	
30°	20:15	21:01	21:53	09:30	10:41	11:49	
20°	20:36	21:26	22:21	09:11	10:17	11:22	
N 10°	20:53	21:48	22:45	08:55	09:57	10:59	
0°	21:10	22:08	23:08	08:41	09:38	10:37	
S 10°	21:27	22:29	23:30	08:26	09:19	10:15	
20°	21:46	22:51	23:55	08:10	08:59	09:52	
30°	22:07	23:17		07:53	08:36	09:25	
35°	22:19	23:32		07:42	08:22	09:09	
40°	22:34	23:50		07:30	08:07	08:50	
45°	22:51		00:12	07:17	07:48	08:28	
S 50°	23:13		00:39	07:00	07:25	08:00	
52°	23:23		00:53	06:52	07:14	07:46	
54°	23:35		01:08	06:43	07:02	07:30	
56°	23:48		01:27	06:34	06:48	07:11	
58°		00:04	01:49	06:23	06:31	06:48	
S 60°		00:23	02:19	06:10	06:12	06:18	

	Sun			Moon		
Day Eqn.of Ti		f Time	Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-69%
21	06:57	07:07	11:53	02:28	14:55	
22	07:18	07:28	11:53	03:24	15:53	
23	07:39	07:50	11:52	04:23	16:52	

September 24, 25, 26 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	3° 19.19	154°20.45 \$11°46.45	261°13.72 N23°20.56	283°6.93 N22°25.23	16°25.30 \$07°59.69	Alpheratz 357°34.69 29°13.73
1 2	18°21.66 33°24.12	169°20.04 47.63 184°19.63 48.80	276°14.69 20.50 291°15.65 20.44	298° 9.26 25.23 313° 11.59 25.24	31°27.93 59.76 46°30.57 59.83	Ankaa 353°6.94 -42°10.18
3	48° 26.59	199°19.22 · · 49.97	306°16.62 · · 20.38	328°13.92 · · 25.25	61°33.20 07°59.90	Schedar 349°30.81 56°40.41
4	63°29.05	214°18.81 51.14	321°17.59 20.32	343°16.25 25.26	76°35.83 07°59.96	Diphda 348°47.21 -17°50.92 Achernar 335°19.79 -57°6.49
5	78°31.52	229°18.40 52.31	336°18.56 20.26	358°18.58 25.26	91°38.46 0.03	Hamal 327°51.19 23°34.83
6 7	93°33.98 108°36.44	244°17.99 \$11°53.48 259°17.58 54.66	351°19.53 N23°20.20 6°20.50 20.14	13°20.91 N22°25.27 28°23.24 25.28	106°41.09 \$08°0.10 121°43.72 0.17	Polaris 313°49.50 89°21.89
8	123°38.91	274°17.16 55.82	21°21.47 20.08	43°25.57 25.28	136°46.35 0.24	Acamar 315°11.64 -40°12.06
9	$138^{\circ}41.37$	289°16.75 · · 56.99	36°22.45 · · 20.02	58°27.90 · · 25.29	151°48.98 · · 0.31	Menkar 314° 6.18 4° 11.34 Mirfak 308° 28.31 49° 56.85
10	153° 43.84	304°16.34 58.16	51°23.42 19.96	73°30.24 25.30	166°51.61 0.37	Aldebaran 290°39.78 16°33.61
11 12	168° 46.30 183° 48.76	319°15.92 11°59.33 334°15.51 \$12°0.50	66°24.39 19.90 81°25.36 N23°19.84	88°32.57 25.31 103°34.90 N22°25.31	181°54.24 0.44 196°56.87 \$08°0.51	Rigel 281°4.03 -8°10.16
13	198°51.23	349°15.10 1.67	96°26.33 19.78	118°37.23 25.32	211°59.50 0.58	Capella 280°22.16 46°1.25 Bellatrix 278°23.08 6°22.46
14	213°53.69	4°14.68 2.83	111°27.31 19.72	133°39.57 25.33	227°2.13 0.65	Elnath 278°2.12 28°37.68
15 16	228° 56.16 243° 58.62	19°14.27 · · 4.00 34°13.85 5.17	126°28.28 ·· 19.66 141°29.26 19.59	148°41.90 · · 25.33 163°44.24 25.34	242°4.76 · · 0.72 257°7.39 0.78	Alnilam 275°37.94 -1°10.98
17	259°1.09	49°13.44 6.33	156°30.23 19.53	178°46.57 25.35	272°10.02 0.85	Betelgeuse 270°52.33 7°24.83
18	274°3.55	64°13.02 \$12°7.50	171°31.21 N23°19.47	193°48.91 N22°25.35	287°12.65 S 08°0.92	Canopus 263°52.54 -52°42.11 Sirius 258°26.50 -16°44.73
19	289°6.01	79°12.60 8.66	186°32.18 19.41	208°51.24 25.36	302°15.28 0.99	Adhara 255°6.14 -29°0.01
20 21	304°8.48 319°10.94	94°12.19 9.83 109°11.77 · · 10.99	201°33.16 19.34 216°34.13 • 19.28	223°53.58 25.37 238°55.91 •• 25.38	317°17.91 1.06 332°20.54 •• 1.12	Procyon 244°51.21 5°9.84
22	334° 13.41	124°11.35 12.15	231°35.11 19.22	253°58.25 25.38	347°23.17 1.19	Pollux 243°17.75 27°58.00
23	$349^{\circ}15.87$	139°10.93 13.32	246°36.09 19.16	269° 0.59 25.39	2°25.80 1.26	Avior 234°15.21 -59°34.95 Suhail 222°46.82 -43°31.63
Mer.	pass. 23:43	ν-0.4' d1.2' m-3.89	$\nu 1.0' \ d$ -0.1' m0.52	ν2.3' d0.0' m-2.41	ν2.6' d0.1' m0.63	Miaplacidus 221°39.05 -69°48.79
	<u> </u>					Alphard 217°48.25 -8°45.74
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.98 11°50.91
0	4° 18.33	154°10.52 S 12°14.48	261°37.06 N23°19.09	284°2.92 N22°25.40	17°28.43	Dubhe 193°41.89 61°37.06 Denebola 182°25.52 14°26.17
1	19°20.80	169°10.10 15.64	276°38.04 19.03	299° 5.26 25.40	32°31.06 1.40	Gienah 175°44.19 -17°40.62
2	34°23.26 49°25.73	184°9.68 16.80 199°9.26 · · 17.96	291°39.02 18.97 306°40.00 •• 18.90	314°7.60 25.41 329°9.94 · · 25.42	47°33.69 1.46 62°36.32 · · 1.53	Acrux 173°1.14 -63°14.11
4	64°28.19	214°8.84 19.12	321°40.98 18.84	344°12.28 25.42	77°38.95 1.60	Gacrux 171°52.55 -57°15.04
5	79°30.66	229°8.42 20.28	336°41.96 18.77	359°14.62 25.43	92°41.58 1.67	Alioth 166°13.69 55°49.65 Spica 158°22.88 -11°17.31
6	94°33.12	244°8.00 \$12°21.44	351°42.94 N23°18.71	14°16.96 N22°25.44	107°44.21	Alkaid 152°52.61 49°11.55
7 8	109° 35.58 124° 38.05	259°7.58 22.60 274°7.16 23.76	6°43.92 18.64 21°44.90 18.58	29°19.29 25.44 44°21.63 25.45	122°46.84 1.80 137°49.47 1.87	Hadar 148°36.97 -60°29.59
9	139° 40.51	289°6.73 · · 24.92	36°45.88 · · 18.51	59°23.98 · · 25.46	152°52.09 · · 1.94	Menkent 147°58.28 -36°29.48 Arcturus 145°48.42 19°3.38
10	154° 42.98	304°6.31 26.08	51°46.86 18.45	74°26.32 25.46	167°54.72 2.00	Rigil Kent. 139°41.22 -60°56.34
11	169° 45.44	319°5.89 27.23 334°5.47 \$12°28.39	66°47.84 18.38 81°48.82 N23°18.32	89°28.66 25.47	182°57.35 2.07	Kochab 137°20.59 74°3.39
12 13	184° 47.90 199° 50.37	334°5.47 \$12°28.39 349°5.04 29.55	81°48.82 N23°18.32 96°49.81 18.25	104°31.00 N22°25.48 119°33.34 25.48	197°59.98 \$08°2.14 213°2.61 2.21	Zuben'ubi 136°56.55 -16°8.61
14	214° 52.83	4°4.62 30.70	111°50.79 18.19	134°35.68 25.49	228°5.24 2.27	Alphecca 126°4.17 26°38.08 Antares 112°16.30 -26°29.23
15	229° 55.30	19°4.20 · · 31.86	126°51.77 · · 18.12	149°38.03 · · 25.49	243°7.87 · · 2.34	Atria 107°10.92 -69°4.53
16 17	244°57.76 260°0.23	34°3.77 33.01 49°3.35 34.17	141°52.76 18.06 156°53.74 17.99	164°40.37 25.50 179°42.71 25.51	258°10.50 2.41 273°13.12 2.48	Sabik 102°3.16 -15°45.31
18	275°2.69	64°2.92 \$12°35.32	171°54.73 N23°17.92	194°45.05 N22°25.51	288°15.75 S08°2.54	Shaula 96°10.77 -37°7.39
19	290°5.15	79°2.50 36.47	186°55.71 17.86	209°47.40 25.52	303°18.38 2.61	Rasalhague 95°58.83 12°32.67 Eltanin 90°42.33 51°29.38
20	305°7.62	94°2.07 37.63	201°56.70 17.79	224°49.74 25.53	318°21.01 2.68	Kaus Aust. 83°32.82 -34°22.45
21 22	320° 10.08 335° 12.55	109°1.64 · · · 38.78 124°1.22	216°57.68 ·· 17.72 231°58.67 17.66	239°52.09 · · 25.53 254°54.43	333°23.64 · · 2.75 348°26.27 2.81	Vega 80°33.35 38°48.62
23	350° 15.01	139°0.79 41.08	246°59.66 17.59	269°56.78 25.55	3°28.90 2.88	Nunki 75°48.00 -26°16.00
Mori	pass. 23:39	ν-0.4' d1.2' m-3.89	$\nu 1.0' \ d$ -0.1' m0.51	ν2.3' d0.0' m-2.42	ν2.6' d0.1' m0.63	Altair 62°0.07 8°56.15 Peacock 53°5.77 -56°39.49
- IVIEL.	pass. 23.39	ν-0.4 d1.2 iii-3.09	VI.0 U-0.1 III0.51	ν2.3 d0.0 III-2.42		Deneb 49°25.72 45°22.33
Th	СПУ	CHA Dee	CHA Doo	CHA Doe	CHA Dos	Enif 33°38.79 9°59.43
Thu 0	GHA 5° 17.47	GHA Dec 154°0.36 S 12°42.23	GHA Dec 262°0.64 N23°17.52	GHA Dec 284°59.12 N22°25.55	GHA Dec 18°31.52 \$08°2.95	Al Na'ir 27°32.80 -46°50.52 Fomalhaut 15°14.43 -29°29.43
1	$20^{\circ}19.94$	168°59.93 43.38	277°1.63 17.45	300°1.47 25.56	33°34.15 3.01	Scheat 13°45.12 28°13.15
2	35°22.40	183°59.51 44.53	292°2.62 17.38 307°3.61 · · 17.32	315° 3.82 25.56	48°36.78 3.08	Markab 13°29.84 15°20.43
3 4	50°24.87 65°27.33	198°59.08 · · 45.68 213°58.65 46.83	307°3.61 ·· 17.32 322°4.60 17.25	330°6.16 · · 25.57 345°8.51 25.58	63°39.41 · · 3.15 78°42.04 3.21	Sep 24 Tue SHA Mer.pass
5	80°29.80	228°58.22 47.98	337°5.59 17.18	0°10.86 25.58	93°44.66 3.28	Venus 151°1.26 13:43
6	95°32.26	243°57.79 \$12°49.13	352°6.58 N23°17.11	15°13.21 N22°25.59	108°47.29 S 08°3.35	Mars 257°54.52 06:35
7	110°34.72	258° 57.36 50.27	7°7.57 17.04	30°15.55 25.59	123°49.92 3.42	Jupiter 279°47.74 05:07 Saturn 13°6.11 22:50
8 9	125° 37.19 140° 39.65	273°56.93 51.42 288°56.50 · · 52.57	22°8.56 16.97 37°9.55 · 16.91	45°17.90 25.60 60°20.25 · 25.61	138°52.55 3.48 153°55.17 · · 3.55	
10	155° 42.12	303°56.06 53.71	52°10.54 16.84	75°22.60 25.61	168°57.80 3.62	Sep 25 Wed SHA Mer.pass
11	170° 44.58	318°55.63 54.86	67°11.53 16.77	90°24.95 25.62	184°0.43 3.68	Venus 149°52.18 13:44 Mars 257°18.73 06:33
12 13	185° 47.04 200° 49.51	333°55.20 \$12°56.00 348°54.77 57.15	82°12.52 N23°16.70 97°13.52 16.63	105°27.30 N22°25.63 120°29.65 25.63	199°3.06 \$08°3.75 214°5.68 3.82	Jupiter 279°44.59 05:03
13 14	200 49.51 215°51.97	348°54.77 57.15 3°54.33 58.29	97°13.52 16.63 112°14.51 16.56	120 29.05 25.03 135°32.00 25.64	214°5.68 3.82 229°8.31 3.88	Saturn 13°10.10 22:46
15	$230^{\circ}54.44$	$18^{\circ}53.90$ $12^{\circ}59.44$	127°15.50 · · 16.49	150°34.35 · · 25.64	244°10.94 · · 3.95	Sep 26 Thu SHA Mer.pass
16	245° 56.90	33°53.47 13°0.58	142°16.50 16.42	165°36.70 25.65	259°13.56 4.01	Venus 148°42.89 13:44
17 18	260°59.37 276°1.83	48°53.03 1.72 63°52.60 \$13°2.86	157°17.49 16.35 172°18.48 N23°16.28	180°39.06 25.65 195°41.41 N22°25.66	274°16.19 4.08 289°18.82 \$08°4.15	Mars 256°43.17 06:32
19	270 1.63 291°4.29	78°52.16 4.00	187°19.48 16.21	210°43.76 25.67	304°21.45 4.21	Jupiter 279°41.65 04:59 Saturn 13°14.05 22:42
20	306°6.76	93°51.73 5.14	202°20.48 16.13	225°46.11 25.67	319°24.07 4.28	
21	321°9.22	108°51.29 · · 6.28	217°21.47 · · 16.06	240°48.47 · · 25.68	334°26.70 · · 4.35	Horizontal parallax Venus: 0.1
22 23	336° 11.69 351° 14.15	123°50.85 7.42 138°50.42 8.56	232°22.47 15.99 247°23.47 15.92	255°50.82 25.68 270°53.17 25.69	349°29.33 4.41 4°31.95 4.48	Venus: 0.1 Mars: 0.1
ıvler.	pass. 23:35	ν-0.4' d1.2' m-3.89	ν1.0′ d-0.1′ m0.50	ν2.3' d0.0' m-2.43	ν2.6' d0.1' m0.64	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°0.00	S00°34.32	$282^{\circ}42.11$	5.3'	${\color{red}N28^{\circ}17.21}$	2.9'	57.8'
1	197°0.22	35.29	297° 6.45	5.4'	28°20.11	2.7'	57.8'
2	212°0.44 227°0.66	36.26 · · · 37.24	311°30.82 325°55.20	5.4' 5.4'	28°22.84 28°25.38	2.5' 2.4'	57.7' 57.7'
4	242°0.88	38.21	340°19.60	5.4'	28°27.75	2.2'	57.7'
5	257°1.09	39.18	$354^{\circ}44.02$	5.4'	$28^{\circ}29.93$	2.0'	57.6'
6	272°1.31 287°1.53	S00°40.16	9°8.47	5.5'	N28°31.94	1.8'	57.6'
7 8	287°1.53 302°1.75	41.13 42.10	23°32.94 37°57.44	5.5' 5.5'	28°33.76 28°35.41	1.6' 1.5'	57.6' 57.5'
9	317°1.96	• • 43.08	52°21.98	5.6'	28°36.88	1.3'	57.5'
10	332°2.18	44.05	$66^{\circ}46.54$	5.6'	28°38.17	1.1'	57.4'
11	347°2.40	45.02	81°11.14	5.6'	28°39.29	0.9'	57.4'
12 13	2°2.61 17°2.83	\$00°46.00 46.97	95°35.77 110°0.44	5.7' 5.7'	N28°40.23 28°40.99	0.8' 0.6'	57.4' 57.3'
14	32°3.05	47.94	124°25.15	5.8'	28°41.58	0.4	57.3'
15	47°3.27	• • 48.92	138°49.90	5.8'	28°41.99	0.2'	57.3'
16	62°3.48	49.89	153°14.70	5.8'	28°42.23	0.1'	57.2'
17	77°3.70 92°3.92	50.87 \$00°51.84	167°39.54 182°4.42	5.9'	28°42.29 N28°42.18	-0.1'	57.2'
18 19	92°3.92 107°4.13	52.81	182°4.42 196°29.36	5.9' 6.0'	28°41.90	-0.3' -0.5'	57.2' 57.1'
20	122°4.35	53.79	210°54.34	6.0'	28°41.45	-0.6	57.1'
21	137°4.56	• • 54.76	225°19.38	6.1'	28°40.82	-0.8'	57.1'
22	152°4.78	55.73	239°44.47	6.1'	28°40.03	-1.0'	57.0'
23	167°5.00	56.71	254° 9.62	6.2'	28°39.06	-1.1'	57.0'
	SD = 15.9'	d = 1.0'		SD	0 = 15.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°5.21	S00°57.68	268°34.83	6.3'	N28°37.93	-1.3'	57.0'
1	197°5.43 212°5.65	58.65 00°59.63	283°0.09 297°25.41	6.3'	28°36.63 28°35.16	-1.5'	56.9'
2	212°5.65 227°5.86	00°59.63 01°0.60	297°25.41 311°50.80	6.4' 6.5'	28°35.16 28°33.52	-1.6' -1.8'	56.9' 56.8'
4	242°6.08	1.57	326°16.25	6.5	28°31.72	-2.0'	56.8'
5	257°6.29	2.55	340°41.77	6.6'	28°29.75	-2.1'	56.8'
6	272°6.51	S01°3.52	355°7.35	6.7'	N28°27.62	-2.3'	56.7'
7	287°6.72	4.50	9°33.00	6.7'	28°25.33	-2.5'	56.7
8 9	302°6.94 317°7.16	5.47 •• 6.44	23°58.72 38°24.52	6.8' 6.9'	28°22.87 28°20.26	-2.6' -2.8'	56.7' 56.6'
10	332°7.37	7.42	52°50.38	6.9'	28°17.48	-2.9'	56.6'
11	347°7.59	8.39	$67^{\circ}16.32$	7.0'	$28^{\circ}14.55$	-3.1'	56.6'
12	2°7.80	S01°9.36	81°42.34	7.1'	N28°11.45	-3.3'	56.6'
13 14	17°8.02 32°8.23	10.34 11.31	96°8.43 110°34.60	7.2' 7.2'	28° 8.20 28° 4.80	-3.4' -3.6'	56.5' 56.5'
15	47°8.45	• • 12.28	125° 0.85	7.3'	28° 1.24	-3.7'	56.5
16	62°8.66	13.26	$139^{\circ}27.18$	7.4'	$27^{\circ}57.52$	-3.9'	56.4'
17	77°8.88	14.23	153°53.59	7.5'	27°53.65	-4.0'	56.4
18 19	92°9.09 107°9.30	S01°15.21 16.18	168°20.09 182°46.66	7.6' 7.7'	N27°49.63 27°45.46	-4.2' -4.3'	56.4' 56.3'
20	107 9.50 122° 9.52	17.15	197°13.33	7.7'	27°41.15		56.3
21	137°9.73	• • 18.13	211°40.08	7.8'	27°36.68	-4.6'	56.3
22	152°9.95	19.10	226°6.91	7.9'	27°32.06	-4.8'	56.2'
23	167°10.16	20.07	240°33.84	8.0'	27°27.30	-4.9'	56.2'
	SD = 15.9'	d = 1.0'		SL	0 = 15.5'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182° 10.38 197° 10.59	S01°21.05 22.02	255°0.85 269°27.95	8.1' 8.2'	N27°22.40 27°17.35	-5.0' -5.2'	56.2' 56.1'
2	212° 10.80	22.02	283°55.14	8.3'	27°12.15	-5.2 -5.3'	56.1
3	227° 11.02	• • 23.97	298°22.43	8.4'	$27^{\circ}6.82$	-5.5'	56.1'
4	242°11.23	24.94	312°49.80	8.5'	27°1.34	-5.6'	56.1'
5 6	257°11.45 272°11.66	25.91 \$01°26.89	327°17.27 341°44.83	8.6' 8.7'	26°55.73 N26°49.98	-5.8' -5.9'	56.0' 56.0'
7	272 11.00 287°11.87	27.86	341 44.83 356°12.49	8.8'	26°44.09	-5.9 -6.0'	56.0'
8	302°12.09	28.83	10°40.24	8.8'	26°38.07	-6.2'	55.9'
9	317° 12.30	• • 29.81	25°8.09	8.9'	26°31.91	-6.3	55.9'
10 11	332° 12.51 347° 12.73	30.78 31.75	39°36.03 54°4.06	9.0' 9.1'	26°25.62 26°19.20	-6.4' -6.6'	55.9' 55.9'
11	347°12.73 2°12.94	31.75 \$01°32.73	68°32.20	9.1	N26°12.65	-6.7'	55.9° 55.8°
13	17° 13.15	33.70	83°0.43	9.3'	26°5.97	-6.8	55.8'
14	32°13.36	34.68	97°28.76	9.4'	25°59.16	-6.9'	55.8'
15 16	47° 13.58 62° 13.79	· · 35.65	111°57.19 126°25.71	9.5'	25°52.22 25°45.16	-7.1'	55.7'
16 17	62°13.79 77°14.00	36.62 37.60	126°25.71 140°54.33	9.6' 9.7'	25°45.16 25°37.97	-7.2' -7.3'	55.7' 55.7'
18	92°14.21	S01°38.57	155°23.06	9.8'	N25°30.66	-7.4'	55.7'
19	107° 14.43	39.54	169°51.88	9.9'	25°23.23	-7.6'	55.6'
20	122°14.64	40.52	184°20.80	10.0'	25°15.68	-7.7'	55.6'
21 22	137° 14.85 152° 15.06	· · 41.49 42.46	198°49.82 213°18.94	10.1' 10.2'	25° 8.01 25° 0.22	-7.8' -7.9'	55.6' 55.6'
23	152 15.06 167°15.28	42.46	213 18.94 227°48.15	10.2	25 0.22 24°52.31	-7.9 -8.0'	55.5'
	SD = 15.9'	d = 1.0'			0 = 15.3'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	03:19	04:46	05:54	17:47	18:54	20:20
N 70°	03:36	04:52	05:53	17:47	18:48	20:04
68°	03:49	04:57	05:53	17:48	18:43	19:51
66°	03:59	05:02	05:53	17:48	18:39	19:41
64°	04:08	05:05	05:53	17:49	18:36	19:33
62°	04:15	05:08	05:52	17:49	18:33	19:26
60°	04:21	05:11	05:52	17:49	18:31	19:20
N 58°	04:26	05:13	05:52	17:50	18:29	19:15
56°	04:31	05:15	05:52	17:50	18:27	19:11
54°	04:35	05:16	05:52	17:50	18:25	19:07
52°	04:38	05:18	05:52	17:50	18:24	19:03
50°	04:41	05:19	05:51	17:51	18:23	19:01
45°	04:48	05:22	05:51	17:51	18:20	18:54
N 40°	04:52	05:24	05:51	17:52	18:18	18:50
35°	04:56	05:25	05:50	17:52	18:17	18:47
30°	04:58	05:26	05:50	17:52	18:16	18:44
20°	05:02	05:28	05:50	17:53	18:15	18:41
N 10°	05:04	05:28	05:49	17:54	18:15	18:39
0°	05:04	05:28	05:48	17:55	18:15	18:39
S 10°	05:02	05:26	05:47	17:56	18:17	18:41
20°	04:59	05:24	05:46	17:57	18:19	18:44
30°	04:54	05:21	05:45	17:58	18:22	18:50
35°	04:50	05:19	05:45	17:59	18:24	18:54
40°	04:45	05:17	05:44	18:00	18:27	18:59
45°	04:39	05:13	05:43	18:01	18:30	19:05
S 50°	04:31	05:09	05:41	18:03	18:35	19:13
52°	04:27	05:07	05:41	18:03	18:37	19:17
54°	04:23	05:05	05:40	18:04	18:39	19:22
56°	04:18	05:02	05:39	18:05	18:42	19:27
58°	04:12	04:59	05:39	18:06	18:45	19:33
S 60°	04:05	04:56	05:38	18:07	18:49	19:40

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°			20:51			18:44
62°		19:32	21:42		18:11	17:52
60°	19:12	20:34	22:14	16:31	17:08	17:20
N 58°	19:54	21:08	22:37	15:49	16:34	16:56
56°	20:22	21:33	22:56	15:21	16:08	16:36
54°	20:44	21:53	23:12	14:59	15:48	16:20
52°	21:02	22:10	23:25	14:41	15:31	16:06
50°	21:18	22:24	23:37	14:25	15:17	15:54
45°	21:49	22:53		13:54	14:47	15:28
N 40°	22:13	23:16		13:30	14:24	15:08
35°	22:33	23:35		13:10	14:05	14:51
30°	22:50	23:51		12:53	13:48	14:36
20°	23:19		00:18	12:24	13:20	14:11
N 10°	23:44		00:41	11:59	12:56	13:49
0°		00:07	01:03	11:36	12:34	13:28
S 10°		00:29	01:24	11:13	12:11	13:08
20°		00:54	01:48	10:48	11:47	12:46
30°	00:23	01:23	02:14	10:19	11:19	12:20
35°	00:40	01:40	02:30	10:02	11:02	12:05
40°	01:00	02:00	02:49	09:42	10:42	11:47
45°	01:24	02:24	03:11	09:18	10:18	11:26
S 50°	01:55	02:55	03:39	08:47	09:47	10:58
52°	02:11	03:11	03:53	08:31	09:32	10:45
54°	02:29	03:29	04:08	08:13	09:14	10:29
56°	02:51	03:51	04:27	07:50	08:52	10:11
58°	03:20	04:19	04:50	07:22	08:24	09:49
S 60°	04:02	05:01	05:20	06:39	07:43	09:19

	Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	21-23	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	59-38%	
24	08:00	08:10	11:52	05:22	17:51		
25	08:21	08:31	11:51	06:20	18:48		
26	08:42	08:52	11:51	07:16	19:42		

September 27, 28, 29 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri -	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	6° 16.61	153°49.98 \$13°9.70	262°24.46 N23°15.85	285°55.53 N22°25.69	19°34.58	
1	21° 19.08	168°49.54 10.84	277°25.46 15.78	300°57.88 25.70	34°37.21 4.61	Alpheratz 357°34.68 29°13.74
2	36°21.54	183°49.10 11.98	292°26.46 15.71	316° 0.24 25.71	49°39.83 4.68	Ankaa 353°6.93 -42°10.19
3	51°24.01	198°48.66 · · 13.12	307°27.46 · · 15.63	331°2.59 · · 25.71	64°42.46 · · 4.74	Schedar 349°30.79 56°40.43
4	66°26.47	213°48.23 14.25	322°28.46 15.56	346° 4.95 25.72	79°45.08 4.81	Diphda 348°47.20 -17°50.92
5	81°28.93	228° 47.79 15.39	337°29.46 15.49	1°7.31 25.72	94°47.71 4.88	Achernar 335°19.77 -57°6.50 Hamal 327°51.17 23°34.84
6	96°31.40	243°47.35 \$13°16.52	352°30.45 N23°15.42	16°9.66 N22°25.73	109°50.34 S 08°4.94	Polaris 313°48.29 89°21.91
7	111°33.86	258°46.91 17.66	7°31.46 15.34	31°12.02 25.73	124°52.96 5.01	Acamar 315°11.61 -40°12.06
8	126° 36.33	273°46.47 18.79	22°32.46 15.27	46°14.38 25.74	139°55.59 5.07	Menkar 314°6.16 4°11.35
9	141°38.79	288°46.03 · · 19.93	37°33.46 · · 15.20	61°16.73 · · 25.75	154°58.22 · · 5.14	Mirfak 308°28.28 49°56.86
10	156°41.26	303°45.58 21.06	52°34.46 15.12	76°19.09 25.75	170°0.84 5.21	Aldebaran 290°39.75 16°33.61
11	171°43.72	318° 45.14 22.19	67°35.46 15.05	91°21.45 25.76	185°3.47 5.27	Rigel 281°4.00 -8°10.16
12 13	186° 46.18 201° 48.65	333°44.70 \$13°23.33 348°44.26 24.46	82°36.46 N23°14.98 97°37.47 14.90	106°23.81 N22°25.76 121°26.17 25.77	200°6.09 \$08°5.34 215°8.72 5.40	Capella 280°22.12 46°1.26
14	216°51.11	3°43.81 25.59	112°38.47 14.83	136°28.53 25.77	230°11.34 5.47	Bellatrix 278°23.06 6°22.46
15	231°53.58	18°43.37 · · 26.72	127°39.47 · · 14.76	151°30.89 · · 25.78	245°13.97 · · 5.53	Elnath 278° 2.09 28° 37.69
16	246° 56.04	33°42.93 27.85	142°40.48 14.68	166°33.25 25.78	260°16.59 5.60	Alnilam 275°37.91 -1°10.98
17	261°58.50	48°42.48 28.98	157°41.48 14.61	181°35.61 25.79	275°19.22 5.66	Betelgeuse 270°52.31 7°24.83
18	277°0.97	63°42.04 \$13°30.11	172°42.49 N23°14.53	196°37.97 N22°25.79	290°21.85 \$08°5.73	Canopus 263°52.51 -52°42.11
19	292°3.43	78° 41.59 31.24	187°43.49 14.46	211°40.33 25.80	305°24.47 5.80	Sirius 258°26.48 -16°44.73
20	307°5.90	93°41.15 32.37	202°44.50 14.38	226°42.69 25.80	320°27.10 5.86	Adhara 255°6.12 -29°0.01 Procyon 244°51.19 5°9.84
21	322°8.36	108°40.70 · · 33.50	217°45.50 · · 14.31	241°45.05 · · 25.81	335°29.72 · · 5.93	Procyon 244°51.19 5°9.84 Pollux 243°17.72 27°57.99
22	$337^{\circ}10.82$	123°40.26 34.62	232°46.51 14.23	256°47.42 25.81	350°32.35 5.99	Avior 234°15.18 -59°34.94
23	352° 13.29	138°39.81 35.75	247°47.52 14.16	271°49.78 25.82	5°34.97 6.06	Suhail 222°46.80 -43°31.62
Mer	pass. 23:31	ν-0.4' d1.1' m-3.90	ν1.0' d-0.1' m0.50	ν 2.4' d0.0' m-2.44	ν 2.6' d0.1' m0.64	Miaplacidus 221°39.01 -69°48.78
		- J GI.I III J.JU			22.0 40.1 1110.04	Alphard 217°48.23 -8°45.74
_						Regulus 207°34.96 11°50.90
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.87 61°37.04
0	7° 15.75	153°39.36 \$13°36.88	262°48.53 N23°14.08	286°52.14 N22°25.82	20°37.60 \$08°6.12	Denebola 182°25.51 14°26.16
1	22° 18.22	168°38.91 38.00	277°49.53 14.01	301°54.51 25.83	35°40.22 6.19	Gienah 175°44.18 -17°40.62
2 3	37° 20.68 52° 23.15	183°38.47 39.13 198°38.02 •• 40.25	292°50.54 13.93	316°56.87 25.83	50°42.85 6.25	Acrux 173°1.14 -63°14.10
3 4	52 23.15 67°25.61	213°37.57 41.37	307°51.55 · · 13.86 322°52.56 13.78	331°59.23 · · 25.84 347°1.60 25.85	65°45.47 · · 6.32 80°48.10 6.38	Gacrux 171°52.55 -57°15.03
5	82° 28.07	213 37.57 41.57 228°37.12 42.50	337°53.57 13.70	2°3.96 25.85	95°50.72 6.45	Alioth 166°13.69 55°49.64
6	97°30.54	243°36.67 \$13°43.62	352°54.58 N23°13.63	17°6.33 N22°25.86	110°53.34 \$08°6.51	Spica 158°22.87 -11°17.31
7	112°33.00	258° 36.22 44.74	7°55.59 13.55	32°8.69 25.86	125°55.97 6.58	Alkaid 152°52.61 49°11.54
8	127°35.47	273°35.77 45.86	22°56.60 13.47	47°11.06 25.86	140°58.59 6.64	Hadar 148°36.98 -60°29.58
9	142°37.93	288°35.32 · · 46.99	37°57.61 · · 13.40	62°13.43 · · 25.87	156°1.22 · · 6.71	Menkent 147°58.28 -36°29.47
10	157° 40.39	303°34.87 48.11	52°58.62 13.32	77°15.79 25.87	171°3.84 6.77	Arcturus 145°48.42 19°3.37
11	172°42.86	318°34.41 49.23	67°59.64 13.24	92°18.16 25.88	186°6.47 6.84	Rigil Kent. 139°41.23 -60°56.33 Kochab 137°20.63 74°3.37
12	187°45.32	333°33.96 \$13°50.35	83°0.65 N23°13.17	107°20.53 N22°25.88	201°9.09 S08°6.90	Zuben'ubi 136°56.55 -16°8.61
13	202°47.79	348°33.51 51.47	98°1.66 13.09	122°22.90 25.89	216°11.71 6.97	Alphecca 126°4.17 26°38.07
14	217°50.25	3°33.06 52.58	113°2.68 13.01	137°25.26 25.89	231°14.34 7.03	Antares 112°16.31 -26°29.23
15	232°52.71	18°32.60 · · 53.70	128° 3.69 · · 12.93	152°27.63 · · 25.90	246°16.96 · · 7.10	Atria 107°10.95 -69°4.53
16	247°55.18	33°32.15 54.82	143° 4.71 12.85	167°30.00 25.90	261°19.58 7.16	Sabik 102°3.16 -15°45.31
17	262°57.64	48°31.69 55.94	158° 5.72 12.78	182°32.37 25.91	276°22.21 7.23	Shaula 96°10.78 -37°7.40
18	278°0.11	63°31.24 \$13°57.05	173°6.74 N23°12.70	197°34.74 N22°25.91	291°24.83	Rasalhague 95°58.84 12°32.67
19	293°2.57	78°30.78 58.17	188° 7.75 12.62	212°37.11 25.92	306°27.46 7.36	Eltanin 90°42.35 51°29.38
20 21	308°5.03 323°7.50	93°30.33 13°59.28 108°29.87 14°0.40	203°8.77 12.54 218°9.78 •• 12.46	227°39.48 25.92 242°41.85 •• 25.93	321°30.08 7.42 336°32.70 · · 7.48	Kaus Aust. 83°32.83 -34°22.45
22	338°9.96	123°29.42 1.51	233°10.80 12.38	257°44.22 25.93	351°35.33 7.55	Vega 80°33.37 38°48.62
23	353° 12.43	138°28.96 2.63	248°11.82 12.30	272°46.59 25.94	6°37.95 7.61	Nunki 75°48.01 -26°16.00
			·			Altair 62°0.08 8°56.15
Mer.	pass. 23:27	ν -0.4 $'$ $d1.1'$ m-3.90	$ u 1.0' \ d$ -0.1' m0.49	ν 2.4′ d 0.0′ m-2.44	$ u 2.6' \ d0.1' \ m0.64$	Peacock 53°5.79 -56°39.50
						Deneb 49°25.74 45°22.33 Enif 33°38.79 9°59.44
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.80 -46°50.53
0	8° 14.89	153°28.50 \$14°3.74	263°12.84 N23°12.22	287°48.96 N22°25.94	21°40.57 \$08°7.68	Fomalhaut 15°14.43 -29°29.43
1	$23^{\circ}17.35$	168°28.04 4.85	278°13.86 12.15	$302^{\circ}51.34$ 25.95	36°43.20 7.74	Scheat 13°45.12 28°13.17
2	$38^{\circ}19.82$	183°27.59 5.96	293°14.87 12.07	317°53.71 25.95	51°45.82 7.81	Markab 13°29.84 15°20.44
3	53°22.28	198°27.13 · · 7.07	308°15.89 · · 11.99	332°56.08 · · 25.95	66°48.44 · · 7.87	
4	68°24.75	213°26.67 8.18	323°16.91 11.91	347°58.46 25.96	81°51.06 7.94	Sep 27 Fri SHA Mer.pass
5	83°27.21	228°26.21 9.29	338°17.93 11.83	3°0.83 25.96	96°53.69 8.00	Venus 147°33.37 13:45
6	98°29.68	243°25.75 \$14°10.40	353°18.95 N23°11.75	18° 3.20 N22° 25.97	111°56.31 \$08°8.06	Mars 256°7.85 06:30
7	113°32.14	258°25.29 11.51	8°19.98 11.67	33° 5.58 25.97	126°58.93 8.13	Jupiter 279°38.92 04:56 Saturn 13°17.97 22:38
8 9	128° 34.60 143° 37.07	273°24.83 12.62 288°24.37 · · 13.73	23°21.00 11.59 38°22.02 · · 11.50	48° 7.95 25.98 63° 10.33 •• 25.98	142°1.55 8.19 157°4.18 · · 8.26	Jatum 13 11.91 22:30
10	143 37.07 158° 39.53	303°23.90 14.84	53°23.04 11.42	78°12.70 25.99	172°6.80 8.32	Sep 28 Sat SHA Mer.pass
11	173° 42.00	318°23.44 15.94	68°24.06 11.34	93°15.08 25.99	172 0.60 6.32 187°9.42 8.38	Venus 146°23.61 13:46
12	188° 44.46	333°22.98 \$14°17.05	83°25.09 N23°11.26	108°17.45 N22°25.99	202°12.04 \$08°8.45	Mars 255°32.77 06:28
13	203°46.92	348°22.52 18.16	98°26.11 11.18	123°19.83 26.00	217°14.67 8.51	Jupiter 279°36.39 04:52
14	218°49.39	3°22.05 19.26	113°27.14 11.10	138°22.21 26.00	232°17.29 8.57	Saturn 13°21.84 22:34
15	233°51.85	18°21.59 · · 20.37	128°28.16 · · 11.02	153°24.59 · · 26.01	247°19.91 · · 8.64	Sep 29 Sun SHA Mer.pass
16	$248^{\circ}54.32$	33°21.12 21.47	143°29.19 10.94	168°26.96 26.01	262°22.53 8.70	Venus 145°13.61 13:47
17	263°56.78	48°20.66 22.57	158°30.21 10.85	183°29.34 26.02	277°25.15 8.77	Mars 254°57.95 06:27
18	278°59.24	63°20.19 S 14°23.68	173°31.24 N23°10.77	198°31.72 N22°26.02	292°27.78 \$08°8.83	Jupiter 279°34.07 04:48
19	294°1.71	78°19.73 24.78	188°32.26 10.69	213°34.10 26.02	307°30.40 8.89	Saturn 13°25.68 22:29
20	309°4.17	93°19.26 25.88	203°33.29 10.61	228°36.48 26.03	322°33.02 8.96	Horizontal parallar
21	324°6.64	108°18.80 · · 26.98	218°34.32 · · 10.53	243°38.86 · · 26.03	337°35.64 · · 9.02	Horizontal parallax Venus: 0.1
22	339°9.10	123°18.33 28.08	233°35.35 10.44	258°41.24 26.04	352°38.26 9.08	Mars: 0.1
23	354° 11.56	138°17.86 29.18	248°36.38 10.36	273°43.62 26.04	7°40.88 9.15	
Mer.	pass. 23:23	u-0.5 $'$ $d1.1'$ m-3.90	$ u 1.0' \ d$ -0.1' m0.48	$\nu 2.4' \ d0.0' \ \text{m-}2.45$	$\nu 2.6' \ d0.1' \ m0.65$	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 15.49	S01°44.41	$242^{\circ}17.47$	10.4'	N24°44.29	-8.1'	55.5'
1	197° 15.70	45.38	256°46.89	10.5'	24°36.16	-8.2'	55.5'
2	212°15.91 227°16.12	46.35 •• 47.33	271°16.40 285°46.02	10.6' 10.7'	24°27.91 24°19.55	-8.4' -8.5'	55.5' 55.4'
4	242° 16.33	48.30	300°15.73	10.7	24°11.08	-8.6'	55.4'
5	257° 16.54	49.27	314°45.55	10.9'	24°2.49	-8.7'	55.4'
6	272° 16.76	S01°50.25	329°15.46	11.0'	N23°53.81	-8.8'	55.4'
7	287°16.97	51.22	343°45.47	11.1'	23°45.01 23°36.11	-8.9'	55.3'
8 9	302°17.18 317°17.39	52.19 •• 53.17	358°15.59 12°45.80	11.2' 11.3'	23°36.11 23°27.10	-9.0' -9.1'	55.3' 55.3'
10	332°17.60	54.14	27°16.10	11.4'	23°17.99	-9.2'	55.3'
11	347° 17.81	55.11	$41^{\circ}46.51$	11.5'	23°8.78	-9.3'	55.2'
12	2°18.02	S01°56.09	56°17.01	11.6'	N22°59.47	-9.4'	55.2'
13 14	17°18.23 32°18.44	57.06 58.03	70°47.62 85°18.31	11.7' 11.8'	22°50.06 22°40.55	-9.5' -9.6'	55.2' 55.2'
14 15	32 18.44 47°18.65	58.03 01°59.00	99°49.11	11.8	22 40.55 22°30.94	-9.6 -9.7'	55.2'
16	62°18.86	01°59.98	114°20.00	12.0'	22°21.24	-9.8'	55.1'
17	77° 19.07	0.95	128°50.99	12.1'	22°11.44	-9.9'	55.1'
18	92°19.28	S02°1.92	143°22.07	12.2'	N22°1.55	-10.0'	55.1'
19 20	107°19.49 122°19.70	2.90 3.87	157°53.25 172°24.52	12.3' 12.4'	21°51.57 21°41.49	-10.1' -10.2'	55.1' 55.1'
21	137° 19.91	• • 4.84	186°55.89	12.5'	21°31.33	-10.2	55.0'
22	152°20.12	5.81	201°27.35	12.6'	21°21.08	-10.3	55.0'
23	167°20.33	6.79	215°58.91	12.6'	21°10.73	-10.4'	55.0'
	SD = 15.9'	d = 1.0'		SI	D = 15.1'		
	CUA				-	,	110
Sat 0	GHA 182° 20.54	Dec \$02°7.76	GHA 230° 30.55	u 12.7'	Dec N21°0.31	<i>d</i> -10.5′	HP 55.0'
1	197°20.75	8.73	245° 2.29	12.7	20°49.79	-10.5 -10.6'	54.9'
2	212°20.96	9.70	259°34.12	12.9'	20°39.20	-10.7'	54.9'
3	227°21.17	• • 10.68	274°6.04	13.0'	20°28.52	-10.8'	54.9'
4	242°21.38 257°21.59	11.65	288°38.05 303°10.15	13.1' 13.2'	20°17.75 20°6.91	-10.8'	54.9'
5 6	257 21.59 272°21.80	12.62 S 02°13.59	303 10.15 317°42.34	13.2	20 6.91 N19°55.99	-10.9' -11.0'	54.9' 54.9'
7	287°22.00	14.57	332°14.62	13.4'	19°44.98	-11.1'	54.8'
8	302°22.21	15.54	346°46.98	13.5'	19°33.91	-11.2'	54.8'
9	317°22.42	• • 16.51	1°19.43	13.5'	19°22.75	-11.2'	54.8'
10 11	332°22.63 347°22.84	17.48 18.46	15°51.97 30°24.59	13.6' 13.7'	19°11.52 19°0.21	-11.3' -11.4'	54.8' 54.8'
12	2°23.05	S02°19.43	44°57.30	13.8'	N18°48.84	-11.5'	54.7'
13	17°23.25	20.40	59°30.09	13.9'	18°37.39	-11.5'	54.7'
14	32°23.46	21.37	74°2.96	14.0'	18°25.86	-11.6'	54.7'
15 16	47°23.67 62°23.88	· · 22.34 23.32	88°35.92 103°8.96	14.0' 14.1'	18°14.27 18°2.61	-11.7' -11.7'	54.7' 54.7'
17	77°24.08	23.32	105 6.90 117°42.08	14.1	10 2.01 17°50.89	-11.7 -11.8'	54.7'
18	92°24.29	S02°25.26	132°15.27	14.3'	N17°39.09	-11.9'	54.6'
19	107° 24.50	26.23	146°48.55	14.4'	17°27.23	-11.9'	54.6'
20	122°24.71	27.21	161°21.91		17°15.31		
21 22	137°24.91 152°25.12	· · 28.18 29.15	175°55.34 190°28.85	14.5' 14.6'	17°3.32 16°51.27	-12.1' -12.1'	54.6' 54.6'
23	167°25.33	30.12	205° 2.43	14.7'	16°39.16	-12.2'	54.6'
	SD = 16.0'	d = 1.0'		SI	D = 15.0'		
_							
Sun 0	GHA 182° 25.53	Dec S 02°31.09	GHA 219°36.09	u14.7'	Dec N16°26.98	d -12.2'	HP 54.5'
1	182 25.53 197°25.74	32.06	219 36.09 234° 9.83	14.7 14.8'	16°14.75	-12.2 -12.3'	54.5'
2	212°25.95	33.04	248°43.64	14.9'	16°2.46	-12.3'	54.5'
3	227° 26.15	• • 34.01	263°17.51	15.0'	15°50.11	-12.4'	54.5'
4 5	242°26.36 257°26.57	34.98 35.95	277°51.47 292°25.49	15.0' 15.1'	15°37.70 15°25.24	-12.5' -12.5'	54.5' 54.5'
6	257 26.57 272° 26.77	35.95 \$02°36.92	306°59.58	15.1	N15° 12.73	-12.5' -12.6'	54.5'
7	287° 26.98	37.89	321°33.73	15.2'	15° 0.16	-12.6'	54.4'
8	302°27.18	38.87	336°7.96	15.3'	14°47.53	-12.7'	54.4'
9	317°27.39	39.84	350°42.25	15.4'	14°34.86	-12.7'	54.4'
10 11	332°27.60 347°27.80	40.81 41.78	5°16.61 19°51.04	15.4' 15.5'	14°22.13 14°9.36	-12.8' -12.8'	54.4' 54.4'
12	2°28.01	\$02°42.75	34°25.52	15.6'	N13°56.53	-12.9	54.4'
13	17°28.21	43.72	49°0.07	15.6'	13°43.66	-12.9'	54.4'
14	32°28.42	44.69	63°34.69	15.7'	13°30.74	-13.0'	54.3'
15 16	47°28.62 62°28.83	· · 45.67 46.64	78° 9.36 92° 44.09	15.7' 15.8'	13°17.78 13°4.77	-13.0' -13.1'	54.3' 54.3'
17	77°29.03	46.64 47.61	92 44.09 107°18.88	15.8 15.9'	13 4.77 12°51.71	-13.1'	54.3'
18	92°29.24	S02°48.58	121°53.73	15.9'	N12°38.61	-13.1	54.3'
19	107°29.44	49.55	136°28.64	16.0'	12°25.47	-13.2'	54.3'
20	122°29.65 137°29.85	50.52	151°3.60 165°38.62	16.0' 16.1'	12°12.29 11°59.07	-13.2'	54.3' 54.3'
21 22	137°29.85 152°30.05	•• 51.49 52.46	165°38.62 180°13.69	16.1' 16.1'	11°59.07 11°45.80	-13.3' -13.3'	54.3' 54.3'
23	167°30.26	53.43	194°48.82	16.2	11°32.50	-13.3'	54.2
	SD = 16.0'	d = 1.0'		SI	D = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	03:36	05:00	06:07	17:31	18:38	20:01
N 70°	03:50	05:05	06:05	17:34	18:34	19:48
68°	04:01	05:08	06:04	17:35	18:30	19:37
66°	04:10	05:11	06:02	17:37	18:28	19:29
64°	04:17	05:14	06:01	17:38	18:25	19:21
62°	04:24	05:16	06:00	17:39	18:23	19:15
60°	04:29	05:18	05:59	17:40	18:22	19:10
N 58°	04:33	05:19	05:59	17:41	18:20	19:06
56°	04:37	05:21	05:58	17:42	18:19	19:02
54°	04:41	05:22	05:57	17:43	18:18	18:59
52°	04:43	05:23	05:57	17:43	18:17	18:56
50°	04:46	05:24	05:56	17:44	18:16	18:54
45°	04:51	05:25	05:55	17:45	18:15	18:49
N 40°	04:55	05:27	05:54	17:47	18:14	18:45
35°	04:58	05:27	05:53	17:48	18:13	18:42
30°	05:00	05:28	05:52	17:49	18:12	18:40
20°	05:03	05:28	05:50	17:50	18:12	18:38
N 10°	05:03	05:28	05:49	17:52	18:13	18:37
0°	05:03	05:27	05:47	17:54	18:14	18:38
S 10°	05:00	05:25	05:46	17:55	18:16	18:41
20°	04:56	05:22	05:44	17:57	18:19	18:45
30°	04:50	05:18	05:42	18:00	18:24	18:52
35°	04:45	05:15	05:40	18:01	18:27	18:56
40°	04:40	05:12	05:39	18:03	18:30	19:02
45°	04:33	05:08	05:37	18:05	18:34	19:09
S 50°	04:24	05:02	05:35	18:07	18:40	19:18
52°	04:19	05:00	05:34	18:08	18:42	19:23
54°	04:15	04:57	05:33	18:09	18:45	19:28
56°	04:09	04:54	05:31	18:11	18:48	19:34
58°	04:03	04:51	05:30	18:12	18:52	19:40
S 60°	03:55	04:47	05:28	18:14	18:56	19:48

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°		22:54			20:02	18:44
N 70°		23:45			19:09	18:23
68°	21:33		00:17	19:46	18:36	18:06
66°	22:34		00:40	18:44	18:12	17:52
64°	23:08		00:58	18:09	17:53	17:41
62°	23:32		01:12	17:43	17:37	17:31
60°	23:52		01:24	17:23	17:24	17:23
N 58°		80:00	01:35	17:07	17:12	17:16
56°		00:21	01:44	16:52	17:02	17:09
54°		00:33	01:52	16:40	16:54	17:03
52°		00:43	01:59	16:29	16:46	16:58
50°		00:52	02:06	16:20	16:39	16:53
45°	00:02	01:12	02:20	15:59	16:23	16:43
N 40°	00:21	01:27	02:31	15:42	16:10	16:34
35°	00:38	01:40	02:41	15:28	16:00	16:27
30°	00:52	01:52	02:49	15:16	15:50	16:20
20°	01:16	02:11	03:04	14:55	15:34	16:08
N 10°	01:36	02:28	03:16	14:36	15:19	15:58
0°	01:55	02:44	03:28	14:19	15:05	15:48
S 10°	02:14	02:59	03:40	14:01	14:52	15:39
20°	02:35	03:16	03:52	13:43	14:37	15:28
30°	02:58	03:35	04:06	13:21	14:20	15:16
35°	03:12	03:46	04:15	13:08	14:10	15:09
40°	03:27	03:58	04:24	12:53	13:58	15:01
45°	03:46	04:13	04:35	12:35	13:45	14:52
S 50°	04:09	04:31	04:48	12:13	13:28	14:40
52°	04:21	04:40	04:54	12:03	13:20	14:35
54°	04:33	04:49	05:00	11:51	13:11	14:29
56°	04:48	05:00	05:08	11:37	13:01	14:23
58°	05:04	05:12	05:16	11:20	12:50	14:15
S 60°	05:25	05:26	05:25	11:01	12:37	14:07

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	28-13%
27	09:02	09:12	11:51	08:07	20:31	
28	09:22	09:32	11:50	08:55	21:17	
29	09:42	09:52	11:50	09:38	21:59	

September 30, 01, 02 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	9° 14.03	153°17.39 \$14°30.2		288°46.00 N22°26.04	22°43.50	
1	$24^{\circ}16.49$	168° 16.93 31.3		303°48.38 26.05	37°46.13 9.27	Alpheratz 357°34.68 29°13.75 Ankaa 353°6.93 -42°10.20
2	$39^{\circ}18.96$	183°16.46 32.48	3 293°39.46 10.11	318°50.76 26.05	52°48.75 9.34	Ankaa 353°6.93 -42°10.20 Schedar 349°30.79 56°40.45
3	54°21.42	198°15.99 · · 33.5		333°53.14 · · 26.06	67°51.37 · · 9.40	Diphda 348°47.20 -17°50.92
4	69°23.88	213° 15.52 34.6°		348°55.52 26.06	82°53.99 9.46	Achernar 335°19.76 -57°6.51
5 6	84° 26.35 99° 28.81	228°15.05 35.7° 243°14.58 \$14°36.80		3°57.91 26.06 19°0.29 N22°26.07	97°56.61 9.53 112°59.23 \$08°9.59	Hamal 327°51.16 23°34.85
7	114°31.28	258°14.11 37.9		34°2.67 26.07	128°1.85 9.65	Polaris 313°47.32 89°21.92
8	129°33.74	273°13.64 39.0		49°5.06 26.08	143°4.47 9.72	Acamar 315°11.60 -40°12.07
9	144°36.20	288°13.16 · · 40.1		64°7.44 · · 26.08	158°7.09 · · 9.78	Menkar 314°6.15 4°11.35 Mirfak 308°28.26 49°56.87
10	159°38.67	303°12.69 41.2		79° 9.82 26.08	173°9.71 9.84	Aldebaran 290°39.73 16°33.62
11	174°41.13	318°12.22 42.33		94°12.21 26.09	188°12.33 9.91	Rigel 281°3.99 -8°10.16
12	189° 43.60 204° 46.06	333°11.74 \$14°43.43 348°11.27 44.53		109°14.59 N22°26.09 124°16.98 26.10	203°14.95	Capella 280°22.09 46°1.26
13 14	219° 48.52	348°11.27 44.53 3°10.80 45.63		124°16.98 26.10 139°19.36 26.10	218°17.57 10.03 233°20.19 10.09	Bellatrix 278°23.04 6°22.46
15	234°50.99	18°10.32 · · 46.70		154°21.75 · · 26.10	248°22.81 · · 10.16	Elnath 278°2.07 28°37.69
16	249°53.45	33°9.85 47.79		169°24.14 26.11	263°25.43 10.22	Alnilam 275°37.89 -1°10.98
17	$264^{\circ}55.92$	48°9.37 48.88	8 158°54.96 8.85	184°26.52 26.11	278°28.05 10.28	Betelgeuse 270°52.29 7°24.83 Canopus 263°52.48 -52°42.11
18	279°58.38	63°8.90 \$14°49.9		199°28.91 N22°26.11	293°30.67 S 08°10.34	Sirius 258°26.46 -16°44.73
19	295°0.84	78°8.42 51.0		214°31.30 26.12	308°33.29 10.41	Adhara 255°6.09 -29°0.00
20	310°3.31 325°5.77	93°7.94 52.14 108°7.47 • 53.23		229°33.69 26.12 244°36.07 · · · 26.12	323°35.91 10.47 338°38.53 · · 10.53	Procyon 244°51.17 5°9.84
21 22	340°8.24	108°7.47 · · · 53.23 123°6.99 54.33		244°36.07 · · 26.12 259°38.46 26.13	353°41.15 10.59	Pollux 243°17.70 27°57.99
23	355° 10.70	138°6.51 55.4		274°40.85 26.13	8°43.77 10.66	Avior 234°15.15 -59°34.93
						Suhail 222°46.78 -43°31.62
ivier.	pass. 23:19	ν-0.5′ d1.1′ m-3.90	$\nu 1.0' \ d$ -0.1' m0.47	ν2.4' d0.0' m-2.46	ν2.6' d0.1' m0.65	Miaplacidus 221°38.98 -69°48.77 Alphard 217°48.21 -8°45.74
						Regulus 207°34.95 11°50.90
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.85 61°37.03
0	10° 13.17	153°6.03 \$14°56.4		289°43.24 N22°26.14 304°45.63 26.14	23°46.39	Denebola 182°25.51 14°26.15
1 2	25° 15.63 40° 18.09	168°5.55 57.5° 183°5.07 58.6		304°45.63 26.14 319°48.02 26.14	38°49.01 10.78 53°51.63 10.84	Gienah 175°44.18 -17°40.61
3	55° 20.56	198°4.59 14°59.74		334°50.41 · · 26.15	68°54.25 · · 10.91	Acrux 173°1.14 -63°14.09
4	70°23.02	213°4.11 15°0.8		349°52.80 26.15	83°56.87 10.97	Gacrux 171°52.55 -57°15.01 Alioth 166°13.69 55°49.62
5	85°25.49	228°3.63 1.90) 339°7.44 7.81	4°55.19 26.15	98°59.49 11.03	Spica 158°22.88 -11°17.31
6	100°27.95	243°3.15 \$15°2.98		19°57.59 N22°26.16	114°2.11 S 08°11.09	Alkaid 152°52.62 49°11.52
7	115° 30.41	258°2.67 4.00		34°59.98 26.16	129°4.73 11.15	Hadar 148°36.99 -60°29.57
8	130° 32.88	273°2.19 5.1		50°2.37 26.16	144°7.34 11.22	Menkent 147°58.29 -36°29.47
9 10	145° 35.34 160° 37.81	288°1.70 · · 6.23 303°1.22 7.30		65° 4.76 · · · 26.17 80° 7.16	159°9.96 ·· 11.28 174°12.58	Arcturus 145°48.43 19°3.36
11	175° 40.27	318° 0.74 8.3		95° 9.55 26.17	189°15.20 11.40	Rigil Kent. 139°41.25 -60°56.32
12	190°42.73	333°0.25 \$15°9.4		110°11.94 N22°26.18	204°17.82 S08°11.46	Kochab 137°20.66 74°3.36
13	205°45.20	347°59.77 10.5		125°14.34 26.18	219°20.44 11.53	Zuben'ubi 136°56.56 -16°8.61 Alphecca 126°4.19 26°38.06
14	220°47.66	2°59.28 11.6		140°16.73 26.18	234°23.05 11.59	Antares 112°16.32 -26°29.23
15	235°50.13	17°58.80 · · 12.69		155°19.13 · · 26.19	249°25.67 · · 11.65	Atria 107°10.99 -69°4.53
16	250° 52.59	32°58.31 13.70		170°21.52 26.19	264°28.29 11.71 279°30.91 11.77	Sabik 102°3.18 -15°45.31
17 18	265° 55.05 280° 57.52	47°57.83 14.84 62°57.34 \$15°15.91		185°23.92 26.19 200°26.31 N22°26.19	279°30.91 11.77 294°33.53 \$08°11.83	Shaula 96°10.80 -37°7.40
19	295°59.98	77°56.85 16.98	_	215°28.71 26.20	309°36.14 11.90	Rasalhague 95°58.86 12°32.67
20	311°2.45	92°56.36 18.0		230°31.11 26.20	324°38.76 11.96	Eltanin 90°42.38 51°29.38 Kaus Aust. 83°32.85 -34°22.46
21	$326^{\circ}4.91$	107°55.88 · · 19.13		245°33.50 · · 26.20	339°41.38 · · 12.02	Vega 80°33.39 38°48.62
22	341°7.37	122°55.39 20.20		260°35.90 26.21	354°44.00 12.08	Nunki 75°48.02 -26°16.00
23	356°9.84	137°54.90 21.2°	7 249°26.27 6.22	275°38.30 26.21	9°46.61 12.14	Altair 62°0.09 8°56.15
Mer. _I	pass. 23:15	ν -0.5 $'$ $d1.1'$ m-3.91	$\nu 1.0' \ d$ -0.1' m0.46	ν 2.4′ d 0.0′ m -2.47	$ u 2.6' \ d0.1' \ m0.66$	Peacock 53°5.81 -56°39.50
						Deneb 49°25.76 45°22.34
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.80 9°59.44
0	11° 12.30	152°54.41 \$15°22.3		290°40.70 N22°26.21	24°49.23	Al Na'ir 27°32.81 -46°50.54 Fomalhaut 15°14.43 -29°29.44
1	$26^{\circ}14.77$	167°53.92 23.4	1 279°28.37 6.04	305°43.10 26.22	39°51.85 12.26	Scheat 13°45.13 28°13.17
2	41° 17.23	182°53.43 24.44		320°45.50 26.22	54°54.47 12.33	Markab 13°29.85 15°20.44
3	56° 19.69	197°52.94 · · 25.5		335°47.90 · · 26.22	69°57.08 · · 12.39	
4 5	71°22.16 86°24.62	212°52.45 26.65 227°51.95 27.66		350°50.30 26.22 5°52.70 26.23	84°59.70 12.45 100°2.32 12.51	Sep 30 Mon SHA Mer.pass Venus 144°3.37 13:47
6	101°27.09	242°51.46 S15°28.7		20°55.10 N22°26.23	115°4.93 S08°12.57	Mars 254°23.38 06:25
7	116° 29.55	257°50.97 29.83		35°57.50 26.23	130°7.55 12.63	Jupiter 279°31.97 04:44
8	131°32.01	272°50.48 30.8		50°59.90 26.24	145°10.17 12.69	Saturn 13°29.48 22:25
9	146°34.48	287°49.98 · · 31.99		66°2.30 · · 26.24	160°12.78 · · 12.75	Oct 01 Tue SHA Mer.pass
10	161°36.94	302°49.49 33.00		81°4.70 26.24	175°15.40 12.81	Venus 142°52.87 13:48
11	176° 39.41 191° 41.87	317°48.99 34.0° 332°48.50 \$15°35.14		96°7.10 26.24 111°9.51 N22°26.25	190°18.02 12.87 205°20.63 \$08°12.94	Mars 253°49.06 06:23
12 13	191 41.87 206° 44.33	332°48.50 \$15°35.14 347°48.00 36.20		111°9.51 N22°26.25 126°11.91 26.25	205°20.63 \$08°12.94 220°23.25 13.00	Jupiter 279°30.08 04:40
14	221°46.80	2°47.51 37.20	_	141°14.31 26.25	235°25.87 13.06	Saturn 13°33.23 22:21
15	$236^{\circ}49.26$	17°47.01 · · 38.3	2 129°43.14 · · 4.77	156°16.72 · · 26.25	250°28.48 · · 13.12	Oct 02 Wed SHA Mer.pass
16	251°51.73	32°46.51 39.3		171°19.12 26.26	265°31.10 13.18	Venus 141°42.11 13:49
17	266° 54.19	47°46.01 40.4		186°21.53 26.26	280°33.71 13.24	Mars 253°15.02 06:22
18	281° 56.65 296° 59.12	62°45.52 \$15°41.50 77°45.02 42.50		201°23.93 N22°26.26	295°36.33	Jupiter 279°28.40 04:37
19 20	312°1.58	77°45.02 42.50 92°44.52 43.60		216°26.34 26.27 231°28.74 26.27	310°38.95 13.36 325°41.56 13.42	Saturn 13°36.93 22:17
21	312 1.56 327°4.05	107°44.02 · · 44.6	_	246°31.15 · · 26.27	340°44.18 · · 13.48	Horizontal parallax
22	$342^{\circ}6.51$	122°43.52 45.73	3 234°50.56 4.12	261°33.55 26.27	355°46.79 13.54	Venus: 0.1
23	357°8.97	137°43.02 46.73	3 249°51.62 4.03	276°35.96 26.28	10°49.41 13.60	Mars: 0.1
Mer.	pass. 23:11	ν-0.5′ d1.1′ m-3.91	ν1.1' d-0.1' m0.45	ν2.4' d0.0' m-2.47	ν2.6' d0.1' m0.66	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°30.46	S02°54.40	209°24.00	16.2'	$N11^{\circ}19.16$	-13.4'	54.2'
1	197°30.67	55.37	223°59.23	16.3'	11°5.78	-13.4'	54.2'
2 3	212°30.87 227°31.07	56.34 •• 57.32	238°34.51 253°9.84	16.3' 16.4'	10°52.37 10°38.92	-13.5' -13.5'	54.2' 54.2'
4	242°31.28	58.29	267°45.21	16.4	10° 35.92	-13.5'	54.2
5	257°31.48	02°59.26	282°20.64	16.5'	10°11.91	-13.6'	54.2'
6	272°31.68	S 03°0.23	$296^{\circ}56.11$	16.5'	N09°58.36	-13.6'	54.2'
7	287°31.89	1.20	311°31.62	16.6'	09°44.78	-13.6'	54.2'
8 9	302°32.09 317°32.29	2.17 · · 3.14	326°7.18 340°42.78	16.6' 16.6'	09°31.16 09°17.52	-13.6' -13.7'	54.1' 54.1'
10	332°32.49	4.11	355°18.43	16.7	09 17.32 09°3.84	-13.7'	54.1
11	347°32.70	5.08	9°54.11	16.7'	08°50.14	-13.7'	54.1'
12	2°32.90	\$03°6.05	24°29.84	16.8'	N08°36.40	-13.8'	54.1'
13	17°33.10 32°33.30	7.02 7.99	39°5.60 53°41.41	16.8' 16.8'	08°22.64 08°8.86	-13.8' -13.8'	54.1' 54.1'
14 15	32 33.30 47°33.51	· · 8.96	68°17.25	16.8	08 8.86 07°55.05	-13.8'	54.1'
16	62°33.71	9.93	82°53.12	16.9'	07°41.21	-13.9'	54.1'
17	77°33.91	10.90	97°29.04	16.9'	$07^{\circ}27.35$	-13.9'	54.1'
18	92°34.11	S03°11.87	112°4.98	17.0'	N07°13.47	-13.9'	54.1'
19 20	107°34.31 122°34.51	12.84 13.81	126°40.96 141°16.97	17.0' 17.0'	06°59.56 06°45.63	-13.9' -13.9'	54.1' 54.0'
21	137°34.72	. 14.78	155°53.01	17.1	06°31.68	-13.9 -14.0'	54.0'
22	152°34.92	15.75	170°29.09	17.1	06°17.72	-14.0'	54.0'
23	$167^{\circ}35.12$	16.72	185°5.19	17.1'	$06^{\circ}3.73$	-14.0'	54.0'
	SD = 16.0'	d = 1.0'		SI	D = 14.8'		
_							
Tue 0	GHA 182°35.32	Dec \$03°17.69	GHA 199°41.32	u 17.2'	Dec N05°49.72	<i>d</i> -14.0'	HP 54.0'
1	182 35.32 197°35.52	18.65	199 41.32 214°17.47	17.2'	05°35.70	-14.0' -14.0'	54.0'
2	212°35.72	19.62	228°53.65	17.2'	05°21.66	-14.1'	54.0'
3	227°35.92	• • 20.59	243°29.86	17.2'	05°7.60	-14.1'	54.0'
4	242°36.12	21.56	258°6.09 272°42.35	17.3'	04°53.53	-14.1'	54.0'
5 6	257°36.32 272°36.52	22.53 S 03°23.50	272°42.35 287°18.62	17.3' 17.3'	04°39.44 N04°25.34	-14.1' -14.1'	54.0' 54.0'
7	287°36.72	24.47	301°54.92	17.3'	04°11.23	-14.1'	54.0'
8	302°36.92	25.44	316°31.24	17.3'	$03^{\circ}57.11$	-14.1'	54.0'
9	317°37.12	26.41	331°7.57	17.4	03°42.97	-14.1'	54.0'
10 11	332°37.32 347°37.52	27.38 28.34	345°43.92 0°20.29	17.4' 17.4'	03°28.82 03°14.67	-14.2' -14.2'	54.0' 54.0'
12	2°37.72	503°29.31	14°56.68	17.4	N03°0.50	-14.2	53.9'
13	17°37.92	30.28	29°33.08	17.4'	02°46.32	-14.2'	53.9'
14	32°38.12	31.25	44°9.50	17.4'	$02^{\circ}32.14$	-14.2'	53.9'
15	47°38.32 62°38.52	• • 32.22	58°45.92 73°22.36	17.4' 17.5'	02°17.95 02°3.76	-14.2' -14.2'	53.9'
16 17	77°38.71	33.19 34.16	73 22.30 87°58.81	17.5'	02 3.76 01°49.56	-14.2'	53.9' 53.9'
18	92°38.91	S03°35.12	102°35.27	17.5'	N01°35.35	-14.2'	53.9'
19	107°39.11	36.09	$117^{\circ}11.74$	17.5'	$01^{\circ}21.14$	-14.2'	53.9'
20	122°39.31	37.06	131°48.22		01°6.93		53.9'
21 22	137°39.51 152°39.71	· · 38.03 39.00	146°24.70 161°1.19	17.5' 17.5'	00°52.71 00°38.50	-14.2' -14.2'	53.9' 53.9'
23	167°39.90	39.96	175°37.69	17.5	00°24.28	-14.2'	53.9'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 0	182°40.10	S03°40.93	190°14.19	ν 17.5'	N00°10.06	-14.2'	53.9'
1	197°40.30	41.90	204°50.69	17.5'	S00°4.15	14.2'	53.9'
2	212°40.50	42.87	219°27.19	17.5'	00°18.37	14.2'	53.9'
3 4	227°40.69 242°40.89	· · 43.83 44.80	234°3.69 248°40.20	17.5' 17.5'	00°32.58 00°46.79	14.2' 14.2'	53.9' 53.9'
5	257°41.09	44.60 45.77	263°16.70	17.5'	00 40.79 01°1.00	14.2'	53.9'
6	272°41.28	S03°46.74	277°53.20	17.5'	S01°15.20	14.2'	53.9'
7	287°41.48	47.70	292°29.69	17.5'	01°29.40	14.2'	53.9'
8	302°41.68 317°41.87	48.67 •• 49.64	307°6.19 321°42.67	17.5' 17.5'	01°43.59 01°57.78	14.2' 14.2'	53.9' 53.9'
9 10	317°41.87 332°42.07	50.61	321°42.67 336°19.16	17.5'	01°57.78 02°11.95	14.2'	53.9' 53.9'
11	347°42.27	51.57	350°55.63	17.5	02°26.12	14.2'	53.9'
12	2°42.46	S03°52.54	5°32.09	17.5'	S02°40.28	14.2'	53.9'
13	17°42.66	53.51	20°8.55	17.4	02°54.43	14.1'	53.9'
14 15	32°42.85 47°43.05	54.47 •• 55.44	34°45.00 49°21.43	17.4' 17.4'	03°8.57 03°22.70	14.1' 14.1'	53.9' 53.9'
16	62°43.25	56.41	63°57.86	17.4'	03°36.82	14.1	53.9'
17	77°43.44	57.37	78°34.27	17.4'	03°50.92	14.1'	53.9'
18	92°43.64	S03°58.34	93°10.66	17.4	S04°5.02	14.1'	53.9'
19 20	107°43.83 122°44.03	03°59.31 04°0.27	107°47.04 122°23.41	17.4' 17.3'	04°19.09 04°33.15	14.1' 14.0'	53.9' 53.9'
21	137°44.22	• • 1.24	136°59.76	17.3	04 33.13 04°47.20	14.0'	53.9'
22	152°44.42	2.20	151°36.09	17.3'	$05^{\circ}1.23$	14.0'	53.9'
23	167°44.61	3.17	166°12.40	17.3'	05°15.24	14.0'	53.9'
	SD = 16.0'	d = 1.0'		SI	D = 14.7'	<u>-</u>	

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junioc	Juliset	Civil	Naut.
N 72°	03:51	05:13	06:21	17:16	18:23	19:44
N 70°	04:03	05:17	06:17	17:20	18:20	19:33
68°	04:13	05:19	06:14	17:23	18:18	19:24
66°	04:20	05:21	06:12	17:25	18:16	19:16
64°	04:27	05:23	06:10	17:28	18:15	19:10
62°	04:32	05:24	06:08	17:30	18:14	19:05
60°	04:36	05:25	06:06	17:31	18:13	19:01
N 58°	04:40	05:26	06:05	17:33	18:12	18:57
56°	04:43	05:27	06:04	17:34	18:11	18:54
54°	04:46	05:27	06:03	17:35	18:10	18:52
52°	04:49	05:28	06:02	17:36	18:10	18:49
50°	04:51	05:28	06:01	17:38	18:10	18:47
45°	04:55	05:29	05:58	17:40	18:09	18:43
N 40°	04:58	05:30	05:57	17:42	18:09	18:40
35°	05:00	05:30	05:55	17:43	18:09	18:38
30°	05:02	05:30	05:54	17:45	18:09	18:37
20°	05:03	05:29	05:51	17:48	18:10	18:35
N 10°	05:03	05:28	05:49	17:50	18:11	18:36
0°	05:02	05:26	05:46	17:53	18:13	18:37
S 10°	04:58	05:23	05:44	17:55	18:16	18:41
20°	04:53	05:19	05:41	17:58	18:20	18:46
30°	04:46	05:14	05:38	18:02	18:26	18:54
35°	04:41	05:11	05:36	18:04	18:29	18:59
40°	04:35	05:07	05:34	18:06	18:33	19:05
45°	04:27	05:02	05:31	18:09	18:38	19:13
S 50°	04:17	04:56	05:28	18:12	18:44	19:23
52°	04:12	04:53	05:27	18:13	18:47	19:28
54°	04:06	04:49	05:25	18:15	18:51	19:34
56°	04:00	04:46	05:23	18:17	18:55	19:41
58°	03:53	04:42	05:22	18:19	18:59	19:48
S 60°	03:45	04:37	05:19	18:21	19:04	19:56

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	01:41	03:47	05:44	18:02	17:29	16:57
N 70°	02:00	03:54	05:42	17:52	17:27	17:02
68°	02:14	04:00	05:41	17:44	17:25	17:06
66°	02:26	04:04	05:39	17:37	17:23	17:10
64°	02:36	04:08	05:38	17:31	17:22	17:13
62°	02:44	04:12	05:37	17:26	17:21	17:16
60°	02:52	04:15	05:37	17:22	17:20	17:18
N 58°	02:58	04:18	05:36	17:18	17:19	17:20
56°	03:03	04:20	05:35	17:14	17:18	17:22
54°	03:08	04:22	05:35	17:11	17:18	17:24
52°	03:13	04:24	05:34	17:08	17:17	17:26
50°	03:17	04:26	05:34	17:05	17:16	17:27
45°	03:26	04:30	05:33	17:00	17:15	17:30
N 40°	03:33	04:33	05:32	16:55	17:14	17:33
35°	03:39	04:36	05:31	16:51	17:13	17:35
30°	03:44	04:38	05:31	16:47	17:12	17:37
20°	03:54	04:42	05:30	16:40	17:11	17:41
N 10°	04:02	04:46	05:29	16:34	17:09	17:44
0°	04:10	04:49	05:28	16:29	17:08	17:47
S 10°	04:17	04:53	05:27	16:23	17:07	17:50
20°	04:25	04:56	05:26	16:17	17:05	17:53
30°	04:34	05:00	05:25	16:11	17:04	17:56
35°	04:40	05:03	05:25	16:07	17:03	17:58
40°	04:46	05:05	05:24	16:02	17:02	18:01
45°	04:53	05:08	05:24	15:57	17:00	18:03
S 50°	05:01	05:12	05:23	15:50	16:59	18:07
52°	05:05	05:14	05:22	15:47	16:58	18:08
54°	05:09	05:16	05:22	15:44	16:57	18:10
56°	05:13	05:18	05:22	15:41	16:56	18:12
58°	05:18	05:20	05:21	15:37	16:56	18:14
S 60°	05:24	05:22	05:20	15:32	16:54	18:16

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	7-1%	
30	10:02	10:12	11:50	10:19	22:39		
01	10:21	10:31	11:49	10:59	23:18		
02	10:40	10:50	11:49	11:37	23:57		

October 03, 04, 05 UT (Thu., Fri., Sat.)

h	Aries	Ve	nus	,	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	12°11.44	152° 42.52		264°52.68	N23°3.94	291°38.37	N22°26.28	25°52.02	S08°13.66			
1	27° 13.90	167°42.02	48.89	279°53.74	3.85	306°40.78	26.28	40°54.64	13.72	Alpheratz	357°34.68	29°13.76
2	42°16.37	182°41.52	49.95	294°54.81	3.75	321°43.18	26.28	55°57.25	13.78	Ankaa	353°6.93	-42°10.22
3	57° 18.83	$197^{\circ}41.01$	• • 51.00	309°55.87	• • 3.66	336°45.59	• • 26.28	70°59.87	• • 13.84	Schedar Diphda	349°30.79 348°47.20	56°40.46 -17°50.93
4	$72^{\circ}21.29$	212°40.51	52.05	324°56.93	3.57	351°48.00	26.29	86°2.48	13.90	Achernar	335° 19.75	-17 50.93 -57°6.53
5	87°23.76	227°40.01	53.10	339°58.00	3.47	6°50.41	26.29	101°5.10	13.96	Hamal	327°51.15	23°34.85
6	102°26.22	242°39.51	\$15°54.15	354°59.06	N23°3.38	21°52.82	N22°26.29	116°7.71	S08°14.02	Polaris	313°46.31	89°21.94
7	117°28.69	257°39.00	55.20	10°0.13	3.29	36°55.23	26.29	131°10.33	14.08	Acamar	315°11.58	-40°12.08
8	132°31.15	272°38.50	56.25	25°1.19	3.19	51°57.64	26.30	146°12.94	14.14	Menkar	$314^{\circ}6.14$	4°11.35
9 10	147°33.61 162°36.08	287°37.99 302°37.49	• • 57.30 58.35	40°2.26 55°3.33	· · 3.10 3.00	67° 0.05 82° 2.46	· · 26.30 26.30	161°15.56 176°18.17	· · 14.20 14.26	Mirfak	308°28.24	49°56.88
11	102 30.06 177°38.54	302 37.49 317°36.98	56.55 15°59.40	70° 4.40	2.91	97° 4.87	26.30	170 18.17 191°20.78	14.20	Aldebaran	290°39.72	16°33.62
12	192°41.01	332° 36.47	\$16°0.45	85°5.46	N23°2.82	112°7.28	N22°26.31	206°23.40	\$08°14.38	Rigel	281°3.97	-8°10.16
13	207° 43.47	347°35.97	1.49	100°6.53	2.72	127° 9.70	26.31	221°26.01	14.44	Capella	280°22.07	46°1.26
14	222°45.93	2°35.46	2.54	$115^{\circ}7.60$	2.63	$142^{\circ}12.11$	26.31	236°28.63	14.50	Bellatrix	278°23.02	6°22.46
15	237°48.40	17°34.95	• • 3.58	130°8.67	• • 2.53	157°14.52	• • 26.31	251°31.24	• • 14.56	Elnath Alnilam	278°2.05 275°37.87	28°37.69 -1°10.98
16	$252^{\circ}50.86$	32°34.44	4.63	$145^{\circ}9.74$	2.44	172°16.93	26.31	266°33.85	14.62	Betelgeuse	270°52.27	7°24.83
17	267°53.33	47°33.94	5.67	$160^{\circ}10.81$	2.34	187°19.35	26.32	281°36.47	14.68	Canopus	263°52.45	-52°42.11
18	282°55.79	62°33.43	S16°6.71	175°11.88	N23°2.25	202°21.76	N22°26.32	296°39.08	S08°14.74	Sirius	258° 26.44	-16°44.73
19	297°58.25	77°32.92	7.76	190°12.95	2.15	217°24.18	26.32	311°41.70	14.80	Adhara	255°6.07	-29°0.00
20	313°0.72	92°32.41	8.80	205°14.02	2.06	232°26.59	26.32	326°44.31	14.86	Procyon	244°51.15	5°9.84
21	328°3.18	107°31.90	• • 9.84	220°15.10	• • 1.96	247°29.01	• • 26.32	341°46.92	• • 14.92	Pollux	243°17.68	27°57.99
22 23	343°5.65 358°8.11	122°31.38 137°30.87	10.88	235°16.17 250°17.24	1.87	262°31.42 277°33.84	26.33	356°49.54 11°52.15	14.97	Avior	$234^{\circ}15.12$	-59°34.93
23	330 0.11		11.92		1.77	_	26.33		15.03	Suhail	222°46.76	-43°31.61
Mer.	pass. 23:07	$ u$ -0.5 $^{\prime}$ d1	.1' m-3.91	$\nu 1.1' \ d$ -0	.1' m0.44	$\nu 2.4' \ d0.$.0′ m-2.48	ν 2.6 $^{\prime}$ d0	.1' m0.66	Miaplacidus	221°38.94	-69°48.76
										Alphard	217°48.20	-8°45.74
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.94	11°50.89
0	13° 10.58	152°30.36	S16°12.96	265°18.32	N23°1.67	292°36.25	N22°26.33	26°54.76	S08°15.09	Dubhe	193°41.84 182°25.50	61°37.01 14°26.15
1	28°13.04	$167^{\circ}29.85$	14.00	$280^{\circ}19.39$	1.58	307°38.67	26.33	41°57.37	15.15	Denebola Gienah	162 25.50 175°44.17	-17°40.61
2	43° 15.50	182°29.34	15.04	295°20.46	1.48	322°41.09	26.33	56°59.99	15.21	Acrux	173 44.17 173°1.14	-63°14.07
3	$58^{\circ}17.97$	197°28.82	•• 16.07	310°21.54	• • 1.39	337°43.50	• • 26.34	72°2.60	•• 15.27	Gacrux	171°52.55	-57°15.00
4	73°20.43	212°28.31	17.11	325°22.61	1.29	352°45.92	26.34	87°5.21	15.33	Alioth	166° 13.69	55°49.61
5	88°22.90	227°27.79	18.15	340°23.69	1.19	7°48.34	26.34	102°7.83	15.39	Spica	158°22.88	-11°17.31
6	103°25.36	242°27.28	S16°19.18	355°24.77	N23°1.10	22°50.76	N22°26.34	117°10.44	S08°15.45	Alkaid	152° 52.63	49°11.51
7	118° 27.82	257°26.76	20.21	10°25.84	1.00	37°53.18	26.34	132°13.05	15.51	Hadar	148°37.01	-60°29.56
8 9	133°30.29 148°32.75	272°26.25 287°25.73	21.25 •• 22.28	25°26.92 40°28.00	0.90 •• 0.81	52°55.60 67°58.02	26.34 •• 26.35	147°15.66 162°18.27	15.56	Menkent	147°58.30	-36°29.46
10	146 32.75 163°35.22	302°25.21	23.31	55°29.08	0.71	83° 0.44	26.35	102 16.27 177°20.89	· · 15.62 15.68	Arcturus	145°48.43	19° 3.35
11	178° 37.68	317°24.70	24.35	70°30.16	0.71	98°2.86	26.35	177 20.89 192°23.50	15.74	Rigil Kent.	139°41.27	-60°56.31
12	193° 40.14	332°24.18	\$16°25.38	85°31.24	N23°0.51	113°5.28	N22°26.35	207°26.11	S08°15.80	Kochab	137°20.70	74°3.34
13	208° 42.61	347°23.66	26.41	100°32.32	0.42	128°7.70	26.35	222°28.72	15.86	Zuben'ubi	136°56.57	-16°8.61
14	223°45.07	2°23.14	27.44	115°33.40	0.32	143°10.12	26.35	237°31.33	15.92	Alphecca	126°4.20 112°16.34	26°38.05 -26°29.23
15	238° 47.54	17°22.62	• • 28.47	130°34.48	• • 0.22	158°12.54	• • 26.36	252°33.95	• • 15.97	Antares Atria	112 10.34 107°11.03	-20 29.23 -69°4.52
16	253°50.00	32°22.10	29.49	145°35.56	0.12	173°14.96	26.36	267°36.56	16.03	Sabik	102°3.20	-15°45.31
17	268° 52.46	47°21.58	30.52	160°36.64	23°0.03	188°17.39	26.36	282°39.17	16.09	Shaula	96° 10.82	-37°7.39
18	283°54.93		S16°31.55	175°37.72	N22°59.93	203°19.81	N22°26.36	297°41.78	S08°16.15	Rasalhague	95°58.87	12°32.66
19	298°57.39	77°20.54	32.57	190°38.81	59.83	218°22.23	26.36	312°44.39	16.21	Eltanin	90°42.41	51°29.37
20	313°59.86 329°2.32	92°20.02 107°19.50	33.60 •• 34.62	205°39.89 220°40.97	59.73 •• 59.63	233°24.66 248°27.08	26.36 •• 26.36	327°47.00 342°49.61	16.27 •• 16.32	Kaus Aust.	83°32.87	-34°22.46
21 22	344°4.78	107 19.50 122°18.97	35.65	235°42.06	59.54	263°29.50	26.37	357°52.22	16.38	Vega	80°33.41	38°48.62
23	359°7.25	137° 18.45	36.67	250°43.14	59.44	278°31.93	26.37	12°54.84	16.44	Nunki	75°48.04	-26°16.00
										Altair	62°0.11	8°56.15
Mer.	pass. 23:04	ν -0.5′ d1	.0′ m-3.91	ν 1.1' d-0	.1′ m0.42	$\nu^{2.4'} d0.$.0′ m-2.49	$\nu^{2.6'} d0$.1′ m0.67	Peacock	53°5.84 49°25.78	-56°39.51 45°22.35
										Deneb Enif	33°38.82	9°59.44
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°32.83	-46°50.55
0	14°9.71		S 16°37.69	265°44.23	N22°59.34		N22°26.37	27°57.45	S08°16.50	Fomalhaut	15° 14.44	-29°29.45
1	29° 12.18	167° 17.40	38.72	280°45.31	59.24	308°36.78	26.37	43°0.06	16.56	Scheat	13°45.13	28°13.18
2	44° 14.64	182°16.88	39.74	295°46.40	59.14	323°39.21	26.37	58°2.67	16.61	Markab	$13^{\circ}29.85$	15°20.44
3	59° 17.10	197°16.35	• • 40.76	310°47.49	• • 59.04	338°41.63	• • 26.37	73°5.28	· · 16.67	O-+ 02 Th	SHA	M
4	74° 19.57 89° 22.03	212° 15.83 227° 15.30	41.78	325°48.57 340°49.66	58.94	353°44.06 8°46.49	26.37	88°7.89 103°10.50	16.73 16.79	Oct 03 Thu	3HA 140°31.08	Mer.pass 13:50
5 6	104° 24.50	242° 14.78	42.80 \$16°43.82	355°50.75	58.84 N22°58.74	23°48.91	26.38 N22° 26.38	118° 13.11	S08°16.84	Mars	252°41.24	06:20
7	119° 26.96	257°14.25	44.83	10°51.84	58.64	38°51.34	26.38	133°15.72	16.90		279°26.93	04:33
8	134° 29.43	272°13.72	45.85	25°52.93	58.54	53°53.77	26.38	148°18.33	16.96	Saturn	13°40.58	22:13
9	149°31.89	287° 13.19	• • 46.87	40°54.02	• • 58.45	68°56.20	26.38	163°20.94	. 17.02			
10	164°34.35	302°12.67	47.88	55°55.11	58.35	83°58.63	26.38	178°23.55	17.07	Oct 04 Fri	SHA 120°10.70	Mer.pass
11	179°36.82	317° 12.14	48.90	70°56.20	58.25	99°1.06	26.38	193°26.16	17.13		139°19.79	13:50
12	194°39.28		S 16°49.91	85°57.29	N22°58.15	114° 3.49	N22°26.38	208°28.77	S08°17.19	Mars	252°7.74 279°25.68	06:18 04:29
13	209°41.75	347°11.08	50.93	100°58.38	58.05	129°5.92	26.39	223°31.38	17.25	Saturn	13°44.19	22:08
14	224° 44.21	2°10.55	51.94	115°59.48	57.94	144°8.35	26.39	238°33.99	17.30			
15	239° 46.67	17° 10.02	• • 52.95	131°0.57	• • 57.84	159°10.78	• • 26.39	253°36.60	17.36	Oct 05 Sat	SHA	Mer.pass
16	254°49.14	32°9.49	53.96	146°1.66	57.74	174°13.21	26.39	268°39.21	17.42	Venus	138°8.22	13:51
17	269°51.60 284°54.07	47°8.95	54.97 \$16°55.98	161°2.76 176°3.85	57.64 N22°57.54	189°15.64 204°18.07	26.39 N22°26.39	283°41.82 298°44.42	17.47 \$08°17.53	I	251°34.52	06:17
18 19	284 54.07 299°56.53	77°7.89	56.99	170 3.85 191° 4.94	N22 57.54 57.44	204 18.07 219°20.50	26.39	298 44.42 313°47.03	17.59		279°24.64	04:25
20	314°58.99	92°7.36	58.00	206° 6.04	57.34	234°22.94	26.39	328°49.64	17.65	Saturn	13°47.73	22:04
21	330°1.46	107°6.82	16°59.01	221°7.14	• • 57.24	249°25.37	. 26.39	343°52.25	17.70	Horizo	ntal parallax	
22	345°3.92	122°6.29	17°0.02	236° 8.23	57.14	264°27.80	26.39	358°54.86	17.76		Venus:	0.1
23	0°6.39	137°5.75	1.02	251°9.33	57.04	279°30.24	26.40	13°57.47	17.82		Mars:	0.1
Mer	pass. 23:00	_{1/−} 0 5/ √1	.0′ m-3.92	ν1 1/ d.Ω	.1′ m0.41	υ2 Δ' dΩ	.0′ m-2.50	1/2 6/ d0	.1′ m0.67			
14161.	20.00	- U.J UI	.5 111 5.32	ν 1.1 u-0		ν Z.¬ UU.						

1 —	011-010 =	+0.0300 Sec	$\Delta I - II$	-011	— +09.1232	2 360	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°44.80	S04°4.14	180°48.69	17.3'	S05°29.24	14.0'	53.9'
1	197°45.00	5.10	195°24.96	17.2'	05°43.21	14.0'	53.9'
2	212°45.19	6.07	210°1.21	17.2'	05°57.17	13.9'	53.9'
3	227° 45.39	• • 7.03	224°37.43	17.2'	06°11.10	13.9'	53.9'
1 5	242°45.58 257°45.77	8.00 8.96	239°13.64 253°49.81	17.2' 17.2'	06°25.02 06°38.91	13.9' 13.9'	53.9' 53.9'
5	272° 45.97	504° 9.93	268°25.96	17.1	S06°52.78	13.8'	53.9
7	287° 46.16	10.90	283° 2.09	17.1	07° 6.63	13.8'	53.9
3	302°46.35	11.86	297°38.18	17.1'	07°20.45	13.8'	53.9'
)	317°46.55	• • 12.83	312°14.25	17.0'	07°34.25	13.8'	53.9'
0	332°46.74	13.79	326°50.29	17.0'	07°48.02	13.7'	53.9'
1	347°46.93	14.76	341°26.30	17.0'	08° 1.77	13.7'	53.9'
2	2°47.13	S04°15.72	356° 2.27	16.9'	508°15.48	13.7'	53.9'
3	17°47.32	16.69	10°38.22	16.9'	08°29.17	13.7'	53.9'
4	32°47.51	17.65	25°14.13	16.9'	08°42.84	13.6'	53.9'
5	47° 47.70	• • 18.62	39°50.00	16.8'	08°56.47	13.6'	53.9'
6 7	62°47.89 77°48.09	19.58	54°25.85 69°1.65	16.8'	09°10.07 09°23.64	13.6'	53.9'
7 3	92°48.28	20.54 \$04°21.51	83°37.42	16.8' 16.7'	509°37.17	13.5' 13.5'	53.9' 53.9'
)	92 46.26 107°48.47	22.47	98°13.15	16.7	09°50.68	13.5	53.9'
)	122° 48.66	23.44	112°48.84	16.7	10° 4.15	13.4	53.9
1	137° 48.85	24.40	112 48.84 127°24.49	16.6'	10° 4.13	13.4	53.9
2	157° 48.03	25.37	142° 0.09	16.6'	10°17.30	13.4	53.9
3	167°49.23	26.33	156°35.66	16.5	10° 30.90	13.3'	53.9'
	SD = 16.0'	d = 1.0'			0 = 14.7'		
	3D = 10.0	u = 1.0		JL.	0 = 14.7		
ri	GHA	Dec	GHA	ν	Dec	d	HP
)	182°49.42	S04°27.29	171°11.19	16.5'	\$10°57.67	13.3'	53.9'
L	197°49.61	28.26	185°46.67	16.4'	11°10.96	13.3'	53.9'
2	212°49.81	29.22	200°22.10	16.4'	11°24.21	13.2'	53.9'
3	227°50.00	30.18	214°57.49	16.3'	11°37.42	13.2'	53.9'
1	242°50.19 257°50.38	31.15 32.11	229°32.84 244°8.14	16.3' 16.2'	11°50.59 12°3.72	13.1' 13.1'	54.0'
5 5	257 50.38 272°50.57	504°33.07	244 8.14 258°43.38	16.2	\$12°16.81	13.1	54.0' 54.0'
,	287° 50.76	34.04	273° 18.58	16.1	12°29.85	13.0'	54.0'
3	302°50.95	35.00	287°53.73	16.1	12°42.85	13.0'	54.0'
9	317°51.13	• • 35.96	302°28.83	16.0'	12°55.81	12.9'	54.0'
0	332°51.32	36.93	317°3.88	16.0'	13°8.72	12.9'	54.0'
1	$347^{\circ}51.51$	37.89	331°38.87	15.9'	13°21.58	12.8'	54.0'
2	2°51.70	S04°38.85	346°13.81	15.9'	S13°34.40	12.8'	54.0'
3	17°51.89	39.81	0°48.70	15.8'	13°47.17	12.7'	54.0'
4	32°52.08	40.78	15°23.53	15.8'	13°59.89	12.7'	54.0'
5	47°52.27	• • 41.74	29°58.31	15.7'	14°12.56	12.6'	54.0'
6	62°52.46	42.70	44°33.02	15.7'	14°25.17	12.6'	54.0'
7 8	77°52.64 92°52.83	43.66 S 04°44.63	59°7.68 73°42.29	15.6' 15.5'	14°37.74 \$14°50.25	12.5' 12.5'	54.0'
9	92 52.83 107°53.02	45.59	73 42.29 88°16.83		15° 2.71		54.0' 54.0'
9	107 53.02 122° 53.21	46.55	102°51.31	15.4	15° 15.12	12.4'	54.0'
1	137°53.39	47.51	117°25.73	15.4	15°27.47	12.3'	54.1'
2	152°53.58	48.47	132° 0.09	15.3'	15°39.77	12.2'	54.1'
3	167°53.77	49.43	146°34.39	15.2'	15°52.00	12.2'	54.1'
	SD = 16.0'	d = 1.0'	-	SE	0 = 14.7'		
	<u> </u>						
t	GHA	Dec	GHA	ν	Dec	d	HP
)	182°53.96	S04°50.40	161°8.62	15.2'	\$16°4.18	12.1'	54.1'
	197°54.14 212°54.33	51.36	175°42.79	15.1'	16°16.30	12.1'	54.1'
2	212°54.33 227°54.52	52.32 •• 53.28	190°16.89 204°50.93	15.0' 15.0'	16°28.36 16°40.36	12.0' 11.9'	54.1' 54.1'
ļ	242° 54.52	54.24	204 50.93 219°24.90	15.0 14.9'	16° 40.36 16° 52.30	11.9'	54.1'
! 5	242 54.70 257°54.89	55.20	219 24.90 233°58.80	14.8	10 52.30 17°4.18	11.8'	54.1'
5	272°55.08	504°56.16	248°32.64	14.8	\$17°15.99	11.7	54.1
, 7	287° 55.26	57.12	263° 6.41	14.7	17°27.74	11.7	54.1
3	302°55.45	58.08	277°40.10	14.6'	17°39.42	11.6'	54.2'
9	317°55.63	04°59.04	292°13.73	14.6'	17°51.03	11.5'	54.2'
0	332°55.82	05°0.00	306°47.29	14.5'	18°2.58	11.5'	54.2'
1	347°56.00	0.96	321°20.77	14.4'	18°14.06	11.4'	54.2'
2	2°56.19	S05°1.92	335°54.18	14.3'	S18°25.47	11.3'	54.2'
3	17° 56.37	2.88	350°27.52	14.3'	18°36.81	11.3'	54.2'
4	32°56.56	3.84	5°0.79	14.2'	18°48.08	11.2'	54.2'
5	47°56.74	• • 4.80	19°33.98	14.1'	18°59.27	11.1'	54.2'
6	62°56.93	5.76	34°7.10	14.0'	19°10.39	11.0'	54.2'
7	77°57.11	6.72	48°40.14	14.0'	19°21.44	11.0'	54.2'
8	92°57.30 107°57.48	S05°7.68 8.64	63°13.10 77°45.99	13.9'	\$19°32.42 19°43.31	10.9'	54.3'
9 0	107°57.48 122°57.66	8.64 9.60	77°45.99 92°18.80	13.8' 13.7'	19°43.31 19°54.13	10.8' 10.7'	54.3' 54.3'
1	122°57.66 137°57.85	9.60	92°18.80 106°51.53	13.7'	19°54.13 20°4.87	10.7'	54.3'
2	152° 58.03	11.52	100 51.53 121°24.19	13.6'	20 4.87 20°15.53	10.7	54.3'
3	167° 58.21	12.48	135°56.76	13.5	20°26.11	10.5	54.3
	$\frac{SD = 16.0'}{}$	d = 1.0'		SL	0 = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	04:06	05:27	06:34	17:01	18:08	19:27
N 70°	04:16	05:28	06:29	17:06	18:06	19:18
68°	04:24	05:30	06:25	17:10	18:06	19:11
66°	04:30	05:30	06:22	17:14	18:05	19:05
64°	04:36	05:31	06:19	17:17	18:04	19:00
62°	04:40	05:32	06:16	17:20	18:04	18:55
60°	04:44	05:32	06:14	17:22	18:04	18:52
N 58°	04:47	05:32	06:12	17:24	18:03	18:49
56°	04:49	05:33	06:10	17:26	18:03	18:46
54°	04:52	05:33	06:08	17:28	18:03	18:44
52°	04:54	05:33	06:07	17:30	18:03	18:42
50°	04:55	05:33	06:05	17:31	18:03	18:41
45°	04:59	05:33	06:02	17:34	18:03	18:37
N 40°	05:01	05:33	06:00	17:37	18:04	18:35
35°	05:03	05:32	05:57	17:39	18:05	18:34
30°	05:04	05:31	05:55	17:41	18:05	18:33
20°	05:04	05:30	05:52	17:45	18:07	18:33
N 10°	05:03	05:27	05:48	17:49	18:10	18:34
0°	05:00	05:25	05:45	17:52	18:13	18:37
S 10°	04:56	05:21	05:42	17:55	18:16	18:41
20°	04:51	05:16	05:38	17:59	18:21	18:47
30°	04:42	05:10	05:34	18:03	18:27	18:56
35°	04:36	05:06	05:32	18:06	18:31	19:01
40°	04:29	05:02	05:29	18:09	18:36	19:09
45°	04:21	04:56	05:26	18:12	18:42	19:17
S 50°	04:10	04:49	05:22	18:16	18:49	19:29
52°	04:04	04:46	05:20	18:18	18:53	19:34
54°	03:58	04:42	05:18	18:20	18:57	19:41
56°	03:51	04:38	05:16	18:23	19:01	19:48
58°	03:43	04:33	05:13	18:25	19:06	19:56
S 60°	03:34	04:27	05:10	18:28	19:11	20:05

Lat.		Moonris	e		Moonset	
Ldl.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	07:43	09:57		16:21	15:32	
N 70°	07:31	09:30	12:05	16:35	16:01	14:55
68°	07:22	09:11	11:16	16:46	16:22	15:45
66°	07:15	08:55	10:46	16:56	16:39	16:16
64°	07:08	08:42	10:23	17:04	16:53	16:40
62°	07:03	08:32	10:05	17:11	17:05	16:59
60°	06:58	08:22	09:51	17:17	17:15	17:14
N 58°	06:54	08:15	09:38	17:22	17:24	17:28
56°	06:51	80:80	09:27	17:27	17:32	17:39
54°	06:47	08:01	09:18	17:31	17:39	17:49
52°	06:44	07:56	09:10	17:35	17:45	17:58
50°	06:42	07:51	09:02	17:38	17:51	18:06
45°	06:36	07:40	08:46	17:46	18:03	18:24
N 40°	06:31	07:31	08:33	17:52	18:14	18:38
35°	06:27	07:24	08:22	17:58	18:22	18:50
30°	06:23	07:17	08:13	18:03	18:30	19:01
20°	06:17	07:06	07:56	18:11	18:44	19:19
N 10°	06:12	06:56	07:42	18:19	18:56	19:35
0°	06:07	06:47	07:29	18:26	19:07	19:50
S 10°	06:02	06:38	07:16	18:33	19:18	20:05
20°	05:57	06:28	07:02	18:41	19:30	20:21
30°	05:51	06:17	06:46	18:49	19:44	20:40
35°	05:47	06:11	06:37	18:54	19:52	20:51
40°	05:43	06:04	06:26	19:00	20:01	21:04
45°	05:39	05:55	06:14	19:07	20:12	21:19
S 50°	05:34	05:45	05:59	19:15	20:25	21:37
52°	05:31	05:41	05:53	19:19	20:31	21:46
54°	05:28	05:36	05:45	19:23	20:38	21:56
56°	05:26	05:30	05:37	19:28	20:46	22:07
58°	05:22	05:24	05:27	19:33	20:54	22:19
S 60°	05:19	05:17	05:16	19:38	21:04	22:34

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	1-3
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-4%
03	10:59	11:09	11:49	12:16	-:-	
04	11:18	11:27	11:49	12:57	00:36	
05	11:36	11:45	11:48	13:39	01:18	

October 06, 07, 08 UT (Sun., Mon., Tue.)

CHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
0 15°6 815 15°5 225 17°200 20°114.5 12°25 64 394°25 70 12°5 60 27°6 00 20°0 10°0 10°1 40°1 10°1 40°0 10°0 10°0 1	Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1 0.071.31 10.074.08 1.04 20.071.02 10.08 10.0 20.071.02 10.08 10.0 20.071.02 10.0 10.0 20.071.02 10.0 10.0 10.0 10.0 10.0 10.0 10.0							
2							
0.00 110.04 1997.851							
1							
	4	75° 18.71		326°14.82 56.53			· ·
Part 11	5	90°21.17		341°15.92 56.43	9°44.85 26.40	104°13.12 18.16	
1.							
1							
1							
11 108 38.6 316 316 316 316 317 316							
12 1918-38.42 331-98.76 3171-10.09 10-22.00 372-55.71 1157-19.1 1027-20.64 1 200-313.7 1081-105.7 10.09 11.0							Aldebaran 290°39.70 16°33.62
13 2101 40.88 346°8.22 1 10.64 1010°2412 5 95.61 1301°435 7 06.41 220°356.8 18.61 16.62 1010°2412 10.51 10.							
14 225° 43.55						224°33 98 18 61	
15 200"45.01 19"57.13 1.703 131"26.04 5.540 160"92.3							
16 25°-82.8 31°-96.99 13 03 140°2805 > 30 175°110′ 20.41 120°41.80 320°42.91 130°18.31 277.42 110′ 20.50 20.							
10 10 10 10 10 10 10 10	16	255° 48.28	31°56.59 18.03	146°28.05 55.30	175°11.67 26.41		
19 20 20 20 20 20 20 20 2	17	270°50.74	46°56.04 19.02	161°29.16 55.20	190°14.11 26.41	284°44.40 18.83	9
23 30 30 30 30 30 30 30							
31 31 31 32 30 30 30 30 31 32 32 32 32 32 32 32							
23							
Mor. pass. 22:56							
Mon GHA CHA Dec GHA Dec Deceloal 182°25.99 Deceloal 182°25.91 182°6.14 1							Avior 234°15.08 -59°34.92
Mon CHA CHA Dec Dubb 137'1412 217'14016 137'1412 137'14016 137'14016 137'1412 137'14016 137'	23	1 5.55	-				
GHA	Mer.p	pass. 22:56	ν -0.5 $'$ $d1.0'$ m-3.92	$ u 1.1' \; extit{d-0.1'} \; exttt{m0.40}$	ν 2.4′ d 0.0′ m-2.50	$ u 2.6' \ d0.1' \ m0.68$	
Mon GHA CHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec							
10 10 10 10 10 10 10 10	Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 31'10.45 169'13.68 26.94 281'38.02 54.37 310'33.65 26.41 45'5.25 10.28 128'38.13 173'4.13 46'34.146 36'34.146	0	16°7.99	151°52.23 \$17°25.95	266°36.91 N22°54.47	295°31.20 N22°26.41	30°2.65 \$08°19.22	
2 46°12.92 1815.113 27°93 296°39.13 54.26 325°36.09 26.41 60°7.86 19.33 3 6°17.38 106°50.56 20.91 311'40.24 311'							
3 61:1538 211:5003 20.90 30:4673 30.80 314:42.47 53.05 10:43.42 20:41 75:10.47 ***19.39 56**19.55 211:5003 20.90 30:643.55 30:643.55 36.40.68 35:540.99 20.41 100:16.80 19.50 56**19.55 56**19.59 56**19.55 5							
6 106*277 241*48.9 \$17*31.8 \$17*31.8 \$3.6**45.8 \$1.0**2*6.8 \$1.0**43.42 \$26.44 \$1.0**10.8**10.5*							
106 22.77 241 48.93 S17 31.87 356 43.58 N22"63.68 N22"63.68 25'45.87 N22"63.61 136"20.89 1961 136"25.24 256"43.88 32.86 136"27.70 271"47.83 33.83 26'45.80 53.44 40'48.32 641 156"23.49 19.66 136"20.70 19.72 136"27.70 271"47.83 33.83 26'45.80 53.64 55'50.76 26.41 156"23.49 19.66 19.57 19.72 19.7							Alioth 166°13.69 55°49.59
8 1367770 2714743 33 338 265 11244.69 53.74 40748.32 26.41 135°2.089 10.61 4Idad 148'758.03 1.60°2.05.05 10.60°2.05 10.60°2.05.05 10.60°2.							· ·
8 136°27.70 271°47.83 33.83 26°45.80 53.64 55°50.76 26.41 150°23.49 19.66 170°32.40 19.66 170°				_			
9 151°30.17 286°47.28							
10 166°32.63 301°467.3 35.80 56°48.03 53.43 65°55.66 26.41 195°3.1 19.33 11 181°35.50 311°61.61 36.76 87°8.91.5 53.32 106°58.10 2.64 1 195°3.31 19.83 12 11°40.02 346°45.02 51°73.76 86°50.26 N22°53.22 116°0.55 N22°5.64 1 25°3.65 21 19.84 13 211°40.02 346°45.07 33.74 101°51.33 53.11 131°3.00 2.64 1 25°3.65 21 19.94 13 211°40.92 346°45.07 33.74 101°51.35 53.11 131°3.00 2.64 1 25°3.65 21 19.94 13 241°44.95 16°43.95 0.40 69 131°3.53 1 5.21 131°3.00 2.64 1 25°3.65 21 19.94 15 241°44.95 16°43.95 0.40 69 131°3.53 1 5.29 0 110°7.90 0.62 2.55°4.17 3 0.20 0.5 16 256°47.42 31°43.94 1.67 146°5.47 5.28 0 176°10.34 26.42 25°4.04 30 20.10 17 271°4.88 46°4.25 42.64 1.67 146°6.47 3 52.80 176°10.34 26.42 25°4.04 30 20.10 18 286°52.34 61°42.30 517°43.62 176°6.69 N22°52.69 200°15.24 N22°26.42 300°49.54 508°20.21 19 301°54.81 70°41.74 44.59 191°38.09 52.48 221′17.69 2.64 235°52.04 202.2 20 316°57.27 91°41.18 45.57 206°99.20 52.38 236°20.15 26.42 35°57.35 0.02 2.2 21 331°39.74 106°40.03 40.54 222°0.33 25°2.75 52.60 21.2 22 347°2.20 121°40.07 47.51 227°1.45 52.16 266°25.05 26.42 10°59.95 20.43 Nunki 75°48.06 26°16.00 Attair 20°2.12 8°59.95 166°3.89 50.47 220°2.35 1.45 1.25 1.25 2.26 2.25 2.04 Nunki 75°48.06 26°16.00 Attair 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.47 20°2.12 8°59.50 166°3.89 50.42 20°2.13 10°50.39 50.42 10°50.99 10°2.20 10°2.13							
11 181*35.09 316*46.18 36.78 71*49.15 53.32 100*38.10 26.41 195*31.31 19.83	10	166°32.63	301°46.73 35.80	56°48.03 53.43	85°55.66 26.41	180°28.70 19.77	
12 199°37.56 331°45.62 \$17°37.76 86°50.26 N22°52.22 \$116°0.55 N22°26.41 200°39.12 \$19.99\$ 14 226°42.49 \$10°43.96 0.4069 \$131°53.61 \$5.30.1 \$146°54.56 \$26.44\$ 240°39.12 \$19.99\$ 15 241°44.52 \$39.71 \$116°52.50 \$5.30.1 \$146°54.56 \$26.44\$ 240°39.12 \$19.99\$ 16 256°47.42 \$31°43.41 \$41.67 \$146′54.73 \$5.28.0 \$176°10.34 \$26.44\$ 270°44.33 \$20.10\$ 216 226°42.49 \$10°43.84 \$4.41.67 \$146′54.73 \$5.28.0 \$176°10.34 \$26.44\$ 270°44.33 \$20.10\$ 217 271°49.88 \$46′42.30 \$17°43.62 \$176′56.97 \$N22°52.59\$ \$206°15.24 \$N22°26.42 \$300°49.54 \$508°20.21\$ 219 301°45.41 \$76′41.74 \$44.59 \$191°58.09 \$52.48 \$221°17.69 \$1.64 \$300°49.54 \$508°20.21\$ 213 31°97.41 \$106′40.63 \$4.65.5 \$22.69 \$19.16 \$2.64 \$21°17.69 \$1.64 \$300°49.54 \$508°20.21\$ 213 31°97.41 \$106′40.63 \$4.65.5 \$22.09 \$1.52 \$2.64 \$21°17.69 \$1.64 \$1.67 \$1.65 \$1.64 \$1.67 \$1.64 \$1.67 \$1.64 \$1.67 \$1.64 \$1.6							
14 226°42.49 1°44.95 16°43.96 ·							
15 241°44.95 16°43.96 40.69 315°53.61 52.90 161°7.90 26.42 255°41.73 20.05 16 256°4742 31°43.41 416° 146° 146° 143° 3 52.80 176° 10.34 26.42 270°44.33 20.10 17 271°49.88 46°42.95 42.64 161°55.85 52.69 191°12.79 26.42 285°46.93 20.15 18 286°52.34 61°42.30 517°43.62 176°56.97 N22°52.59 20°152.44 N22°26.42 308°94.54 508°0.21 19 301°54.81 76°41.74 44.59 191°58.09 52.48 221°17.69 26.42 315°52.14 20.27 21 331°59.74 106′40.63 46.54 222°0.33 52.27 251°22.60 26.42 435°7.35 20.37 22 347°12.20 121°40.07 47.51 237°1.45 52.16 266°25.05 26.42 0°59.95 20.43 23 2°46 66 136°39.51 48.48 252°2.57 52.06 281°27.50 26.42 16°2.55 20.48 24 27°12.00 177°1.31 151°38.95 517°49.45 20.95°9.09 N22°54.19 20.44 31°5.16 508°20.54 24 47°12.00 181°37.83 51.39 297°5.93 51.74 326°34.86 26.41 61°10.37 20.65 24 47°12.00 181°37.83 51.39 297°5.93 51.74 326°34.86 26.41 61°10.37 20.65 25 92°19.45 226°6.15 54.29 347°3.09 51.14 326°34.86 26.41 61°10.37 20.65 25 92°19.45 226°6.15 54.29 347°3.09 51.14 326°34.86 26.41 61°10.37 20.65 26 107°21.91 241°35.99 516°35.60 55.22 347°2.05 51.63 341°37.31 26.41 61°10.37 20.65 27 122°42.83 266°35.03 50.22 22°11.55 51.21 41°47.13 26.41 136°33.39 20.97 28 131°26.44 271°34.46 571.99 27°12.68 51.10 56°49.58 26.41 118°3.19 21.06 21 122°43.33 36°32.77 18°0.08 751°19 27°12.68 51.10 56°49.58 26.41 118°3.19 21.04							Alphecca 126°4.21 26°38.05
16 256°47.42 31°43.41 41.67 146°54.73 52.80 176°10.34 26.42 270°44.33 20.10 270°44.83 46°42.85 42.64 161°55.85 52.60 191°12.79 26.42 280°46.93 20.16 280°46.93 20.17 280°46.93 20.17 280°46.93 20.17 280°46.93 20.17 280°46.93 20.17 280°46.93 20.17 280°46.93 20.17 280°46.93							
18 266 23 61 42 63 61 61 55 85 52 69 191 12 79 26 42 285 46 49 30 12 44 44 59 191 88 69 70 72 52 52 52 52 60 61 62 52 64 23 31 52 54 64 31 52 54 64 31 52 54 64 31 54 54 54 54 54 54 54 5							
18 286°52.34 61°42.30 517°43.62 176°56.67 N22°52.59 206°15.24 202°17.60 20.42 300°40.54 306°40.54 308°00.21 8783hague 99°58.89 29°58.89 29°32.60 20.31 20.32 20.							
19 301 54.81 76 41.74 44.59 191 58.09 52.48 221 71.769 20.316 57.27 91.418 45.57 20.52 59.20 52.38 236 20.15 26.42 315 57.27 20.321 2	18	286° 52.34					
20 316*5/.27 91*41.18 45.57 220*59.20 52.38 236*20.15 26.42 330*54.75 20.32 48.62 220*33 55.27 251*2226.0 26.42 345*87.35 20.37 48.62 220*33 36*22.75 52.06 281*27.50 26.42 16*2.56 20.48 48.62 220*2.35 22*4.66 136*39.51 48.48 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 252*2.57 52.06 281*27.50 26.42 16*2.56 20.48 48.62 20.42 242*2.35	19	301°54.81	76°41.74 44.59	191°58.09 52.48	221°17.69 26.42	315°52.14 20.27	
21 331°59.74 106°40.63	20	316° 57.27		206°59.20 52.38		330°54.75 20.32	
23 23 347°2.20 121°40.07 47.51 237°1.45 52.16 266°25.05 26.42 16°2.56 20.43 Mer.pass. 22:52 \$\nu\$-0.5'\$ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \							
Mer.pass 22:52 \(\nu \)							
Tue GHA CHA Dec GHA Gen GHA GHA GEN GHA GHA GEN GHA	23	2°4.66	136°39.51 48.48	252°2.57 52.06	281°27.50 26.42	16°2.56 20.48	Altair 62°0.12 8°56.15
Tue GHA GHA ODec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA GNA AIN Nair 27°32.84 -46°50.56 1 17°7.13 151°38.95 517°49.45 267°3.69 N22°51.95 296°29.95 N22°26.41 31°5.16 S08°20.54 41 Nair 27°32.84 -46°50.56 1 32°1.50 166°38.39 50.42 282°4.81 51.84 311°32.40 26.41 46°7.76 20.59 3 60°14.52 196°37.27 · 52.36 312°7.06 · 51.63 341°37.31 · 26.41 76°12.97 · 20.70 3 60°19.45 196°37.27 · 52.36 312°7.06 · 51.63 341°37.31 · 26.41 76°12.97 · 20.70 3 60°19.45 196°37.27 · 52.36 312°7.06 · 51.63 341°37.31 · 26.41 91°15.57 20.75 2	Mer.p	pass. 22:52	ν -0.5′ $d1.0$ ′ m-3.92	$ u 1.1' \ d$ -0.1' m0.39	ν 2.4′ d 0.0′ m-2.51	$ u 2.6' \; d0.1' \; { m m0.68}$	
Tue GHA GHA Dec GHA De				_			
1 17°7.13 151°38.95 \$17°49.45 26°36.96 N22°51.95 296°29.95 N22°26.41 31°5.16 508°20.54 1 32°9.59 166°38.39 50.42 282°4.81 51.84 311°32.40 26.41 46°7.76 20.59 24°4.14 28°13.19 24°12.06 181°37.83 51.39 297°5.93 51.74 326°34.86 26.41 61°10.37 20.65 26.41 77°16.99 211°36.71 53.33 327°8.18 51.53 356°39.76 26.41 91°15.57 20.75 20.75 20.75 20.99 1.50°29.94 226°36.15 54.29 342°9.30 51.42 11°42.22 26.41 106°18.18 20.81 26°44.67 12°22.43 256°35.03 56.22 12°11.55 51.21 41°47.13 26°44.67 12°20.64 136°32.38 20.92 24.38 256°35.03 56.22 12°11.55 51.21 41°47.13 26.41 136°23.38 20.92 24.38 137°25.84 271°34.46 57.19 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 27°12.69 31.10 26°44.67 12°20.40 12°13.31 26°44.67 12°20.40 12°13.31°20.40 26.41 181°31.19 21.08 25°20.31 286°33.90 136°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 21°19°36.70 331°32.21 518°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 118°31.19 21.08 25°20.91 13°20.90 11°19.45 50.45 147°4.32 26.41 286°49.40 21.29 11.29 21.20 11°19.45 50.45 147°4.32 26.41 21°36.39 508°21.19 11°19.45 50.45 147°4.32 26.41 21°36.39 508°21.19 11°19.45 50.45 147°4.32 26.41 226°30.00 21.24 21.40 16°20.91	Tue	GHΔ	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 32°9.59 166°38.39 50.42 282°4.81 51.84 311°32.40 26.41 46°7.76 20.59 24°7°1.206 181°37.83 51.39 297°5.93 51.74 326°34.86 26.41 61°10.37 20.65 36°14.52 196°37.27 · 52.36 312°7.06 · 51.63 341°37.31 · 26.41 76°12.97 · 20.70 47°16.99 211°36.71 53.33 327°8.18 51.53 356°39.76 26.41 91°15.57 20.75 20.75 592°19.45 226°36.15 54.29 342°9.30 51.42 11°42.22 26.41 106°18.18 20.81 406°18.18							
2 47°12.06 181°37.83 51.39 297°5.93 51.74 326°34.86 26.41 61°10.37 20.65 36°21.45: 196°37.27 · 55.26 312°7.06 · 51.63 341°37.31 · 26.41 76°12.97 · 20.70 1							
3 62°14.52 196°37.27 · 52.36 312°7.06 · 51.63 341°37.31 · 26.41 76°12.97 · 20.70 4 77°16.99 211°36.71 53.33 327°8.18 51.53 356°39.76 26.41 91°15.57 20.75 5 92°19.45 226°36.15 54.29 342°9.30 51.42 11°42.22 26.41 106°18.18 20.81 6 107°21.91 241°35.59 S17°55.26 357°10.43 N22°51.31 26°44.67 N22°26.41 121°20.78 S08°20.86 7 122°24.38 256°35.03 56.22 12°11.55 51.21 41°47.13 26.41 136°23.38 20.92 8 137°26.84 271°34.46 57.19 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 9 152°29.31 286°33.90 · 58.15 42°13.81 · 50.99 71°52.04 · 26.41 166°28.59 · 21.02 10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 518°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 508°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · 3.92 132°20.58 · 50.35 162°6.78 · 26.41 226°39.00 21.24 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 211°36.89 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 518°6.79 177°3.37 N22°50.02 207°14.16 N22°26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 · 9.65 222°27.36 · 49.70 252°21.54 · 26.41 346°59.81 · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 272.41 21.72 23 33°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77							
5 92°19.45 226°36.15 54.29 342°9.30 51.42 11°42.22 26.41 106°18.18 20.81 6 107°21.91 241°35.59 \$17°55.26 357°10.43 N22°51.31 26°44.67 N22°26.41 121°20.78 \$08°20.86 7 122°24.38 256°35.03 56.22 12°11.55 51.21 41°47.13 26.41 136°23.38 20.92 8 137°26.84 271°34.46 57.19 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 9 152°29.31 286°33.90 · 58.15 42°13.81 · 50.99 71°52.04 · 26.41 166°28.59 · 21.02 10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 518°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 508°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · 3.92 132°20.58 · 50.35 162°6.78 · 26.41 256°44.20 · 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 7272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 \$18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 310°52.01 \$08°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 20 313°56.88 106°27.10 · 9.65 222°27.36 · 49.70 252°21.54 · 26.41 346°59.81 · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 26.41 2°2.41 21.72 27 2°4.02 2.41 21.72 28 2°4.02 21.02 28 2°4.03 2°4.03 2°4.03 2°4.03 2°4.03 2°4.03 2°4.03 2°4.04 2°4.							
6 107°21.91 241°35.59 \$17°55.26 357°10.43 N22°51.31 26°44.67 N22°26.41 121°20.78 \$08°20.86 7 122°24.38 256°35.03 56.22 12°11.55 51.21 41°47.13 26.41 136°23.38 20.92 8 137°26.48 271°34.46 57.19 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 9 152°29.31 286°33.90 · 58.15 42°13.81 · 50.99 71°52.04 · 26.41 166°28.59 · 21.02 10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 \$18°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 \$08°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · 3.92 132°20.58 · 50.35 162°6.78 · 26.41 256°44.20 · 21.35 16°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 \$18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 316°52.01 \$08°21.51 \$34°31.82 13:54 13°58.03 21:52 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°24.41 21.72 24.41 21.72 23 38°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77							
7 122°24.38 256°35.03 56.22 12°11.55 51.21 41°47.13 26.41 136°23.38 20.92 8 137°26.84 271°34.46 57.19 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 9 152°29.31 286°33.90 ·· 58.15 42°13.81 ·· 50.99 71°52.04 ·· 26.41 166°28.59 ·· 21.02 10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 S18°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 S08°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 ·· 3.92 132°20.58 ·· 50.35 162°6.78 ·· 26.41 256°44.20 ·· 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 172°4.94.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 S18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 301°52.01 S08°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21.55 222°27.36 ·· 49.70 252°21.54 ·· 26.41 346°59.81 ·· 21.67 22.41 21.72 23 38°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 170 21.77 21.77 21.77 22.40 20 23 38°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77							
8 137°26.84 271°34.46 57.19 27°12.68 51.10 56°49.58 26.41 151°25.98 20.97 9 152°29.31 286°33.90 · · 58.15 42°13.81 · · 50.99 71°52.04 · · 26.41 166°28.59 · · · 21.02 10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 518°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 508°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · · 3.92 132°20.58 · · 50.35 162°6.78 · · · 26.41 256°44.20 · · · 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 518°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 310°52.01 508°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 331°57.21 21.61 21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · · 26.41 346°59.81 · · · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 23 33°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77							
9 152°29.31 286°33.90 ·· 58.15 42°13.81 ·· 50.99 71°52.04 ·· 26.41 166°28.59 ·· 21.02 10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 518°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 508°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 ·· 3.92 132°20.58 ·· 50.35 162°6.78 ·· 26.41 256°44.20 ·· 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 518°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 ·· 9.65 222°27.36 ·· 49.70 252°21.54 ·· 26.41 346°59.81 ·· 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 17°5.01 21.77 Poch of the proper section of the pro							
10 167°31.77 301°33.34 17°59.11 57°14.93 50.88 86°54.49 26.41 181°31.19 21.08 11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 518°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 508°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · 3.92 132°20.58 · 50.35 162°6.78 · 26.41 256°44.20 · 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 518°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 · 9.65 222°27.36 · 49.70 252°21.54 · 26.41 346°59.81 · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 17°5.01 21.77 Mars: 0.1							
11 182°34.23 316°32.77 18°0.08 72°16.06 50.78 101°56.95 26.41 196°33.79 21.13 12 197°36.70 331°32.21 \$18°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 \$08°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · 3.92 132°20.58 · 50.35 162°6.78 · 26.41 256°44.20 · 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 \$18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 · 9.65 222°27.36 · 49.70 252°21.54 · 26.41 346°59.81 · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 17°5.01 21.77 Mars: 0.1							
12 197°36.70 331°32.21 \$18°1.04 87°17.19 N22°50.67 116°59.41 N22°26.41 211°36.39 \$08°21.19 13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 ·· 3.92 132°20.58 ·· 50.35 162°6.78 ·· 26.41 256°44.20 ·· 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 \$518°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 301°52.01 \$508°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 ·· 9.65 222°27.36 ·· 49.70 252°21.54 ·· 26.41 346°59.81 ·· 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 17°5.01 21.77 Mars 250°28.92 06:13 Jupiter 279°23.21 04:17 Saturn 13°54.66 21:56 Oct 08 Tue SHA Mer.pass Venus 134°31.82 13:54 Mars 249°56.56 06:11 Jupiter 279°22.82 04:13 Saturn 13°58.03 21:52 Horizontal parallax Venus: 0.1 Mars: 0.1							
13 212°39.16 346°31.64 2.00 102°18.32 50.56 132°1.86 26.41 226°39.00 21.24 14 227°41.63 1°31.08 2.96 117°19.45 50.45 147°4.32 26.41 241°41.60 21.29 15 242°44.09 16°30.51 · · 3.92 132°20.58 · · 50.35 162°6.78 · · 26.41 256°44.20 · · 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 518°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 301°52.01 508°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · · 26.41 346°59.81 · · · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 17°5.01 21.77 Mars: 0.1			331°32.21 \$18°1.04				
15 242°44.09 16°30.51 · · 3.92 132°20.58 · · 50.35 162°6.78 · · 26.41 256°44.20 · · 21.35 16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40 17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 \$18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 301°52.01 \$08°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 316°54.61 21.56 21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · · 26.41 346°59.81 · · · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 17°5.01 21.77 Mars: 0.1						226°39.00 21.24	
16 257°46.56 31°29.94 4.87 147°21.71 50.24 177°9.24 26.41 271°46.80 21.40							
17 272°49.02 46°29.38 5.83 162°22.84 50.13 192°11.70 26.41 286°49.40 21.45 18 287°51.48 61°28.81 \$18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 301°52.01 \$08°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 331°57.21 21.61 21 332°58.88 106°27.10 · 9.65 222°27.36 · 49.70 252°21.54 · 26.41 346°59.81 · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 Mars 249°56.56 06:11 Jupiter 279°22.82 04:13 Saturn 13°58.03 21:52 Horizontal parallax Venus: 0.1 Mars: 0.1							
18 287°51.48 61°28.81 \$18°6.79 177°23.97 N22°50.02 207°14.16 N22°26.41 301°52.01 \$08°21.51 19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 331°57.21 21.61 21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · 26.41 346°59.81 · · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 Mars: 0.1							
19 302°53.95 76°28.24 7.74 192°25.10 49.92 222°16.62 26.41 316°54.61 21.56 20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 331°57.21 21.61 21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · 26.41 346°59.81 · · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 Mars: 0.1							
20 317°56.41 91°27.67 8.70 207°26.23 49.81 237°19.08 26.41 331°57.21 21.61 21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · 26.41 346°59.81 · · 21.67 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 Horizontal parallax Venus: 0.1 Mars: 0.1							1 '
21 332°58.88 106°27.10 · · 9.65 222°27.36 · · 49.70 252°21.54 · · 26.41 346°59.81 · · 21.67 Horizontal parallax 22 348°1.34 121°26.53 10.61 237°28.50 49.59 267°24.00 26.41 2°2.41 21.72 Venus: 0.1 23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 Mars: 0.1							
23 3°3.80 136°25.96 11.56 252°29.63 49.48 282°26.46 26.41 17°5.01 21.77 Mars: 0.1	21	332°58.88	106°27.10 · · 9.65	222°27.36 · · 49.70	252°21.54 · · 26.41	346°59.81 · · 21.67	1
							1
Mer.pass. 22:48 ν -0.6′ d 1.0′ m-3.93 ν 1.1′ d -0.1′ m0.38 ν 2.5′ d -0.0′ m-2.52 ν 2.6′ d 0.1′ m0.69	23	3~3.80	136~25.96 11.56				IVIAIS: U.1
	Mer.p	pass. 22:48	u-0.6′ $d1.0$ ′ m-3.93	$\nu 1.1' \ d ext{-}0.1' \ ext{m}0.38$	ν 2.5′ <i>d</i> -0.0′ m-2.52	$\nu 2.6' \ d0.1' \ { m m0.69}$	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°58.40	S05°13.44	$150^{\circ}29.26$	13.4'	S20°36.61	10.4'	54.3'
1	197°58.58	14.40	165°1.68	13.3'	20°47.03	10.3'	54.3'
2	212°58.76 227°58.95	15.36 •• 16.31	179°34.01 194°6.27	13.3' 13.2'	20°57.36 21°7.61	10.2' 10.2'	54.4' 54.4'
4	242°59.13	17.27	208°38.44	13.1'	21°17.78	10.1	54.4'
5	257°59.31	18.23	223°10.53	13.0'	$21^{\circ}27.85$	10.0'	54.4'
6	272°59.49	S05°19.19	237°42.54	12.9'	S21°37.84	9.9'	54.4'
7 8	287°59.67 302°59.86	20.15 21.10	252°14.47 266°46.31	12.8' 12.8'	21°47.74 21°57.55	9.8' 9.7'	54.4' 54.4'
9	318°0.04	• • 22.06	281°18.07	12.7'	22°7.27	9.6'	54.4'
10	333°0.22	23.02	295°49.75	12.6'	22°16.90	9.5'	54.5'
11 12	348°0.40 3°0.58	23.98 \$05°24.93	310°21.34 324°52.85	12.5' 12.4'	22°26.44 \$22°35.88	9.4' 9.3'	54.5' 54.5'
13	18°0.76	25.89	324 52.65 339°24.27	12.4	22°45.23	9.3'	54.5'
14	33°0.94	26.85	353°55.61	12.3'	22°54.48	9.2'	54.5'
15	48°1.12	• • 27.81	8°26.87	12.2'	23°3.63	9.1'	54.5'
16 17	63°1.30 78°1.48	28.76 29.72	22°58.04 37°29.12	12.1' 12.0'	23°12.69 23°21.65	9.0' 8.9'	54.6' 54.6'
18	93°1.66	S05°30.68	52°0.12	11.9'	\$23°30.50	8.8'	54.6
19	108°1.84	31.63	66°31.03	11.8'	23°39.26	8.7'	54.6'
20	123°2.02	32.59	81°1.85	11.7'	23°47.91	8.5'	54.6'
21 22	138°2.20 153°2.38	· · 33.55 34.50	95°32.59 110°3.24	11.7' 11.6'	23°56.46 24°4.90	8.4' 8.3'	54.6' 54.6'
23	153 2.38 168°2.56	34.50 35.46	110 3.24 124°33.81	11.5'	24 4.90 24°13.24	8.3 8.2	54.0 54.7'
	SD = 16.0'	d = 1.0'			0 = 14.8'		
				- 56	10		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°2.74 198°2.92	S05°36.41 37.37	139°4.29 153°34.69	11.4' 11.3'	\$24°21.48 24°29.60	8.1' 8.0'	54.7' 54.7'
2	213°3.10	38.32	168° 4.99	11.3	24° 29.60 24° 37.62	7.9'	54.7'
3	228°3.28	• • 39.28	182°35.22	11.1'	$24^{\circ}45.52$	7.8'	54.7'
4	243°3.45	40.24	197°5.35	11.0'	24°53.32	7.7'	54.8'
5 6	258°3.63 273°3.81	41.19 \$05°42.15	211°35.40 226°5.36	11.0' 10.9'	25°1.00 \$25°8.57	7.6' 7.5'	54.8' 54.8'
7	288°3.99	43.10	240°35.24	10.8'	25°16.03	7.3'	54.8'
8	303°4.17	44.06	255°5.03	10.7'	25°23.37	7.2'	54.8'
9	318°4.34	• • 45.01	269°34.74	10.6'	25°30.59	7.1'	54.8'
10 11	333°4.52 348°4.70	45.97 46.92	284°4.36 298°33.90	10.5' 10.5'	25°37.70 25°44.69	7.0' 6.9'	54.9' 54.9'
12	3°4.88	S05°47.87	313°3.35	10.4	S25°51.56	6.7'	54.9'
13	18°5.05	48.83	327°32.72	10.3'	25°58.31	6.6'	54.9'
14 15	33°5.23 48°5.40	49.78 •• 50.74	342°2.00 356°31.20	10.2' 10.1'	26°4.93 26°11.44	6.5' 6.4'	54.9' 55.0'
16	63°5.58	51.69	11°0.32	10.1	26°17.82	6.3	55.0'
17	78°5.76	52.64	25°29.35	10.0'	26°24.08	6.1'	55.0'
18	93°5.93	S05°53.60	39°58.31	9.9'	\$26°30.21	6.0'	55.0'
19 20	108° 6.11 123° 6.28	54.55 55.50	54°27.18 68°55.97	9.8' 9.7'	26°36.21 26°42.09	5.9' 5.7'	55.0' 55.1'
21	138°6.46	56.46	83°24.67	9.6'	26°47.83	5.6'	55.1'
22	153°6.63	57.41	97°53.30	9.5'	$26^{\circ}53.45$	5.5'	55.1'
23	168°6.81	58.36	112°21.85	9.5'	26°58.94	5.4'	55.1'
	SD = 16.0'	d = 1.0'		SE	0 = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	183°6.98	S05°59.32	126°50.32	9.4'	S27° 4.29	5.2'	55.2'
1	198°7.16	06°0.27	141°18.71	9.3'	27°9.52	5.1'	55.2'
2	213°7.33 228°7.51	1.22 · · 2.17	155°47.03 170°15.26	9.2' 9.2'	27°14.61 27°19.56	5.0' 4.8'	55.2' 55.2'
3 4	228° 7.51 243° 7.68	3.13	170°15.26 184°43.43	9.2 9.1'	27°19.56 27°24.38	4.8° 4.7'	55.2' 55.2'
5	258°7.85	4.08	$199^{\circ}11.51$	9.0'	27°29.06	4.5'	55.3'
6	273°8.03	S06° 5.03	213°39.52	8.9'	\$27°33.60	4.4'	55.3'
7 8	288°8.20 303°8.38	5.98 6.93	228°7.46 242°35.33	8.9' 8.8'	27°38.01 27°42.28	4.3' 4.1'	55.3' 55.3'
9	318°8.55	• • 7.88	257°3.12	8.7'	27°46.40	4.0'	55.4'
10	333°8.72	8.84	271°30.84	8.7'	27°50.39	3.8'	55.4'
11	348°8.89	9.79 \$06°10.74	285°58.50	8.6'	27°54.23	3.7'	55.4'
12 13	3°9.07 18°9.24	11.69	300°26.08 314°53.60	8.5' 8.4'	\$27°57.93 28°1.48	3.6' 3.4'	55.4' 55.5'
14	33°9.41	12.64	329°21.05	8.4'	28°4.90	3.3'	55.5'
15	48°9.58	• • 13.59	343°48.43	8.3'	28°8.16	3.1'	55.5'
16 17	63°9.75 78°9.93	14.54 15.49	358°15.75 12°43.01	8.3' 8.2'	28°11.28 28°14.25	3.0' 2.8'	55.5' 55.6'
18	78°9.93 93°10.10	15.49 \$06°16.44	27°10.20	8.2	28°14.25 \$28°17.07	2.8	55.6'
19	108°10.27	17.39	41°37.33	8.1'	$28^{\circ}19.75$	2.5'	55.6'
20	123°10.44	18.34	56°4.41	8.0'	28°22.27	2.4'	55.6'
21 22	138°10.61 153°10.78	· · 19.29 20.24	70°31.42 84°58.38	8.0' 7.9'	28°24.65 28°26.87	2.2' 2.1'	55.7' 55.7'
23	168° 10.76	21.19	99°25.28	7.9 7.8'	28°28.94	1.9'	55.7'
	SD = 16.0'	d = 1.0'			0 = 15.0'	-	

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Julisce	Civil	Naut.
N 72°	04:21	05:40	06:48	16:45	17:53	19:11
N 70°	04:29	05:40	06:41	16:52	17:53	19:04
68°	04:35	05:40	06:36	16:58	17:53	18:58
66°	04:40	05:40	06:31	17:03	17:54	18:53
64°	04:45	05:40	06:27	17:07	17:54	18:49
62°	04:48	05:39	06:24	17:10	17:54	18:46
60°	04:51	05:39	06:21	17:13	17:55	18:43
N 58°	04:53	05:39	06:18	17:16	17:55	18:41
56°	04:56	05:39	06:16	17:19	17:56	18:39
54°	04:57	05:38	06:14	17:21	17:56	18:37
52°	04:59	05:38	06:12	17:23	17:56	18:35
50°	05:00	05:38	06:10	17:25	17:57	18:34
45°	05:03	05:37	06:06	17:29	17:58	18:32
N 40°	05:04	05:36	06:03	17:32	17:59	18:30
35°	05:05	05:34	06:00	17:35	18:00	18:30
30°	05:05	05:33	05:57	17:38	18:02	18:29
20°	05:05	05:30	05:53	17:43	18:05	18:30
N 10°	05:03	05:27	05:48	17:47	18:08	18:32
0°	05:00	05:24	05:44	17:51	18:12	18:36
S 10°	04:55	05:19	05:40	17:55	18:16	18:41
20°	04:48	05:14	05:36	18:00	18:22	18:48
30°	04:38	05:07	05:31	18:05	18:29	18:58
35°	04:32	05:02	05:28	18:08	18:34	19:04
40°	04:24	04:57	05:24	18:12	18:39	19:12
45°	04:15	04:50	05:20	18:16	18:46	19:22
S 50°	04:03	04:42	05:15	18:21	18:54	19:34
52°	03:57	04:38	05:13	18:23	18:58	19:40
54°	03:50	04:34	05:10	18:26	19:03	19:47
56°	03:42	04:29	05:08	18:29	19:07	19:55
58°	03:34	04:24	05:05	18:32	19:13	20:04
S 60°	03:23	04:18	05:01	18:36	19:19	20:14

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°				_		
68°						
66°	13:08			15:29		
64°	12:18			16:20		
62°	11:47	13:41		16:51	16:40	
60°	11:24	13:02	14:37	17:15	17:19	17:33
N 58°	11:05	12:35	13:59	17:34	17:47	18:12
56°	10:50	12:13	13:32	17:50	18:08	18:39
54°	10:37	11:56	13:11	18:04	18:26	19:01
52°	10:25	11:41	12:53	18:16	18:41	19:18
50°	10:15	11:28	12:38	18:27	18:55	19:34
45°	09:54	11:02	12:08	18:49	19:22	20:04
N 40°	09:37	10:41	11:44	19:07	19:43	20:28
35°	09:22	10:24	11:25	19:22	20:01	20:48
30°	09:10	10:09	11:08	19:36	20:17	21:05
20°	08:49	09:44	10:40	19:58	20:43	21:33
N 10°	08:31	09:22	10:16	20:18	21:06	21:58
0°	08:14	09:02	09:54	20:37	21:27	22:20
S 10°	07:57	08:42	09:32	20:55	21:48	22:43
20°	07:39	08:21	09:08	21:15	22:11	23:08
30°	07:19	07:56	08:41	21:38	22:37	23:36
35°	07:07	07:42	08:25	21:52	22:53	23:53
40°	06:53	07:26	08:06	22:08	23:12	•• ••
45°	06:37	07:06	07:43	22:27	23:34	
S 50°	06:17	06:41	07:14	22:50		00:02
52°	06:08	06:29	07:00	23:02		00:16
54°	05:58	06:16	06:44	23:15		00:32
56°	05:46	06:00	06:24	23:30		00:51
58°	05:32	05:42	06:00	23:48		01:15
S 60°	05:17	05:19	05:28		00:10	01:46

	Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-23%	
06	11:54	12:02	11:48	14:25	02:02		
07	12:11	12:20	11:48	15:14	02:49		
08	12:28	12:36	11:47	16:07	03:40		

October 09, 10, 11 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	18° 6.27	151°25.39 \$18°12.51	267°30.76 N22°49.38	297°28.92 N22°26.41	32°7.61 \$08°21.82	
1	33°8.73	166°24.82 13.46	282°31.90 49.27	312°31.38 26.41	47°10.21 21.88	Alpheratz 357°34.68 29°13.77
2	48°11.20	181°24.25 14.41	297°33.03 49.16	327°33.84 26.41	62°12.81 21.93	Ankaa 353°6.92 -42°10.24 Schedar 349°30.77 56°40.49
3	63° 13.66	196°23.68 · · 15.36	312°34.17 · · 49.05	342°36.30 · · 26.40	77°15.41 · · 21.98	Diphda 348°47.19 -17°50.94
4	78° 16.13	211°23.10 16.31	327°35.31 48.94	357°38.77 26.40	92°18.01 22.04	Achernar 335°19.73 -57°6.55
5 6	93°18.59	226°22.53 17.26	342°36.44 48.83 357°37.58 N22°48.72	12°41.23 26.40	107°20.61 22.09	Hamal 327°51.13 23°34.86
7	108°21.05 123°23.52	241°21.96 \$18°18.21 256°21.38 19.15	357°37.58 N22°48.72 12°38.72 48.61	27°43.69 N22°26.40 42°46.16 26.40	122°23.22 \$08°22.14 137°25.82 22.19	Polaris 313°43.94 89°21.97
8	138° 25.98	271°20.81 20.10	27°39.86 48.51	57°48.62 26.40	152°28.42 22.25	Acamar 315°11.55 -40°12.10
9	153° 28.45	286°20.23 · · 21.04	42°40.99 · · 48.40	72°51.09 · · 26.40	167°31.02 · · 22.30	Menkar 314°6.10 4°11.35
10	168°30.91	301°19.66 21.99	57°42.13 48.29	87°53.55 26.40	182°33.62 22.35	Mirfak 308°28.18 49°56.90 Aldebaran 290°39.67 16°33.62
11	183°33.37	316°19.08 22.93	72°43.27 48.18	102°56.02 26.40	197°36.21 22.40	Rigel 281°3.92 -8°10.17
12	198°35.84	331°18.50 \$18°23.87	87°44.41 N22°48.07	117°58.48 N22°26.40	212°38.81	Capella 280°22.00 46°1.27
13 14	213°38.30 228°40.77	346°17.93 24.81 1°17.35 25.76	102°45.55 47.96 117°46.70 47.85	133° 0.95 26.40 148° 3.42 26.40	227°41.41 22.51 242°44.01 22.56	Bellatrix 278°22.98 6°22.46
15	243° 43.23	16°16.77 · · 26.70	132°47.84 · · 47.74	163°5.88 · · 26.40	257°46.61 · · 22.61	Elnath 278°1.99 28°37.69
16	258° 45.70	31°16.19 27.64	147°48.98 47.63	178° 8.35 26.39	272°49.21 22.67	Alnilam 275°37.83 -1°10.99
17	273°48.16	46°15.61 28.57	162°50.12 47.52	193°10.82 26.39	287°51.81 22.72	Betelgeuse 270°52.22 7°24.82
18	288°50.62	61°15.03 \$18°29.51	177°51.27 N22°47.41	208°13.29 N22°26.39	302°54.41 S 08°22.77	Canopus 263°52.38 -52°42.12 Sirius 258°26.39 -16°44.74
19	303°53.09	76°14.45 30.45	192°52.41 47.30	223°15.75 26.39	317°57.01 22.82	Adhara 255°6.02 -29°0.01
20	318° 55.55	91°13.87 31.38	207°53.56 47.19	238°18.22 26.39	332°59.61 22.87	Procyon 244°51.10 5°9.83
21 22	333°58.02 349°0.48	106°13.29 · · 32.32 121°12.71 33.25	222°54.70 · · 47.08 237°55.85 46.97	253°20.69 · · 26.39 268°23.16 26.39	348°2.21 · · 22.93 3°4.80 22.98	Pollux 243°17.63 27°57.97
23	4°2.94	136°12.13 34.19	252°56.99 46.86	283°25.63 26.39	18°7.40 23.03	Avior 234°15.04 -59°34.92
				· · · · · · · · · · · · · · · · · · ·		Suhail 222°46.71 -43°31.61
Mer.	pass. 22:44	ν-0.6' d1.0' m-3.93	$\nu 1.1' \ d$ -0.1' m0.37	ν2.5′ d-0.0′ m-2.53	$\nu 2.6' \ d0.1' \ \text{m}0.69$	Miaplacidus 221°38.84 -69°48.75
						Alphard 217°48.16 -8°45.75 Regulus 207°34.90 11°50.88
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.80 61°36.98
0	19°5.41	151°11.54 \$18°35.12	267°58.14 N22°46.75	298°28.10 N22°26.39	33°10.00 \$08°23.08	Denebola 182°25.48 14°26.13
1	34°7.87	166°10.96 36.05	282°59.29 46.64	313°30.57 26.39	48°12.60 23.13	Gienah 175°44.15 -17°40.61
2	49° 10.34 64° 12.80	181°10.38 36.98 196°9.79 · · 37.91	298°0.44 46.53 313°1.58 • 46.42	328°33.04 26.38 343°35.51 •• 26.38	63°15.20 23.18 78°17.79 · · 23.24	Acrux 173°1.11 -63°14.05
4	79° 15.27	211°9.21 38.84	328° 2.73 46.31	358°37.99 26.38	93°20.39 23.29	Gacrux 171°52.52 -57°14.98
5	94° 17.73	226°8.62 39.77	343°3.88 46.20	13°40.46 26.38	108°22.99 23.34	Alioth 166°13.69 55°49.57
6	109°20.19	241°8.04 S 18°40.70	358°5.03 N22°46.09	28°42.93 N22°26.38	123°25.59 \$08°23.39	Spica 158°22.87 -11°17.31 Alkaid 152°52.63 49°11.48
7	$124^{\circ}22.66$	256°7.45 41.63	13°6.18 45.98	43°45.40 26.38	138°28.18 23.44	Hadar 148°37.00 -60°29.53
8	139°25.12	271°6.87 42.55	28°7.33 45.86	58°47.88 26.38	153°30.78 23.49	Menkent 147°58.29 -36°29.44
9	154°27.59	286°6.28 · · 43.48	43°8.49 · · 45.75	73°50.35 · · 26.38	168°33.38 · · 23.54	Arcturus 145°48.44 19°3.34
10 11	169°30.05 184°32.51	301°5.69 44.41 316°5.10 45.33	58° 9.64 45.64 73° 10.79 45.53	88°52.83 26.38 103°55.30 26.37	183°35.98 23.60 198°38.57 23.65	Rigil Kent. 139°41.28 -60°56.28
12	199°34.98	331°4.51 \$18°46.25	88°11.94 N22°45.42	118°57.77 N22°26.37	213°41.17 \$08°23.70	Kochab 137°20.77 74°3.31
13	214° 37.44	346°3.92 47.17	103°13.10 45.31	134° 0.25 26.37	228°43.77 23.75	Zuben'ubi 136°56.58 -16°8.60
14	229°39.91	1°3.34 48.10	118°14.25 45.20	149°2.73 26.37	243°46.36 23.80	Alphecca 126°4.22 26°38.04 Antares 112°16.35 -26°29.22
15	244° 42.37	16°2.75 · · 49.02	133°15.41 · · 45.09	164°5.20 · · 26.37	258°48.96 · · 23.85	Atria 107°11.09 -69°4.50
16	259° 44.84	31°2.15 49.94	148°16.56 44.97	179° 7.68 26.37	273°51.56 23.90	Sabik 102°3.21 -15°45.31
17	274° 47.30	46°1.56 50.86 61°0.97 \$18°51.77	163°17.72 44.86	194°10.15 26.37 209°12.63 N22°26.36	288°54.15 23.95	Shaula 96°10.85 -37°7.39
18 19	289° 49.76 304° 52.23	61°0.97 \$18°51.77 76°0.38 52.69	178°18.87 N22°44.75 193°20.03 44.64	209°12.63 N22°26.36 224°15.11 26.36	303°56.75 \$08°24.00 318°59.35 24.05	Rasalhague 95°58.90 12°32.66
20	319°54.69	90°59.79 53.61	208°21.19 44.53	239°17.59 26.36	334°1.94 24.11	Eltanin 90°42.46 51°29.37
21	334° 57.16	105°59.19 · · 54.52	223°22.35 · · 44.41	254°20.07 · · 26.36	349°4.54 · · 24.16	Kaus Aust. 83°32.90 -34°22.45 Vega 80°33.45 38°48.62
22	349°59.62	120°58.60 55.44	238°23.50 44.30	269°22.54 26.36	4°7.13 24.21	Nunki 75°48.07 -26°16.00
23	5°2.08	135°58.01 56.35	253°24.66 44.19	284°25.02 26.36	19°9.73 24.26	Altair 62°0.13 8°56.15
Mer.	pass. 22:40	ν -0.6' d0.9' m-3.93	$\nu 1.1' \ d$ -0.1' m0.36	$\nu 2.5' \ d$ -0.0' m-2.53	ν 2.6' d0.1' m0.69	Peacock 53°5.88 -56°39.52
						Deneb 49°25.81 45°22.36
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.83 9°59.45
0	20°4.55	150°57.41 \$18°57.27	268°25.82 N22°44.08	299°27.50 N22°26.36	34°12.32	Al Na'ir 27°32.85 -46°50.57 Fomalhaut 15°14.45 -29°29.46
1	35°7.01	165°56.82 58.18	283°26.98 43.97	314°29.98 26.35	49°14.92 24.36	Scheat 13°45.14 28°13.20
2	50°9.48	180°56.22 18°59.09	298°28.14 43.85	329°32.46 26.35	64°17.51 24.41	Markab 13°29.86 15°20.46
3	65° 11.94	195°55.62 19°0.00	313°29.30 · · 43.74	344°34.94 · · 26.35	79°20.11 · · 24.46	0 : 00) 14 5114 14
4	80°14.41	210°55.03 0.91	328°30.47 43.63	359°37.42 26.35	94°22.70 24.51	Oct 09 Wed SHA Mer.pass Venus 133°19.12 13:55
5 6	95° 16.87 110° 19.33	225°54.43 1.82 240°53.83 \$19°2.73	343°31.63 43.52 358°32.79 N22°43.40	14°39.90 26.35 29°42.39 N22°26.35	109°25.30 24.56 124°27.89 \$08°24.61	Venus 133°19.12 13:55 Mars 249°24.49 06:09
7	125°21.80	255°53.23 3.64	13°33.96 43.29	44°44.87 26.34	139°30.49 24.66	Jupiter 279°22.65 04:09
8	140°24.26	270°52.64 4.54	28°35.12 43.18	59°47.35 26.34	154°33.08 24.71	Saturn 14°1.34 21:48
9	155°26.73	285°52.04 · · 5.45	43°36.28 · · 43.07	74°49.83 · · 26.34	169°35.68 · · 24.76	Oct 10 Thu SHA Mer.pass
10	170°29.19	300°51.44 6.35	58°37.45 42.95	89°52.32 26.34	184°38.27 24.81	Oct 10 Thu SHA Mer.pass Venus 132°6.14 13:56
11	185°31.65	315°50.84 7.26	73°38.61 42.84	104°54.80 26.34	199°40.87 24.86	Mars 248°52.73 06:08
12 13	200°34.12 215°36.58	330°50.24 \$19°8.16 345°49.64 9.06	88°39.78 N22°42.73 103°40.95 42.61	119°57.28 N22°26.34 134°59.77 26.33	214°43.46 \$08°24.91 229°46.06 24.96	Jupiter 279°22.69 04:05
13 14	215° 36.58 230° 39.05	0°49.03 9.97	118°42.11 42.50	150° 2.25 26.33	244°48.65 25.01	Saturn 14°4.59 21:44
15	245° 41.51	15°48.43 · · 10.87	133°43.28 · · 42.39	165° 4.74 · · · 26.33	259°51.24 · · 25.06	Oct 11 Fri SHA Mer.pass
16	260° 43.98	30°47.83 11.77	148°44.45 42.27	180°7.22 26.33	274°53.84 25.11	Venus 130°52.86 13:57
17	275°46.44	45°47.23 12.67	163°45.62 42.16	195°9.71 26.33	289°56.43 25.16	Mars 248°21.27 06:06
18	290°48.90	60°46.62 \$19°13.56	178°46.79 N22°42.05	210°12.20 N22°26.32	304°59.02 \$08°25.21	Jupiter 279°22.95 04:02
19	305°51.37	75°46.02 14.46	193°47.96 41.93	225°14.68 26.32	320°1.62 25.26	Saturn 14°7.78 21:39
20 21	320° 53.83 335° 56.30	90°45.41 15.36 105°44.81 · · 16.25	208°49.13 41.82 223°50.30 • 41.71	240°17.17 26.32 255°19.66 • 26.32	335°4.21 25.30 350°6.80 •• 25.35	Horizontal parallax
22	350°58.76	120° 44.20 17.15	238°51.47 41.59	270°22.14 26.32	5°9.40 25.40	Venus: 0.1
23	6°1.22	135°43.60 18.04	253°52.64 41.48	285°24.63 26.31	20°11.99 25.45	Mars: 0.1
Merr	pass. 22:36	ν-0.6' d0.9' m-3.94	ν1.2' d-0.1' m0.35	ν2.5' d-0.0' m-2.54	$\nu 2.6' \ d0.1' \ m0.70$	
		- 0.0 do.5 iii-0.54		- 2.5 d 0.0 III-2.54	22.0 00.1 1110.70	

h	Sui	n			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	183°11.12	S06°22.14	113°52.12	7.8'	\$28°30.86	1.8'	55.7'	
1	198°11.29	23.09	128°18.91	7.7'	28°32.63	1.6'	55.8'	
2	213°11.46	24.04	142°45.65	7.7'	28°34.24	1.5'	55.8'	
3	228°11.63	• • 24.99	157°12.34	7.6'	28°35.69	1.3'	55.8'	
4	243°11.80	25.93	171°38.98	7.6'	28°36.99	1.1'	55.9'	
5	258°11.97	26.88	186°5.57	7.5'	28°38.14	1.0'	55.9'	
6	273°12.14	S06°27.83	200°32.11	7.5'	\$28°39.13	0.8'	55.9'	
7 8	288°12.31 303°12.48	28.78 29.73	214°58.61 229°25.07	7.5' 7.4'	28°39.96 28°40.63	0.7' 0.5'	55.9' 56.0'	
9	318° 12.65	30.67	243°51.48	7.4'	28°41.15	0.3	56.0'	
10	333°12.81	31.62	258°17.85	7.3'	28°41.50	0.4	56.0'	
11	348°12.98	32.57	272°44.19	7.3'	28°41.70	0.0'	56.1'	
12	3°13.15	S06°33.52	287°10.48	7.3'	S28°41.73	-0.1'	56.1'	
13	18°13.32	34.46	301°36.74	7.2'	$28^{\circ}41.61$	-0.3'	56.1'	
14	33°13.49	35.41	316°2.96	7.2'	28°41.32	-0.4'	56.1'	
15	48°13.65 63°13.82	• • 36.36	330°29.15	7.2'	28°40.88 28°40.27	-0.6'	56.2'	
16 17	78°13.82	37.31 38.25	344°55.31 359°21.44	7.1' 7.1'	28° 40.27 28° 39.50	-0.8' -0.9'	56.2' 56.2'	
18	93°14.15	506° 39.20	13°47.54	7.1'	S28°38.56	-0.9	56.3	
19	108°14.32	40.15	28°13.62	7.0'	28° 37.47	-1.3	56.3	
20	123°14.49	41.09	42°39.66	7.0'	28°36.21	-1.4'	56.3	
21	138°14.65	• • 42.04	57°5.69	7.0'	28°34.78	-1.6'	56.4	
22	153°14.82	42.98	71°31.69	7.0'	28°33.20	-1.8'	56.4'	
23	168°14.99	43.93	85°57.67	7.0'	28°31.44	-1.9'	56.4'	
	SD = 16.0'	d = 0.9'		SI	D = 15.2'			
			- <u>- 35 - 13.2</u>					
Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	183°15.15	S06°44.87	100°23.63	6.9'	\$28°29.53	-2.1'	56.5'	
1	198°15.32 213°15.48	45.82	114°49.58 129°15.51	6.9' 6.9'	28°27.45 28°25.20	-2.2' -2.4'	56.5'	
2	213°15.48 228°15.65	46.77 •• 47.71	129°15.51 143°41.42	6.9'	28°25.20 28°22.79	-2.4 -2.6'	56.5' 56.6'	
3 4	243°15.81	48.66	145 41.42 158°7.33	6.9	28°20.21	-2.0 -2.7'	56.6	
5	258° 15.98	49.60	172°33.22	6.9'	28°17.47	-2.9'	56.6'	
6	273°16.14	S06°50.54	186°59.10	6.9'	S28°14.56	-3.1'	56.7'	
7	288°16.31	51.49	201°24.97	6.9'	28°11.49	-3.2'	56.7'	
8	303°16.47	52.43	215°50.84	6.9'	28°8.25	-3.4'	56.7'	
9	318°16.63	• • 53.38	230°16.70	6.9'	28°4.84	-3.6'	56.8'	
10	333°16.80	54.32	244°42.56	6.9'	28°1.27	-3.7'	56.8'	
11	348°16.96 3°17.12	55.27 \$06° 56.21	259°8.42 273°34.28	6.9'	27°57.53 \$27°53.63	-3.9'	56.8'	
12 13	18°17.12	57.15	273°34.28 288°0.14	6.9' 6.9'	27°49.56	-4.1' -4.2'	56.9' 56.9'	
14	33°17.45	58.10	302°26.00	6.9	27°45.32	-4.2 -4.4'	56.9'	
15	48°17.61	06°59.04	316°51.87	6.9'	27°40.92	-4.6'	57.0'	
16	63°17.77	06°59.98	331°17.74	6.9'	27°36.36	-4.7'	57.0'	
17	$78^{\circ}17.94$	0.92	$345^{\circ}43.62$	6.9'	$27^{\circ}31.62$	-4.9'	57.0'	
18	93°18.10	S07°1.87	0°9.51	6.9'	\$27°26.73	-5.1'	57.1'	
19	108°18.26	2.81	14°35.40	6.9'	27°21.66	-5.2'	57.1'	
20 21	123°18.42 138°18.58	3.75 · · 4.69	29°1.31 43°27.24	6.9' 6.9'	27°16.44 27°11.04	-5.4' -5.6'	57.1' 57.2'	
22	158 18.58 153°18.74	5.64	43 27.24 57°53.17	6.9 7.0'	27 11.04 27°5.48	-5.0 -5.7'	57.2'	
23	168° 18.91	6.58	72°19.13	7.0'	26°59.76	-5.9'	57.2	
23	SD = 16.0'	d = 0.9'	.2 19.19		D = 15.4'	3.3	J1.2	
	3D = 10.0	$u = 0.9^{\circ}$		31) = 15.4°			
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	183°19.07	S07°7.52	86°45.10	7.0'	S26°53.88	-6.0'	57.3'	
1	198°19.23	8.46	101°11.08	7.0'	26°47.83	-6.2'	57.3'	
2	213°19.39	9.40	115°37.09	7.0'	26°41.61	-6.4'	57.3	
3	228°19.55	• • 10.34	130°3.12	7.1'	26°35.24	-6.5'	57.4'	
4 5	243°19.71 258°19.87	11.28 12.22	144°29.17 158°55.24	7.1' 7.1'	26°28.70 26°22.00	-6.7' -6.9'	57.4' 57.5'	
6	258° 19.87 273° 20.03	12.22 S07°13.16	158°55.24 173°21.34	7.1'	\$26° 22.00 \$26° 15.14	-6.9 -7.0'	57.5'	
7	288°20.19	14.11	173 21.34 187°47.47	7.1 7.2'	26°8.11	-7.0 -7.2'	57.5'	
8	303°20.35	15.05	202°13.62	7.2'	26° 0.93	-7.3'	57.6'	
9	318°20.50	• • 15.99	216°39.79	7.2'	25°53.58	-7.5'	57.6'	
10	333°20.66	16.93	231°6.00	7.2'	25°46.07	-7.7'	57.6'	
11	348°20.82	17.86	245°32.24	7.3'	25°38.41	-7.8'	57.7'	
12	3°20.98	S07°18.80	259°58.50	7.3'	\$25°30.58	-8.0'	57.7'	
13	18°21.14 33°21.30	19.74	274°24.80 288°51.14	7.3'	25°22.60 25°14.46	-8.1'	57.8'	
14 15	33°21.30 48°21.45	20.68 •• 21.62	288°51.14 303°17.50	7.4' 7.4'	25°14.46 25°6.16	-8.3' -8.5'	57.8' 57.8'	
15 16	48 21.45 63°21.61	22.56	303 17.50 317°43.90	7.4 7.4'	25 0.10 24°57.71	-8.6'	57.8 57.9'	
17	78°21.77	23.50	317 45.90 332°10.34	7.4 7.5'	24° 49.10	-8.8'	57.9'	
18	93°21.93	S07°24.44	346°36.81	7.5'	S24°40.33	-8.9'	57.9'	
19	108°22.08	25.38	1°3.32	7.5'	24°31.41	-9.1'	58.0'	
20	123°22.24	26.31	15°29.87	7.6'	24°22.34	-9.2'	58.0'	
21	138°22.40	• • 27.25	29°56.45	7.6'	24°13.11	-9.4'	58.1'	
22	153°22.55	28.19	44°23.08	7.7'	24°3.73	-9.5'	58.1'	
23	168°22.71	29.13	58°49.75	7.7'	23°54.20	-9.7'	58.1'	
	SD = 16.0'	d = 0.9'		SI	O = 15.6'			

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	04:35	05:53	07:02	16:29	17:38	18:56
N 70°	04:41	05:52	06:54	16:38	17:40	18:50
68°	04:46	05:51	06:47	16:45	17:41	18:45
66°	04:50	05:49	06:41	16:51	17:43	18:42
64°	04:53	05:48	06:36	16:56	17:44	18:39
62°	04:56	05:47	06:32	17:01	17:45	18:36
60°	04:58	05:46	06:28	17:04	17:46	18:34
$N 58^{\circ}$	05:00	05:45	06:25	17:08	17:47	18:32
56°	05:02	05:45	06:22	17:11	17:48	18:31
54°	05:03	05:44	06:19	17:14	17:49	18:30
52°	05:04	05:43	06:17	17:16	17:50	18:29
50°	05:05	05:42	06:15	17:18	17:51	18:28
45°	05:06	05:40	06:10	17:23	17:53	18:27
N 40°	05:07	05:38	06:06	17:27	17:55	18:26
35°	05:07	05:37	06:02	17:31	17:56	18:26
30°	05:07	05:35	05:59	17:34	17:58	18:26
20°	05:06	05:31	05:53	17:40	18:02	18:28
N 10°	05:03	05:27	05:48	17:45	18:06	18:31
0°	04:59	05:23	05:44	17:50	18:11	18:35
S 10°	04:53	05:18	05:39	17:55	18:16	18:41
20°	04:45	05:11	05:33	18:01	18:23	18:49
30°	04:35	05:03	05:27	18:07	18:31	19:00
35°	04:28	04:58	05:24	18:11	18:36	19:07
40°	04:19	04:52	05:19	18:15	18:43	19:15
45°	04:09	04:45	05:15	18:20	18:50	19:26
S 50°	03:55	04:36	05:09	18:26	18:59	19:40
52°	03:49	04:31	05:06	18:29	19:04	19:46
54°	03:42	04:27	05:03	18:32	19:09	19:54
56°	03:33	04:21	05:00	18:35	19:14	20:03
58°	03:23	04:15	04:56	18:39	19:20	20:12
S 60°	03:12	04:08	04:52	18:43	19:27	20:24
		Moonris	•		Moonsot	

Lat.		Moonris	e		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°						_
64°			17:40			20:24
62°		17:17	16:56		18:48	21:07
60°	15:48	16:17	16:26	18:18	19:48	21:36
N 58°	15:05	15:44	16:03	19:02	20:21	21:58
56°	14:36	15:19	15:45	19:31	20:45	22:16
54°	14:13	14:59	15:29	19:53	21:05	22:31
52°	13:55	14:42	15:16	20:12	21:22	22:44
50°	13:39	14:28	15:04	20:27	21:36	22:56
45°	13:07	13:58	14:39	20:59	22:05	23:19
N 40°	12:43	13:35	14:19	21:23	22:27	23:38
35°	12:23	13:16	14:03	21:43	22:46	23:54
30°	12:06	13:00	13:48	22:00	23:02	
20°	11:37	12:32	13:24	22:29	23:29	
N 10°	11:12	12:08	13:02	22:53	23:52	
0°	10:49	11:46	12:42	23:16		00:13
S 10°	10:26	11:23	12:22	23:39		00:34
20°	10:01	10:59	12:01		00:04	00:57
30°	09:33	10:32	11:36		00:32	01:23
35°	09:16	10:15	11:21		00:49	01:39
40°	08:56	09:56	11:04	00:13	01:08	01:56
45°	08:32	09:32	10:43	00:37	01:32	02:18
S 50°	08:01	09:02	10:17	01:08	02:03	02:45
52°	07:45	08:47	10:04	01:23	02:18	02:58
54°	07:27	08:30	09:50	01:41	02:35	03:13
56°	07:05	08:09	09:33	02:03	02:56	03:30
58°	06:37	07:42	09:12	02:31	03:23	03:52
S 60°	05:56	07:05	08:46	03:12	04:01	04:18

October 12, 13, 14 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	21°3.69	150°42.99 \$19°18.94	268°53.82 N22°41.37	300°27.12 N22°26.31	35°14.58 \$08°25.50	
1	36°6.15	165°42.38 19.83	283°54.99 41.25	315°29.61 26.31	50°17.17 25.55	Alpheratz 357°34.67 29°13.78
2	51°8.62	180°41.78 20.72	298°56.16 41.14	330°32.10 26.31	65°19.77 25.60	Ankaa 353°6.92 -42°10.25
3	66°11.08	195°41.17 · · 21.61	313°57.34 · · 41.02	345°34.59 · · 26.31	80°22.36 · · 25.65	Schedar 349°30.77 56°40.51
4	81° 13.55	210°40.56 22.50	328°58.51 40.91	0°37.08 26.30	95°24.95 25.70	Diphda 348° 47.18 -17° 50.94
5	$96^{\circ}16.01$	225°39.95 23.39	343°59.69 40.80	15°39.57 26.30	110°27.54 25.75	Achernar 335°19.72 -57°6.56 Hamal 327°51.11 23°34.87
6	111° 18.47	240°39.34 \$19°24.28	359°0.86 N22°40.68	30°42.06 N22°26.30	125°30.14 S08°25.79	Hamal 327°51.11 23°34.87 Polaris 313°43.02 89°21.99
7	126°20.94	255°38.73 25.16	14°2.04 40.57	45°44.55 26.30	140°32.73 25.84	Acamar 315°11.53 -40°12.11
8	141°23.40	270°38.12 26.05	29°3.22 40.45	60°47.04 26.30	155°35.32 25.89	Menkar 314°6.09 4°11.35
9	156° 25.87	285°37.51 · · 26.94	44°4.39 · · 40.34	75°49.53 · · 26.29	170°37.91 · · 25.94	Mirfak 308°28.16 49°56.91
10	171°28.33	300°36.90 27.82	59° 5.57 40.22	90°52.03 26.29	185°40.50 25.99	Aldebaran 290°39.65 16°33.62
11 12	186°30.79 201°33.26	315°36.28 28.71 330°35.67 \$19°29.59	74°6.75 40.11 89°7.93 N22°39.99	105°54.52 26.29 120°57.01 N22°26.29	200°43.09 26.04 215°45.68 \$08°26.09	Rigel 281°3.90 -8°10.17
13	201 33.20 216°35.72	345°35.06 30.47	104° 9.11 39.88	135°59.50 26.29	230°48.28 26.13	Capella 280°21.97 46°1.28
14	231° 38.19	0°34.44 31.35	119°10.29 39.77	151°2.00 26.28	245°50.87 26.18	Bellatrix 278°22.95 6°22.46
15	246° 40.65	15°33.83 · · 32.23	134°11.47 · · 39.65	166° 4.49 · · 26.28	260°53.46 · · 26.23	Elnath 278°1.96 28°37.70
16	261°43.11	30°33.22 33.11	149°12.65 39.54	181°6.99 26.28	275°56.05 26.28	Alnilam 275°37.80 -1°10.99
17	276°45.58	45°32.60 33.99	164°13.83 39.42	196° 9.48 26.28	290°58.64 26.33	Betelgeuse 270°52.20 7°24.82
18	291°48.04	60°31.99 S 19°34.87	179°15.02 N22°39.31	211°11.98 N22°26.27	306°1.23 S 08°26.38	Canopus 263°52.35 -52°42.13
19	306°50.51	75°31.37 35.74	194°16.20 39.19	226°14.47 26.27	321°3.82 26.42	Sirius 258° 26.37 -16° 44.74 Adhara 255° 6.00 -29° 0.01
20	321°52.97	90°30.75 36.62	209°17.38 39.08	241°16.97 26.27	336°6.41 26.47	Adhara 255°6.00 -29°0.01 Procyon 244°51.08 5°9.82
21	336° 55.44	105°30.14 · · 37.50	224°18.57 · · 38.96	256°19.46 · · 26.27	351°9.00 · · 26.52	Pollux 243°17.60 27°57.97
22	351°57.90	120°29.52 38.37	239°19.75 38.85	271°21.96 26.26	6°11.59 26.57	Avior 234°15.01 -59°34.92
23	7°0.36	135°28.90 39.24	254°20.94 38.73	286°24.46 26.26	21°14.18 26.62	Suhail 222°46.68 -43°31.60
Mer	pass. 22:32	ν-0.6' d0.9' m-3.94	ν 1.2' d-0.1' m0.33	$\nu 2.5' \ d$ -0.0' m-2.55	$\nu 2.6' \ d0.0' \ m0.70$	Miaplacidus 221°38.80 -69°48.74
						Alphard 217°48.14 -8°45.75
_						Regulus 207°34.88 11°50.87
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.76 61°36.96
0 1	22°2.83 37°5.29	150°28.28 S19°40.12 165°27.66 40.99	269°22.12 N22°38.61 284°23.31 38.50	301°26.96 N22°26.26 316°29.45 26.26	36°16.77 S08°26.66 51°19.36 26.71	Denebola 182°25.46 14°26.12
2	52°7.76	180°27.04 41.86	284 23.31 38.50 299°24.50 38.38	310 29.45 26.25 331°31.95 26.25	66°21.95 26.76	Gienah 175°44.14 -17°40.61
3	67° 10.22	195°26.42 · · 42.73	314°25.68 · · 38.27	346°34.45 · · 26.25	81°24.54 · · 26.81	Acrux 173°1.10 -63°14.04
4	82° 12.68	210°25.80 43.60	329°26.87 38.15	1°36.95 26.25	96°27.13 26.85	Gacrux 171°52.51 -57°14.97
5	97° 15.15	225°25.18 44.47	344°28.06 38.04	16°39.45 26.25	111°29.72 26.90	Alioth 166°13.68 55°49.55
6	112° 17.61	240°24.56 \$19°45.33	359°29.25 N22°37.92	31°41.95 N22°26.24	126°32.31 S08°26.95	Spica 158°22.86 -11°17.31
7	127°20.08	255°23.94 46.20	14°30.44 37.81	46°44.45 26.24	141°34.90 27.00	Alkaid 152°52.63 49°11.46
8	142°22.54	270°23.31 47.07	29°31.63 37.69	61°46.95 26.24	156°37.49 27.04	Hadar 148°37.00 -60°29.52
9	157° 25.00	285°22.69 · · 47.93	44°32.82 · · 37.57	76°49.45 · · 26.24	171°40.07 · · 27.09	Menkent 147°58.29 -36°29.44 Arcturus 145°48.43 19°3.33
10	172°27.47	300°22.07 48.79	59°34.01 37.46	91°51.95 26.23	186°42.66 27.14	Arcturus 145°48.43 19°3.33 Rigil Kent. 139°41.28 -60°56.27
11	187°29.93	315°21.44 49.66	74°35.20 37.34	106°54.45 26.23	201°45.25 27.19	Kochab 137°20.80 74°3.29
12	202°32.40	330°20.82 \$19°50.52	89°36.40 N22°37.23	121°56.96 N22°26.23	216°47.84 \$08°27.23	Zuben'ubi 136°56.58 -16°8.60
13	217°34.86	345°20.19 51.38	104°37.59 37.11	136°59.46 26.22	231°50.43 27.28	Alphecca 126°4.22 26°38.03
14	232°37.33	0°19.57 52.24	119°38.78 36.99	152° 1.96 26.22	246°53.02 27.33	Antares 112°16.36 -26°29.22
15	247°39.79	15°18.94 · · 53.10	134°39.98 · · 36.88	167° 4.46 · · · 26.22	261°55.60 · · 27.37	Atria 107°11.11 -69°4.49
16	262° 42.25	30°18.32 53.96	149°41.17 36.76	182°6.97 26.22	276°58.19 27.42	Sabik 102°3.22 -15°45.31
17	277° 44.72	45°17.69 54.82	164°42.37 36.65	197° 9.47 26.21	292°0.78 27.47	Shaula 96°10.86 -37°7.38
18	292° 47.18 307° 49.65	60°17.06 S19°55.67	179°43.56 N22°36.53 194°44.76 36.41	212°11.98 N22°26.21 227°14.48 26.21	307°3.37 S08°27.51 322°5.95 27.56	Rasalhague 95°58.91 12°32.66
19	307 49.05 322°52.11	75°16.43 56.53 90°15.81 57.39				Eltanin 90°42.48 51°29.36
20 21	322 52.11 337°54.57	90° 15.81 57.39 105° 15.18 •• 58.24	209°45.96 36.30 224°47.15 · · 36.18	242°16.98 26.20 257°19.49 · · 26.20	$337^{\circ}8.54$ 27.61 $352^{\circ}11.13$ · · · 27.65	Kaus Aust. 83°32.91 -34°22.45
22	352° 57.04	120°14.55 59.09	239°48.35 36.06	272°22.00 26.20	7°13.72 27.70	Vega 80°33.47 38°48.62
23	7°59.50	135°13.92 59.94	254°49.55 35.95	287°24.50 26.20	22°16.30 27.75	Nunki 75°48.08 -26°16.00
			-			Altair 62°0.14 8°56.15
Mer.p	pass. 22:28	ν-0.6' d0.9' m-3.94	$\nu 1.2' \ d$ -0.1' m0.32	ν2.5′ <i>d</i> -0.0′ m-2.56	$\nu 2.6' \ d0.0' \ m0.71$	Peacock 53°5.90 -56°39.52
						Deneb 49°25.83 45°22.37 Enif 33°38.83 9°59.45
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.86 -46°50.57
0	23°1.97	150°13.29 S 20°0.80	269°50.75 N22°35.83	302°27.01 N22°26.19	37°18.89 S 08°27.79	Fomalhaut 15°14.45 -29°29.47
1	38°4.43	165°12.66 1.65	284°51.95 35.71	317°29.52 26.19	52°21.48 27.84	Scheat 13°45.14 28°13.21
2	53°6.89	180°12.02 2.50	299°53.15 35.60	332°32.02 26.19	67°24.06 27.89	Markab 13°29.86 15°20.46
3	68°9.36	195°11.39 · · 3.35	314°54.35 · · 35.48	347°34.53 · · 26.18	82°26.65 · · 27.93	
4	83°11.82	210°10.76 4.19	329°55.55 35.36	2°37.04 26.18	97°29.24 27.98	Oct 12 Sat SHA Mer.pass
5	98°14.29	225°10.13 5.04	344°56.75 35.25	17°39.55 26.18	112°31.82 28.02	Venus 129° 39.30 13:58 Mars 247° 50.13 06:04
6	113° 16.75	240°9.49 \$20°5.89	359°57.96 N22°35.13	32°42.06 N22°26.17	127°34.41 \$08°28.07	Jupiter 279°23.43 03:58
7 8	128° 19.21 143° 21.68	255°8.86 6.73 270°8.22 7.58	14°59.16 35.01 30°0.36 34.89	47°44.56 26.17 62°47.07 26.17	142°37.00 28.12 157°39.58 28.16	Saturn 14°10.89 21:35
9	143 21.08 158° 24.14	285°7.59 · · 8.42	45°1.57 · · 34.78	77°49.58 · · 26.16	172°42.17 · · 28.21	
10	173° 26.61	300°6.95 9.26	60°2.77 34.66	92°52.09 26.16	187°44.75 28.25	Oct 13 Sun SHA Mer.pass
11	188° 29.07	315°6.32 10.10	75°3.98 34.54	107°54.61 26.16	202°47.34 28.30	Venus 128°25.45 13:59
12	203°31.53	330°5.68 S20°10.94	90°5.18 N22°34.43	122°57.12 N22°26.16	217°49.92 S08°28.35	Mars 247°19.30 06:02
13	218° 34.00	345°5.05 11.78	105°6.39 34.31	137°59.63 26.15	232°52.51 28.39	Jupiter 279°24.13 03:54
14	233°36.46	0°4.41 12.62	120°7.60 34.19	153°2.14 26.15	247°55.09 28.44	Saturn 14°13.94 21:31
15	248°38.93	15°3.77 · · 13.46	135°8.80 · · 34.07	168°4.65 · · 26.15	262°57.68 · · 28.48	Oct 14 Mon SHA Mer.pass
16	263°41.39	30°3.13 14.30	150°10.01 33.96	183°7.16 26.14	278°0.26 28.53	Venus 127°11.32 14:00
17	278° 43.85	45°2.49 15.13	165°11.22 33.84	198° 9.68 26.14	293°2.85 28.57	Mars 246°48.78 06:00
18	293°46.32	60°1.85 \$20°15.97	180°12.43 N22°33.72	213°12.19 N22°26.14	308°5.43 S08°28.62	Jupiter 279°25.04 03:50
19	308° 48.78	75°1.21 16.80	195°13.64 33.60	228°14.70 26.13	323°8.02 28.66	Saturn 14°16.92 21:27
20	323°51.25	90°0.57 17.64	210°14.85 33.49	243°17.22 26.13	338°10.60 28.71	Horizontal parallax
21	338°53.71	104°59.93 · · 18.47	225°16.06 · · 33.37	258°19.73 · · 26.13 273°22.25 26.12	353°13.19 · · 28.75	Venus: 0.1
22 23	353°56.17 8°58.64	119°59.29 19.30 134°58.65 20.13	240°17.27 33.25 255°18.49 33.13	273°22.25 26.12 288°24.76 26.12	8°15.77 28.80 23°18.36 28.84	Mars: 0.1
Mer.p	pass. 22:24	ν-0.6' d0.9' m-3.95	ν1.2' d-0.1' m0.31	ν2.5' d-0.0' m-2.56	$\frac{\nu 2.6' \ d0.0' \ m0.71}{}$	

CHA	h	Su	n	Moon				
198°2302 31,00 87°4320 7.8° 23°3460 -10.0° 582	Sat	GHA	Dec	GHA	ν	Dec	d	HP
2 213°2317 31,94 102°999 78° 23°2471 -10.1 58.2 3 228°2333 3.28 116°36.82 7.9 23°4.45 1-0.3 58.3 4 243°2348 33.81 131°3.69 7.9 23°4.30 -10.4 58.3 5 258°23.64 34.75 145°3.601 8.0° 22°323.0 -10.4 58.3 6 273°2379 507°35.68 189°57.57 80° 522°43.31 -10.7 58.4 7 288°23.95 30.62 174°24.57 80° 522°43.31 -10.7 58.4 7 288°23.95 30.62 174°24.57 80° 522°43.31 -10.7 58.4 9 318°24.26 3.35 49 203°18.71 81 22°10.74 -11.1 58.5 10 333°24.11 39.43 217°45.85 8.2 21°45.96 -11.3 58.5 11 348°24.56 40.36 232°13.04 82 21°45.96 -11.3 58.5 11 348°24.72 507°41.30 246°40.27 8.3 521°36.89 -11.6 58.6 13 18°24.87 42.23 261°7.54 8.3 21°25.33 -11.7 58.7 15 48°25.18 · 44.10 290°2.23 8.4 21°1.79 -12.0 58.7 15 48°25.18 · 44.10 290°2.23 8.4 21°1.79 -12.0 58.7 15 48°25.18 · 44.10 290°2.23 8.4 21°1.79 -12.0 58.7 17 78°25.48 45.97 318°57.10 8.5 20°37.71 -12.2 58.8 19 108°25.78 47.48 430°52.16 8.6 20°13.09 -12.5 58.9 10 133°26.53 50°46.90 333°24.60 8.6 520°35.74 -12.2 58.8 19 108°25.78 47.7 22°15.75 8.6 20°05.8 -12.6 58.9 21 133°26.09 · 49.71 16°47.40 8.7 10°47.95 -12.6 58.9 22 133°26.24 50.64 315°15.99 8.7 10°35.18 -12.9 50.0 23 168°26.39 51.57 45°43.33 9.9 18°50.12 -13.3 59.1 11 188°26.69 53.44 74°38.3 8.9 18°50.2 -13.3 59.1 21 138°26.09 · 55.30 103°3.2 20 00° 18°2.9 45 -13.5 59.0 25 28°27.29 57.17 122°3.19 9.11 18°3.0 -13.8 59.2 2 13°3.8 3 50°3.68 233°47.4 5 9.3 18°50.3 -13.8 59.2 2 13°3.8 3 50°3.68 233°47.4 5 9.3 18°50.3 -13.8 59.2 2 13°3.9 10 10 10 10 10 10 10 10 10 10 10 10 10								
288°23.33 32.88 116°36.82 79 23°14.58 -10.3 58.3 288°23.64 34.75 145°30.61 80 22°32.60 -10.9 58.4 6 273°23.79 S07°35.68 159°57.57 80 \$22°32.60 -10.9 58.4 8 303°24.10 37.56 188°51.62 81 22°21.74 -1110 58.5 9 318°24.26 3.84 203°18.17 81 22°21.74 -1110 58.5 10 333°24.41 39.43 203°18.17 81 22°21.74 -1110 58.5 11 388°24.56 40.36 223°13.04 8.2 21°59.60 -11.3 58.5 12 33°24.72 \$507°41.30 246°40.27 8.3 \$21°36.89 -11.6 58.6 13 18°24.87 44.23 260°7.44 83.2 21°35.80 -11.6 58.6 14 33°25.02 43.17 275°34.86 8.4 21°13.62 -118 58.7 15 48°25.18 44.10 200°2.33 84.2 21°1.79 -12.0 58.7 16 63°25.33 45.94 304°29.64 8.5 20°49.81 -121 58.8 18 33°25.63 \$507°46.90 333°24.60 8.6 \$500°25.46 -12.4 58.8 19 108°25.78 47.44 347°52.16 8.6 20°07.37 -12.2 58.8 21 138°26.09 54.74 347°52.16 8.6 20°0.58 -12.6 59.0 22 133°25.93 48.77 2°19.75 8.6 20°0.58 -12.6 59.0 22 133°26.49 50.64 31°15.09 8.7 19°35.16 -12.9 59.0 23 168°26.39 51.57 45°42.82 88 19°22.29 -13.0 59.0 24 243°2.84 45.47 434°3.84 8.9 18°5.12 -13.3 59.1 18 38°27.74 507°52.50 60°10.60 8.8 \$19°22.7 -13.1 59.1 19 38°27.74 507°52.50 60°10.60 8.8 \$19°22.7 -13.1 59.1 19 38°27.74 507°52.50 60°10.60 8.8 \$19°2.7 -13.1 59.1 19 38°27.74 507°52.50 60°10.60 8.8 \$19°2.20 -13.0 59.0 28 303°27.74 507°52.50 60°10.60 8.8 \$19°2.20 -13.0 59.0 29 318°23.83 308°3.68 8.9 18°5.10 -14.8 59.2 20 23 23 23 23 23 23 23								
243°23.48 33.81 131°3.69 7.9 23°4.30 -10.4 58.3 5 258°23.64 37.5 145°3.061 80° 22°53.88 -10.7 58.4 7 288°23.95 30.62 174°24.57 80° 22°32.60 -10.9 58.4 8 303°24.10 337.65 188°51.62 81° 22°21.74 -11.1 58.5 9 318°24.26 -38.49 203°18.71 81° 22°10.74 -11.1 58.5 10 333°44.11 39.43 217°45.85 8.2 21°45.96 -11.3 58.5 11 348°24.95 40.36 22°11.95.60 -11.3 58.5 12 3°24.72 507°41.30 246°40.27 8.3 521°3.68 -11.6 58.6 13 18°24.87 42.23 261°7.54 8.3 21°25.33 -11.7 58.7 15 48°25.18 -44.10 290°2.23 84. 21°1.79 -12.0 58.7 15 48°25.18 -44.10 290°2.23 84. 21°1.79 -12.0 58.7 16 63°25.33 45.04 304°26.64 8.5 20°37.71 -12.2 58.8 17 78°25.48 4.97 318°57.10 8.5 20°37.71 -12.2 58.8 18 93°25.63 507°45.00 333°40.0 8.6 520°25.46 -12.4 58.8 19 108°25.78 47.84 347°52.16 8.6 20°13.09 -12.5 58.9 20 123°25.93 48.77 2°19.75 8.6 20°10.56 -12.6 58.9 21 138°26.24 50.64 31°15.09 8.7 19°35.18 -12.9 59.0 22 158°26.24 50.64 31°15.09 8.7 19°35.18 -12.9 59.0 22 158°26.99 55.5 013°34.22 9.0 18°56.12 -13.3 59.1 23 228°27.99 50°55.50 103°34.22 9.0 18°22.9 -13.0 59.0 24 243°27.14 56.23 118°2.18 9.0 18°15.94 -13.6 59.2 24 243°27.14 56.23 118°2.18 9.0 18°15.94 -13.6 59.2 25 258°27.99 57°15.90 116°2.33 -11.7 58.5 59.2 26 273°27.44 50°75.50 103°4.22 9.0 18°2.30 -13.8 59.3 28 303°27.74 07°59.96 175°4.47 9.2 17°6.57 -14.2 59.4 29 318°3.09 50°16.83 -10.9 18°2.30 -13.8 59.3 28 303°27.74 07°59.96 175°54.77 9.2 17°6.57 -14.2 59.4 10 333°28.03 1.82 204°50.87 9.3 16°82.03 -14.4 59.5 29 138°3.09 508°2.48 -13.5 59.2 10 333°3.09 20°6.80 20°6.80 20°6.80 -10.9 59.8								
5								
288*29.95 36.62 174*24.57 80 22*21.74 -110 58.5 9 303*24.10 37.56 188*51.62 81. 22*21.74 -110 58.5 9 333*24.41 394.3 203*18.71 81. 22*21.74 -110 58.5 11 38*24.56 40.36 232*13.04 8.2 21*959.60 -11.3 58.5 11 38*24.56 40.36 232*13.04 8.2 21*959.60 -11.3 58.5 12 33*24.72 507*41.30 246*40.27 8.3 521*96.89 -11.6 58.5 12 33*24.72 507*41.30 246*40.27 8.3 521*96.89 -11.6 58.5 12 33*25.02 43.17 275*34.86 8.4 21*13.62 -11.8 58.7 14 33*25.02 43.17 275*34.86 8.4 21*13.62 -11.8 58.7 15 48*25.18 -44.10 200*2.23 8.4 21*13.62 -11.8 58.7 15 48*25.18 -44.10 200*2.23 8.4 21*13.62 -11.8 58.7 16 63*25.33 45.04 304*29.64 8.5 20*49.81 -12.1 58.8 19 108*25.78 47.84 34*7*52.16 8.5 20*49.81 -12.1 58.8 19 108*25.78 47.84 34*7*52.16 8.5 20*213.09 -12.5 58.9 21.2 138*26.09 -49.71 16*47.40 8.7 19*47.95 -12.8 59.0 22 13*25.03 51.57 45*42.82 8.8 19*22.29 -13.0 59.0 22 13*26.84 54.37 89*6.30 8.7 88*24.85 -13.3 59.1 59.0 22 13*26.84 54.37 89*6.30 8.9 18*24.85 -13.3 59.1 59.0 22 13*26.84 54.37 89*6.30 8.9 18*24.85 -13.3 59.1 59.0 22 13*26.84 54.37 89*6.30 8.9 18*24.85 -13.3 59.1 59			34.75			22°53.88		
8 303°24 10 37.56 188°51.62 8.1' 22°17.4 -11.0' 58.5' 9 318°24.26 -38.49 203°18.71 8.1' 22°10.74 -11.1' 58.5' 10 338°24.41 39.43 217°45.85 8.2' 21°96.40 -11.3' 58.5' 11 348°24.56 40.36 232°13.04 8.2' 21°48.81 -11.4' 58.6' 12 3°24.72 S07°41.30 246°40.27 8.3' 21°35.93 -11.6' 58.6' 13 18°24.87 42.23 261°7.54 8.3' 21°25.33 -11.6' 58.6' 14 33°25.02 43.17 275°3.486 8.4' 21°13.02 -11.8' 58.7' 15 48°25.18 -44.10 290°2.23 8.4' 21°13.02 -11.8' 58.7' 15 48°25.18 -44.10 290°2.23 8.4' 21°13.02 -11.8' 58.7' 16 63°25.33 45.04 304°2.64 8.5' 20°49.81 -12.1' 58.6' 17 78°25.48 45.97 318°57.10 8.5' 20°37.71 -12.2' 58.8' 18 93°25.63 S07°46.90 333°24.00 8.6' 20°13.09 -12.5' 58.9' 20 123°25.93 48.77 2°19.75 8.6' 20°0.58 -12.6' 58.9' 21 138°26.09 -44.71 16°47.40 8.7' 19°35.18 -12.9' 59.0' 22 153°26.24 50.64 31°15.09 8.7' 19°35.18 -12.9' 59.0' 23 166°26.39 51.57 45°42.82 8.8' 19°22.29 -13.0' 50.0' 24 243°27.14 56.23 118°2.18 9.0' 18°9.54 -13.5' 59.2' 25 26°27.29 57.17 132°3.01 9.1' 18°2.01 1.3' 59.1' 26 273°27.44 50°25.01 16°58.24 9.1' 18°2.94 51.3' 59.2' 27 288°27.29 57.17 132°3.01 9.1' 18°2.30 1.3' 59.1' 28 303°27.79 07°59.96 175°54.47 9.2' 17°0.68 -14.1' 59.4' 28 303°27.79 07°59.96 175°54.47 9.2' 17°0.68 -14.1' 59.4' 29 318°27.88 0.89 10°2.25 9.7 17°2.57 -14.6' 59.5' 21 348°28.18 2.75 219°19.14 9.3' 16°38.02 -14.4' 59.5' 21 138°20.65 0.10 333°6.79 9.5' 15°9.72 -15.1' 59.6' 21 33°30.09 508°14.83 47°30.18 9.8' 13°6.23 -14.1' 59.6' 21 138°30.00 508°14.83 47°30.18 9.8' 13°6.27 -15.5' 59.6' 22 153°30.95 508°20.40 134°23.41 10.0' 511°46.10 -16.3' 60.1' 23 318°31.52 24.10 10°2.94 10.1' 1								
9 318°24 26 · · · · · · · · · · · · · · · · · ·								
10 333°24.41 39.43 217°48.85 8.2 21°98.00 11.3 58.5 11 348°24.56 40.36 232°13.04 8.2 21°48.31 -11.4 58.6 12 3°24.72 \$07°41.30 246°40.27 8.3 \$21°36.99 -11.6 58.6 13 18°24.87 42.23 261°7.54 8.3 21°25.33 -11.7 58.7 14 33°25.02 43.17 275°34.86 8.4 21°13.02 11.8 58.7 15 48°25.18 · 44.10 200°2.23 8.4 21°13.02 11.8 58.7 16 63°25.33 50.04 50.49.04 8.5 20°49.81 12.1 58.7 17 78°25.48 45.97 318°57.10 8.5 20°37.71 12.2 58.8 18 93°25.63 \$07°46.90 333°24.60 8.6 20°3.09 12.4 58.9 19 108°25.73 47.84 347°52.16 8.6 20°3.09 12.5 58.9 20 123°25.93 48.77 2°19.75 8.6 20°0.58 -12.6 58.9 21 138°26.09 · 49.71 16°47.40 8.7 19°47.95 12.8 59.0 22 153°26.24 50.64 31°15.09 8.7 19°35.18 -12.9 59.0 23 168°26.99 53.44 74°3.83 8.9 19°22.29 13.0 59.0 24 243°27.14 55.23 118°2.18 9.0 18°9.94 31.5 59.2 2 138°26.69 · 55.30 103°3.42 9.0 18°9.94 31.5 59.2 2 213°26.84 54.37 83°6.30 8.9 18°42.85 13.4 59.2 3 228°26.99 · 55.30 103°3.42 9.0 18°9.94 31.5 59.2 4 243°27.14 56.23 118°2.18 9.0 18°9.94 31.5 59.2 5 258°27.29 67.17 132°30.19 91.1 18°2.30 13.8 59.3 6 273°27.74 50°5.90 161°26.33 91.1 17°4.67 14.0 59.3 3 30°27.74 50°5.90 15°5.47 92.1 17°0.66 14.1 59.4 10 333°28.03 1.82 246°8.08 93.1 16°52.3 14.1 59.4 11 348°28.18 2.75 219°10.14 93.1 16°53.25 14.4 59.5 2 3°28.33 \$08°3.68 233°4.45 93.1 16°52.35 14.4 59.5 13 18°28.89 7.40 93.3 16°52.35 14.4 59.5 14 33°28.05 1.12 349°3.34 9.7 14°4.16 15.5 59.7 15 48°29.06 31.13 39.3 31.1 38°5.12 41.15 59.6 16 63°29.97 12.98 18°3.62.9 9.7 13°5.32 15.6 59.9 2 16°29.99 15.6 60°6.00 11.13 30.6 50.2								
11 348°24.56 40.36 232°13.04 8.2° 21°4.83 -11.4° 58.6° 12 3°24.72 S07°41.30 246°40.27 8.3° S21°36.99 -11.6° 58.6° 13 18°24.87 42.23 261°7.54 8.3° 21°25.33 -11.7° 58.6° 14 33°25.02 43.17 275°34.86 8.4° 21°1.79 -12.0° 58.7° 15 48°25.18 -4.10 200°2.23 8.4° 21°1.79 -12.0° 58.7° 16 63°25.33 45.04 304°29.64 8.5° 20°49.81 -12.1° 58.8° 17 78°25.48 45.97 318°71.00 8.5° 20°49.81 -12.1° 58.8° 18 93°25.63 50°64.90 333°24.60 8.6° S20°55.66 -12.4° 58.8° 19 108°25.78 47.84 347°52.16 8.6° 20°0.58 -12.6° 58.9° 20 123°25.93 48.77 2°19.75 8.6° 20°0.58 -12.6° 58.9° 21 138°26.09 -49.71 16°47.40 8.7° 19°45.18 12.9° 59.0° 22 153°26.24 50.64 31°15.09 8.7° 19°45.18 12.9° 59.0° 23 168°26.39 51.57 45°42.82 8.8° 19°22.29 -13.0° 59.0° 25 20 133°26.64 50°52.50 60°10.60 8.8° 519°9.27 -13.1° 59.1° 1 198°26.69 53.44 74°38.43 8.9° 18°6.612 -13.3° 59.1° 2 213°26.84 54.37 88°6.30 8.9° 18°24.55 -13.5° 59.2° 3 228°26.99 ·55.30 103°34.22 9.0° 18°29.45 -13.5° 59.2° 4 243°27.14 56.23 118°2.18 9.0° 18°15.94 -13.6° 59.2° 5 258°27.29 57.17 132°30.19 9.1° 18°2.35 -13.5° 59.2° 6 273°27.44 50°58.10 146°58.24 9.1° 18°15.94 -13.6° 59.2° 6 273°27.44 50°58.10 146°58.24 9.1° 18°15.94 -13.6° 59.2° 7 288°27.59 07°59.96 175°54.47 9.2° 17°0.68 -14.1° 59.4° 10 333°28.03 1.82 204°50.87 9.3° 16°2.35 -14.4° 59.4° 11 348°28.18 2.75 219°19.14 9.3° 16°2.25 -14.4° 59.5° 12 3°28.33 S08°3.66 233°47.45 9.3° 16°2.35 -14.3° 59.4° 13 18°28.48 4.61 248°15.79 9.4° 16°9.02 -14.7° 59.6° 14 33°320.05 50.8° 4.83 47°30.18 9.8° 13°3.20 -14.6° 59.7° 15 48°28.97 9.5° 15°9.77 15.1° 59.7° 16								
13	11	348°24.56			8.2'	21°48.31	-11.4'	58.6'
14 33°25,02 43.17 275°34,86 8.4' 21°13,62 11.8' 58.7' 16 63°25,33 46.04 304°29,64 8.5' 20°47,71 12.0' 58.7' 17 78°25,48 45.97 318°57,10 8.5' 20°37,71 12.2' 58.8' 18 93°25,63 50°46,90 333°24,00 8.6' 20°13,09 12.4' 58.9' 19 108°25,78 47.84 347°52,16 8.6' 20°13,09 12.5' 58.9' 20 123°25,93 48.77 22°19,75 8.6 20°13,09 12.6' 58.9' 21 138°26,09 ·49,71 16°47,40 8.7' 19°35,18 12.9' 59.0' 22 153°26,24 50.64 31°15,09 8.7' 19°35,18 12.9' 59.0' 23 168°26,39 51.57 45°42,22 88' 519°22,29 13.0' 59.0' 24 213°26,84 54.37 80°6,30 8.9' 18°26,29 13.0' 59.2' 2 213°26,84 54.37 80°6,30 8.9' 18°24,25 13.4' 59.2' 3 228°26,99 ·55.30 103°34,22 9.0' 18°29,45 13.5' 59.2' 4 243°27,14 56.23 118°2,18 9.0' 18°15,54 13.5' 59.2' 5 258°27,29 57.17 132°30,19 9.1' 18°2,30 13.8' 59.3' 7 288°27,59 07°59,03 161°26,33 9.1' 17°48,55 13.9' 59.3' 8 303°27,74 07°59,06 175°44,79 9.2' 17°20,68 14.1' 59.4' 9 318°27,88 0.89 190°22,65 9.2' 17°6,67 14.0' 59.3' 13 48°28,18 2.75 219°1,19 33' 16°52,35 14.3' 59.4' 14 33°28,62 5.54 262°4,18 9.4' 15°4,35 14.8' 59.6' 15 48°28,79 10.19 338°6,72 9.6' 14°39,45 15.3' 59.8' 16 63°28,92 7.40 291°41,8 9.5' 15°93,58 14.9' 59.6' 16 63°28,93 7.40 291°41,8 9.5' 15°93,55 14.6' 59.5' 16 63°28,93 7.40 291°41,8 9.5' 15°93,55 14.1' 59.4' 17 78°29,06 13°6,67 33' 14.6' 50.5' 18 93°9,021 508°9,26 203°3,14 9.5' 15°93,55 14.1' 59.4' 19 108°29,36 10.19 338°6,72 9.6' 14°39,45 15.5' 59.8' 22 153°39,73 15.6' 60°7,65 9.9' 12°4,45 15.5' 59.9' 23 168°20,36 11.19 33°4,47 49.9' 16°30,41 15.9' 60.0' 4 243°30,66 18.54 10.5' 10.9' 10.9' 10.6' 15								
15								
16								
18								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	17				8.5'			
123°25.93								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $								
Sun GHA Dec GHA ν Dec d HP 0 183°26.59 507°52.50 60°10.60 8.8' 519°9.27' -13.1' 59.1' 1 198°26.69 53.44 74°38.43 8.9' 18°66.12 -13.3' 59.1' 2 213°26.84 54.37 89°6.30 8.9' 18°29.45 -13.5' 59.2' 4 243°27.14 56.23 118°2.18 9.0' 18°29.45 -13.5' 59.2' 5 258°27.29 57.17 132°30.19 9.1' 18°2.30 -13.8' 59.2' 6 273°27.44 507°59.03 161°26.33 9.1' 17°48.55 -13.9' 59.3' 7 288°27.59 07°59.96 115°54.47 9.2' 17°6.57 -14.0' 59.3' 10 333°27.80 3 1.82 204°50.87 9.3' 16°52.35 -14.3' 59.4' 11 348°28.18 2.75 219°19.14 9.3' 16°52.85		168°26.39	51.57	45°42.82		19°22.29		
183°26.54 S07°52.50 60°10.60 8.8' S19°9.27 -13.1' S9.1' 1 199°26.69 53.44 74°38.43 8.9' 18°56.12 -13.3' S9.1' 2 213°26.84 54.37 89°6.30 8.9' 18°42.85 -13.3' S9.1' 3 228°26.99 · · · 55.30 103°34.22 9.0' 18°29.45 -13.5' S9.2' 4 243°27.14 56.23 118°2.18 9.0' 18°15.94 -13.6' S9.2' 5 258°27.29 57.17 132°30.19 9.1' 18°2.30 -13.8' S9.2' 6 273°27.44 S07°58.10 146°58.24 9.1' S17°48.55 -13.9' S9.3' 7 288°27.59 07°59.03 161°26.33 9.1' 17°48.55 -13.9' S9.3' 8 303°27.74 07°59.96 175′54.47 9.2' 17°20.68 -14.1' S9.4' 9 318°27.88 · · 0.89 190°22.65 9.2' 17°6.57 -14.2' S9.4' 10 333°28.03 1.82 204°50.87 9.3' 16°38.02 -14.4' S9.5' 11 348°28.18 2.75 219°19.14 9.3' 16°38.02 -14.4' S9.5' 12 3°28.33 S08°3.68 233°47.45 9.3' S16°23.57 -14.6' S9.5' 13 18°28.48 4.61 248°15.79 9.4' 16°0.02 -14.7' S9.6' 14 33°28.62 5.54 262°44.18 9.4' 15°54.35 -14.8' S9.6' 15 48°28.77 · 6.47 277°12.61 9.5' 15°39.58 -14.9' S9.6' 16 63°28.92 7.40 291°41.08 9.5' 15°39.58 -14.9' S9.6' 16 63°28.92 7.40 291°41.08 9.5' 15°9.72 -15.1' S9.7' 18 93°29.21 S08°9.26 320°38.14 9.6' S14°54.64 -15.2' S9.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.5' S9.8' 20 123°29.50 11.12 349°35.34 9.7' 14°24.16 -15.4' S9.8' 21 138°29.65 · · 12.05 4°4.00 9.7' 14°8.77 -15.5' S9.8' 22 13°30.37 16.69 76°27.80 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°34.46 -16.0' 60.0' 5 213°30.37 16.69 76°27.80 9.9' 12°34.46 -16.0' 60.0' 6 273°30.95 S08°20.40 134°33.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°46.10 -16.3' 60.1' 10 338°31.24 22.25 166°21.39 10.0' 11°34		SD = 16.0'	d = 0.9'		SI	D = 15.9'		
183°26.54 S07°52.50 60°10.60 8.8' S19°9.27 -13.1' S9.1' 1 199°26.69 53.44 74°38.43 8.9' 18°56.12 -13.3' S9.1' 2 213°26.84 54.37 89°6.30 8.9' 18°42.85 -13.3' S9.1' 3 228°26.99 · · · 55.30 103°34.22 9.0' 18°29.45 -13.5' S9.2' 4 243°27.14 56.23 118°2.18 9.0' 18°15.94 -13.6' S9.2' 5 258°27.29 57.17 132°30.19 9.1' 18°2.30 -13.8' S9.2' 6 273°27.44 S07°58.10 146°58.24 9.1' S17°48.55 -13.9' S9.3' 7 288°27.59 07°59.03 161°26.33 9.1' 17°48.55 -13.9' S9.3' 8 303°27.74 07°59.96 175′54.47 9.2' 17°20.68 -14.1' S9.4' 9 318°27.88 · · 0.89 190°22.65 9.2' 17°6.57 -14.2' S9.4' 10 333°28.03 1.82 204°50.87 9.3' 16°38.02 -14.4' S9.5' 11 348°28.18 2.75 219°19.14 9.3' 16°38.02 -14.4' S9.5' 12 3°28.33 S08°3.68 233°47.45 9.3' S16°23.57 -14.6' S9.5' 13 18°28.48 4.61 248°15.79 9.4' 16°0.02 -14.7' S9.6' 14 33°28.62 5.54 262°44.18 9.4' 15°54.35 -14.8' S9.6' 15 48°28.77 · 6.47 277°12.61 9.5' 15°39.58 -14.9' S9.6' 16 63°28.92 7.40 291°41.08 9.5' 15°39.58 -14.9' S9.6' 16 63°28.92 7.40 291°41.08 9.5' 15°9.72 -15.1' S9.7' 18 93°29.21 S08°9.26 320°38.14 9.6' S14°54.64 -15.2' S9.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.5' S9.8' 20 123°29.50 11.12 349°35.34 9.7' 14°24.16 -15.4' S9.8' 21 138°29.65 · · 12.05 4°4.00 9.7' 14°8.77 -15.5' S9.8' 22 13°30.37 16.69 76°27.80 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°34.46 -16.0' 60.0' 5 213°30.37 16.69 76°27.80 9.9' 12°34.46 -16.0' 60.0' 6 273°30.95 S08°20.40 134°33.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°46.10 -16.3' 60.1' 10 338°31.24 22.25 166°21.39 10.0' 11°34								
1 198°26.69								
2 213°26.84 54.37 89°6.30 8.9′ 18°42.85 -13.4′ 59.2′ 3 228°26.99 · · · 55.30 103°34.22 9.0′ 18°29.45 -13.5′ 59.2′ 4 243°27.14 56.23 118°2.18 9.0′ 18°15.94 -13.5′ 59.2′ 5.258°27.29 57.17 132°30.19 9.1′ 18°23.03 -13.8′ 59.3′ 6 273°27.44 S07°58.10 146°58.24 9.1′ 517°48.55 -13.9′ 59.3′ 7 288°27.59 07°59.03 161°26.33 9.1′ 17°34.67 -14.0′ 59.3′ 8 303°27.74 07°59.96 175°54.47 9.2′ 17°20.68 -14.1′ 59.4′ 9 318°27.88 · · 0.89 190°22.65 9.2′ 17°6.67 -14.2′ 59.4′ 10 333°28.03 1.82 204°50.87 9.3′ 16°52.35 -14.2′ 59.4′ 11 348°28.18 2.75 219°19.14 9.3′ 16°38.02 -14.4′ 59.5′ 11 38°28.48 4.61 248°15.79 9.4′ 16°30.02 -14.4′ 59.5′ 11 38°28.48 4.61 248°15.79 9.4′ 16°9.02 -14.4′ 59.6′ 14 33°28.62 5.54 262°44.18 9.4′ 15°54.35 -14.8′ 59.6′ 15 48°28.77 · 6.47 277°12.61 9.5′ 15°39.58 -14.9′ 59.6′ 16 63°28.92 7.40 291°41.08 9.5′ 15°34.55 -15.0′ 59.7′ 17 78°29.06 8.33 306°9.59 9.5′ 15°0.72 -15.1′ 59.7′ 19 108°29.36 10.19 335°6.72 9.6′ 14°39.45 -15.3′ 59.8′ 21 138°29.65 11.12 349°35.34 9.7′ 14°24.16 -15.4′ 59.8′ 21 138°29.65 11.12 349°35.34 9.7′ 14°24.16 -15.4′ 59.8′ 21 138°29.69 11.19 335°6.72 9.6′ 14°39.45 -15.3′ 59.8′ 22 153°29.79 12.98 18°32.69 9.7′ 13°53.29 -15.6′ 59.9′ 23 168°29.94 13.91 33°1.41 9.8′ 13°37.71 -15.7′ 59.9′ 23 168°29.94 13.91 33°1.41 9.8′ 13°37.71 -15.7′ 59.9′ 318°33.03 50.52 · 17.62 90°56.65 9.9′ 12°34.46 -16.0′ 60.0′ 42°30.95 508°20.40 134°23.41 10.0′ 511°46.10 -16.3′ 60.1′ 7 288°31.01 21.32 148°52.38 10.0′ 11°29.80 -16.2′ 60.1′ 13°330.37 16.69 76°27.80 9.9′ 12°34.46 -16.0′ 60.0′ 42°30.95 508°20.40 134°23.41 10.0′ 511°46.10 -16.3′ 60.1′ 7 288°31.01 21.32 148°52.38 10.0′ 11°29.80 -16.2′ 60.1′ 13°333.15 22.24 10 11°29.80 -16.6′ 60.3′ 13°333.15 22.24 10 12°39.55 20.9′ 20.0′ 20°33.56 -16.0′ 60.1′ 13°33.30 508°43.90 27°10.0′ 11°13.43 -16.5′ 60.2′ 90°31.81 13°37.11 15.7′ 15.8′ 59.9′ 11.18 33°3.18 10°00 11°00.0′ 11°13.43 -16.5′ 60.2′ 11°10 348°31.00 21.32 148°52.33 10.0′ 11°13.43 -16.5′ 60.2′ 11°10 348°31.00 21.32 148°52.53 10.0′ 11°10.40.51 -16.6′ 60.3′ 11°10 34°3.18 20.9′ 20°33.56 -16.9′ 60.1′ 11°10 34°3.18 20.9′ 20°40.								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
5		228°26.99	• • 55.30	103°34.22	9.0'	18°29.45	-13.5'	59.2'
6								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
8 303°27.74 07°59.96 175°54.47 9.2' 17°20.68 -14.1' 59.4' 9 318°27.88 · · 0.89 190°22.65 9.2' 17°6.57 -14.2' 59.4' 10 333°28.03 1.82 204°50.87 9.3' 16°52.35 -14.3' 59.4' 11 348°28.18 2.75 219°19.14 9.3' 16°38.02 -14.4' 59.5' 12 3°28.33 508°3.68 233°47.45 9.3' 516°23.57 -14.6' 59.5' 13 18°28.48 4.61 248°15.79 9.4' 16°9.02 -14.7' 59.6' 14 33°28.62 5.54 262°44.18 9.4' 15°54.35 -14.8' 59.6' 15 48°28.77 · · 6.47 277°12.61 9.5' 15°39.58 -14.9' 59.6' 16 63°28.92 7.40 291°41.08 9.5' 15°39.58 -14.9' 59.6' 17 78°29.06 8.33 306°9.59 9.5' 15°37.2 -15.1' 59.7' 18 93°29.21 508°9.26 320°38.14 9.6' 514°54.64 -15.2' 59.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.3' 59.8' 20 123°29.50 11.12 349°35.34 9.7' 14°24.16 -15.4' 59.8' 21 138°29.65 · · 12.05 4°4.00 9.7' 14°34.77 -15.5' 59.8' 22 153°29.79 12.98 18°32.69 9.7' 13°53.29 -15.6' 59.9' 22 168°29.94 13.91 33°1.41 9.8' 13°37.71 -15.7' 59.9' 50.2' 213°30.37 16.69 76°27.80 9.9' 12°54.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°54.46 -16.0' 60.0' 4 243°30.95 508°14.83 19.47 119°54.46 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°54.46 -16.0' 60.0' 4 243°30.65 18.54 105°25.54 9.9' 12°54.46 -16.0' 60.0' 6 273°30.95 508°20.40 134°23.41 10.0' 511°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.35 10.0' 11°13.43 -16.1' 60.1' 6 273°30.95 508°20.40 134°23.41 10.0' 511°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.35 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · · · · · · · · · · · · · · · · · · ·								
10 333°28.03 1.82 204°50.87 9.3' 16°52.35 -14.3' 59.4' 11 348°28.18 2.75 219°19.14 9.3' 16°38.02 -14.4' 59.5' 12 3°28.33 508°3.68 233°47.45 9.3' 516°23.57 -14.6' 59.5' 13 18°28.48 4.61 248°15.79 9.4' 16°9.02 -14.7' 59.6' 14 33°28.62 5.54 262°44.18 9.4' 15°54.35 -14.8' 59.6' 15 48°28.77 · 0.647 277°12.61 9.5' 15°39.58 -14.9' 59.6' 16 63°28.92 7.40 291°41.08 9.5' 15°9.72 -15.1' 59.7' 17 78°29.06 8.33 306°9.59 9.5' 15°9.72 -15.1' 59.7' 18 93°29.21 508°9.26 320°38.14 9.6' 514°54.64 -15.2' 59.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.3' 59.8' 20 123°29.50 11.12 349°35.34 9.7' 14°24.16 -15.4' 59.8' 21 138°29.65 · 12.05 4°4.00 9.7' 14°8.77 -15.5' 59.8' 22 153°29.79 12.98 18°32.69 9.7' 13°53.29 -15.6' 59.9' 23 168°29.94 13.91 33°1.41 9.8' 13°37.71 -15.7' 59.9' 213°30.37 16.69 76°27.80 9.9' 12°34.46 -16.0' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°13.44 -16.0' 60.0' 5 258°30.81 19.47 119°54.46 9.9' 12°23.0 -16.2' 60.1' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.6' 60.2' 288°31.10 21.33 148°32.38 10.0' 11°29.80 -16.6' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°40.45 -16.6' 60.3' 11 348°31.50 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°33.84 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°33.84 -16.5' 60.2' 11 38°32.90 27.80 250°45.92 10.2' 09°35.66 -17.2' 60.5' 18 93°32.66 508°31.50 308°12.69 10.2' 09°35.66 -17.0' 60.4' 18 48°32.24 · 228.73 264°45.09 10.2' 09°56.66 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°59.99 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°59.59 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°59.59 -17.0' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 07°15.53 -17.4' 60.6' 21 138°33.80 33.6 32.43 322°41.93 10.3' 07°15.53 -17.4' 60.6' 21 138°33.86 33.60 32.43 322°41.93 10.3' 07°15.53 -17.4' 60.6' 22 133°33.56 33.60 32.43 322°41.93 10.3' 07°51.57 -17.1' 60.5' 19 108°33								
11 348°28.18 2.75 219°19.14 9.3' 16°38.02 -14.4' 59.5' 12 3°28.33 S08°3.68 233°47.45 9.3' S16°23.57 -14.6' 59.5' 13 18°28.48 4.61 248°15.79 9.4' 16°9.02 -14.7' 59.6' 14 33°28.62 5.54 262°44.18 9.4' 15°54.35 -14.8' 59.6' 15 48°28.77 ·· 6.47 277°12.61 9.5' 15°39.58 -14.9' 59.6' 16 63°28.92 7.40 291°41.08 9.5' 15°24.70 -15.0' 59.7' 17 78°29.06 8.33 306°9.59 9.5' 15°24.70 -15.0' 59.7' 18 93°29.21 S08°9.26 320°38.14 9.6' S14°54.64 -15.2' 59.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.3' 59.8' 20 123°29.50 11.12 349°35.34 9.7' 14°4.16 -15.4' 59.8' 21 138°29.65 ·· 12.05 4°4.00 9.7' 14°8.77 -15.5' 59.8' 22 153°29.79 12.98 18°32.69 9.7' 13°53.29 -15.6' 59.9' 23 168°29.94 13.91 33°1.41 9.8' 13°37.71 -15.7' 59.9' SD = 16.0' d = 0.9' SD = 16.1' Mon GHA Dec GHA ν Dec d HP 0 183°30.03 508°14.83 47°30.18 9.8' S13°22.04 -15.8' 59.9' 22 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 23 228°30.52 ·· 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°18.43 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°23.0 -16.2' 60.1' 6 273°30.95 S08°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°56.98 -16.4' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°43.84 -16.7' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' 510°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.6' 60.3' 14 34°32.24 ·· 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 15 48°32.24 ·· 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°44.93 10.3' 08°5.99 -17.0' 60.4' 18 93°32.66 508°31.50 308°12.69 10.2' 508°25.56 -17.2' 60.5' 18 93°32.66 508°31.50 308°12.69 10.2' 508°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.0 6°9.73 10.3' 07°16.53 -17.4' 60.6' 22 153°33.	9	318°27.88	• • 0.89	190°22.65	9.2'	$17^{\circ}6.57$	-14.2'	59.4'
12 3°28.33 SO8°3.68 233°47.45 9.3' S16°23.57 -14.6' 59.5' 13 18°28.48 4.61 248°15.79 9.4' 16°9.02 -14.7' 59.6' 14 33°28.62 5.54 262°44.18 9.4' 15°54.35 -14.8' 59.6' 15 48°28.77 ·· 6.47 277°12.61 9.5' 15°39.58 -14.9' 59.6' 16 63°28.92 7.40 291°41.08 9.5' 15°39.58 -14.9' 59.6' 17 78°29.06 8.33 306°9.59 9.5' 15°9.72 -15.1' 59.7' 18 93°29.21 SO8°9.26 320°38.14 9.6' S14°54.64 -15.2' 59.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.3' 59.8' 20 123°29.50 11.12 349°35.34 9.7' 14°24.16 -15.4' 59.8' 21 138°29.65 ·· 12.05 4°4.00 9.7' 14*8.77 -15.5' 59.8' 22 153°29.79 12.98 18°32.69 9.7' 13°53.29 -15.6' 59.9' 23 168°29.94 13.91 33°1.41 9.8' 13°37.71 -15.7' 59.9' SD = 16.0' d = 0.9' SD = 16.1' Mon GHA Dec GHA ν Dec GHA ν Dec d HP 0 183°30.09 S08°14.83 47°30.18 9.8' S13°22.04 -15.8' 59.9' 2 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 ·· 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°34.46 -16.0' 60.0' 4 243°30.69 18.54 105°25.54 9.9' 12°34.46 -16.0' 60.0' 4 243°30.69 18.54 105°25.54 9.9' 12°34.46 -16.0' 60.0' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 S08°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 ·· 23.18 177°50.42 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°40.45 -16.6' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' S10°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 10°40.45 -16.6' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 ·· 28.73 264°45.09 10.2' 09°33.56 -16.9' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 S08°31.50 308°12.69 10.2' S08°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 22 153°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								
14								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								
18 93°29.21 S08°9.26 320°38.14 9.6' S14°54.64 -15.2' 59.7' 19 108°29.36 10.19 335°6.72 9.6' 14°39.45 -15.3' 59.8' 20 123°29.50 11.12 349°35.34 9.7' 14°24.16 -15.4' 59.8' 21 138°29.65 · 12.05 4°4.00 9.7' 14°8.77 -15.5' 59.8' 22 153°29.79 12.98 18°32.69 9.7' 13°53.29 -15.6' 59.9' 23 168°29.94 13.91 33°1.41 9.8' 13°37.71 -15.7' 59.9' SD = 16.0' d = 0.9' SD = 16.1' Mon GHA Dec GHA ν Dec d HP 0 183°30.09 S08°14.83 47°30.18 9.8' S13°22.04 -15.8' 59.9' 1 198°30.23 15.76 61°58.97 9.8' 13°6.27 -15.9' 60.0' 2 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°18.43 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.2' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°29.80 -16.4' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 9 318°31.36 23.18 177°50.42 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°23.84 -16.7' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' 10°35.98 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 10°40.45 -16.6' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 508°31.50 308°12.69 10.2' 508°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 07°51.17 -17.3' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.2' 60.5' 22 153°33.22 35.20 6°9.73 10.3' 07°61.53 -17.4' 60.6' 23 168°33.36 33.61 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
19								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	20	123°29.50	11.12	349°35.34	9.7'	14°24.16	-15.4'	59.8'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								
Mon GHA Dec GHA ν Dec d HP 0 183°30.09 \$08°14.83 47°30.18 9.8' \$13°6.27 -15.8' \$9.9' 1 198°30.23 15.76 61°58.97 9.8' 13°6.27 -15.9' 60.0' 2 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°2.30 -16.2' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 508°20.40 134°23.41 10.0' \$11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°3.43 -16.5' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°1.343 -16.5' <td>23</td> <td></td> <td></td> <td>33 1.41</td> <td></td> <td></td> <td>-13.7</td> <td></td>	23			33 1.41			-13.7	
0 183°30.09 S08°14.83 47°30.18 9.8' S13°22.04 -15.8' 59.9' 1 198°30.23 15.76 61°58.97 9.8' 13°6.27 -15.9' 60.0' 2 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°2.30 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 508°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 33°31.52 24.10 1		$SD = 16.0^{\circ}$	$a = 0.9^{\circ}$		51	$J = 10.1^{\circ}$		
1 198°30.23 15.76 61°58.97 9.8' 13°6.27 -15.9' 60.0' 2 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°18.43 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 508°20.40 134°23.41 10.0' 511°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 2	Mon				ν		d	HP
2 213°30.37 16.69 76°27.80 9.9' 12°50.41 -15.9' 60.0' 3 228°30.52 · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°18.43 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 S08°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°40.45 -16.6' 60.3' 12 3°31.81 S08°25.95								
3 228°30.52 · · · 17.62 90°56.65 9.9' 12°34.46 -16.0' 60.0' 4 243°30.66 18.54 105°25.54 9.9' 12°18.43 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 S08°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°23.84 -16.7' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1'								
4 243°30.66 18.54 105°25.54 9.9' 12°18.43 -16.1' 60.1' 5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 S08°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°40.45 -16.6' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' 510°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.94 28.273								
5 258°30.81 19.47 119°54.46 9.9' 12°2.30 -16.2' 60.1' 6 273°30.95 S08°20.40 134°23.41 10.0' S11°46.10 -16.3' 60.1' 7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°40.45 -16.6' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' 510°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.90 27.80 250°15.92 10.2'								
7 288°31.10 21.32 148°52.38 10.0' 11°29.80 -16.4' 60.2' 8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°23.84 -16.7' 60.3' 12 3°31.81 508°25.95 221°17.65 10.1' 50°5.39 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 · 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 293°43.47 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58								
8 303°31.24 22.25 163°21.39 10.0' 11°13.43 -16.5' 60.2' 9 318°31.38 · 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°23.84 -16.7' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' 510°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 · 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 508°31.50								
9 318°31.38 ··· 23.18 177°50.42 10.1' 10°56.98 -16.5' 60.2' 10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°23.84 -16.7' 60.3' 12 3°31.81 508°25.95 221°17.65 10.1' 510°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 ··· 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 508°31.50 308°12.69 10.2' 508°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 ··· 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
10 333°31.52 24.10 192°19.47 10.1' 10°40.45 -16.6' 60.3' 11 348°31.67 25.03 206°48.55 10.1' 10°23.84 -16.7' 60.3' 12 3°31.81 S08°25.95 221°17.65 10.1' S10°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 28.73 264°45.09 10.2' 09°35.36 -16.9' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°59.69 -17.0' 60.5' 18 93°32.66 508°31.50 308°12.69 10.2' 508°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3'								
12 3°31.81 S08°25.95 221°17.65 10.1' S10°7.15 -16.8' 60.3' 13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 · · · 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°59.69 -17.0' 60.5' 18 93°32.66 508°31.50 308°12.69 10.2' 508°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3'	10	333°31.52	24.10	192°19.47	10.1'	10°40.45	-16.6'	60.3'
13 18°31.95 26.88 235°46.77 10.1' 09°50.39 -16.8' 60.3' 14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 · 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 S08°31.50 308°12.69 10.2' S08°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.4' 60.6' 22 153°33.22 35.20 6°9.73 10.3'								
14 33°32.09 27.80 250°15.92 10.2' 09°33.56 -16.9' 60.4' 15 48°32.24 · 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 S08°31.50 308°12.69 10.2' S08°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3'								
15 48°32.24 · · · 28.73 264°45.09 10.2' 09°16.66 -17.0' 60.4' 16 63°32.38 29.65 279°14.27 10.2' 08°59.69 -17.0' 60.4' 17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 S08°31.50 308°12.69 10.2' S08°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
17 78°32.52 30.58 293°43.47 10.2' 08°42.66 -17.1' 60.5' 18 93°32.66 S08°31.50 308°12.69 10.2' S08°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'		48°32.24						
18 93°32.66 S08°31.50 308°12.69 10.2' S08°25.56 -17.2' 60.5' 19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
19 108°32.80 32.43 322°41.93 10.3' 08°8.39 -17.2' 60.5' 20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
20 123°32.94 33.35 337°11.18 10.3' 07°51.17 -17.3' 60.5' 21 138°33.08 · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
21 138°33.08 · · 34.27 351°40.45 10.3' 07°33.88 -17.3' 60.6' 22 153°33.22 35.20 6°9.73 10.3' 07°16.53 -17.4' 60.6' 23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'								
23 168°33.36 36.12 20°39.02 10.3' 06°59.13 -17.5' 60.6'	21	138°33.08	• • 34.27	351°40.45	10.3'	07°33.88	-17.3'	60.6'
SD = 16.0' d = 0.9' $SD = 16.3'$	23			20°39.02			-17.5'	60.6
		SD = 16.0'	d = 0.9'		SI	D = 16.3'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	04:48	06:07	07:17	16:14	17:23	18:41
N 70°	04:53	06:04	07:06	16:24	17:27	18:37
68°	04:57	06:01	06:58	16:33	17:29	18:33
66°	05:00	05:59	06:51	16:40	17:32	18:31
64°	05:02	05:57	06:45	16:46	17:34	18:29
62°	05:04	05:55	06:40	16:51	17:36	18:27
60°	05:05	05:53	06:35	16:56	17:38	18:26
N 58°	05:06	05:52	06:32	17:00	17:39	18:24
56°	05:07	05:50	06:28	17:03	17:41	18:24
54°	05:08	05:49	06:25	17:06	17:42	18:23
52°	05:09	05:48	06:22	17:09	17:43	18:22
50°	05:09	05:47	06:19	17:12	17:45	18:22
45°	05:10	05:44	06:14	17:18	17:47	18:21
N 40°	05:10	05:42	06:09	17:23	17:50	18:21
35°	05:10	05:39	06:05	17:27	17:53	18:22
30°	05:09	05:37	06:01	17:31	17:55	18:23
20°	05:06	05:32	05:54	17:38	18:00	18:25
N 10°	05:03	05:27	05:48	17:44	18:05	18:29
0°	04:58	05:22	05:43	17:49	18:10	18:35
S 10°	04:51	05:16	05:37	17:55	18:16	18:41
20°	04:43	05:09	05:31	18:02	18:24	18:50
30°	04:31	04:59	05:24	18:09	18:33	19:02
35°	04:23	04:54	05:20	18:13	18:39	19:10
40°	04:14	04:47	05:15	18:18	18:46	19:19
45°	04:03	04:39	05:09	18:24	18:54	19:31
S 50°	03:48	04:29	05:03	18:31	19:04	19:46
52°	03:41	04:24	04:59	18:34	19:09	19:53
54°	03:33	04:19	04:56	18:37	19:15	20:01
56°	03:24	04:13	04:52	18:41	19:21	20:10
58°	03:13	04:06	04:48	18:46	19:28	20:21
S 60°	03:01	03:59	04:43	18:51	19:36	20:34

Lat.		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°		18:20	17:19		23:36	
N 70°		17:49	17:07			00:05
68°	18:18	17:26	16:56	21:42		00:26
66°	17:37	17:07	16:48	22:22		00:43
64°	17:08	16:52	16:40	22:50		00:56
62°	16:46	16:40	16:34	23:11		01:07
60°	16:29	16:29	16:28	23:27		01:17
N 58°	16:14	16:19	16:23	23:42		01:25
56°	16:01	16:11	16:19	23:54		01:32
54°	15:49	16:04	16:15		00:04	01:39
52°	15:39	15:57	16:11		00:13	01:44
50°	15:31	15:51	16:08		00:22	01:49
45°	15:11	15:38	16:00		00:39	02:01
N 40°	14:56	15:27	15:54		00:53	02:10
35°	14:43	15:18	15:49		01:05	02:17
30°	14:31	15:09	15:44	00:08	01:16	02:24
20°	14:11	14:55	15:36	00:31	01:33	02:36
N 10°	13:54	14:43	15:29	00:50	01:49	02:46
0°	13:37	14:31	15:22	01:09	02:03	02:55
S 10°	13:21	14:19	15:16	01:27	02:17	03:05
20°	13:03	14:06	15:08	01:47	02:32	03:15
30°	12:43	13:52	15:00	02:09	02:49	03:26
35°	12:31	13:43	14:55	02:22	02:59	03:32
40°	12:17	13:33	14:50	02:37	03:10	03:39
45°	12:01	13:22	14:43	02:54	03:23	03:48
S 50°	11:41	13:08	14:36	03:16	03:39	03:57
52°	11:31	13:01	14:32	03:26	03:47	04:02
54°	11:20	12:54	14:28	03:38	03:55	04:07
56°	11:07	12:46	14:24	03:51	04:04	04:13
58°	10:53	12:36	14:19	04:06	04:14	04:19
S 60°	10:36	12:26	14:13	04:24	04:26	04:26

October 15, 16, 17 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$24^{\circ}1.10$	149°58.01 \$20°20.96	270°19.70 N22°33.01	303°27.28 N22°26.11	38°20.94 S 08°28.89	
1	39°3.57	164°57.36 21.79	285°20.91 32.90	318°29.79 26.11	53°23.52 28.93	Alpheratz 357°34.68 29°13.79 Ankaa 353°6.92 -42°10.26
2	54°6.03	179°56.72 22.62	300°22.13 32.78	333°32.31 26.11	68°26.11 28.98	Schedar 349°30.77 56°40.52
3	69°8.50	194°56.08 · · 23.45	315°23.34 · · 32.66	348°34.83 · · 26.10	83°28.69 · · 29.02	Diphda 348°47.18 -17°50.95
4	84° 10.96	209°55.43 24.27	330°24.55 32.54	3°37.34 26.10	98°31.27 29.07	Achernar 335°19.71 -57°6.58
5 6	99° 13.42 114° 15.89	224°54.79 25.10 239°54.14 \$20°25.92	345°25.77 32.42 0°26.99 N22°32.31	18°39.86 26.10 33°42.38 N22°26.09	113°33.86 29.11 128°36.44 \$08°29.16	Hamal 327°51.11 23°34.88
7	129° 18.35	254°53.50 26.75	15°28.20 32.19	48°44.90 26.09	143°39.02 29.20	Polaris 313°42.35 89°22.00
8	144° 20.82	269°52.85 27.57	30°29.42 32.07	63°47.42 26.09	158°41.61 29.25	Acamar 315°11.52 -40°12.12
9	159°23.28	284°52.20 · · 28.39	45°30.64 · · 31.95	78°49.93 · · 26.08	173°44.19 · · 29.29	Menkar 314°6.08 4°11.35
10	174°25.74	299°51.56 29.21	60°31.86 31.83	93°52.45 26.08	188°46.77 29.34	Mirfak 308°28.14 49°56.92 Aldebaran 290°39.63 16°33.63
11	189°28.21	314°50.91 30.03	75°33.08 31.72	108°54.97 26.07	203°49.36 29.38	Rigel 281°3.88 -8°10.18
12	204°30.67	329°50.26 \$20°30.85	90°34.30 N22°31.60	123°57.49 N22°26.07	218°51.94	Capella 280°21.95 46°1.28
13	219°33.14	344°49.61 31.67	105°35.52 31.48	139° 0.01 26.07	233°54.52 29.47	Bellatrix 278°22.93 6°22.46
14 15	234° 35.60 249° 38.06	359°48.96 32.48 14°48.31 · · 33.30	120°36.74 31.36 135°37.96 · · 31.24	154°2.53 26.06 169°5.06 •• 26.06	248°57.10 29.51 263°59.68 •• 29.56	Elnath 278°1.94 28°37.70
16	264° 40.53	29° 47.66 34.12	150°39.18 31.12	184°7.58 26.06	279°2.27 29.60	Alnilam 275°37.79 -1°10.99
17	279° 42.99	44°47.01 34.93	165°40.40 31.00	199°10.10 26.05	294°4.85 29.65	Betelgeuse 270°52.18 7°24.82
18	294° 45.46	59°46.36	180°41.63 N22°30.89	214°12.62 N22°26.05	309°7.43 \$08°29.69	Canopus 263°52.32 -52°42.13
19	309°47.92	74°45.71 36.56	195°42.85 30.77	229°15.14 26.04	324°10.01 29.73	Sirius 258°26.35 -16°44.74 Adhara 255°5.98 -29°0.02
20	324°50.38	89°45.06 37.37	210°44.07 30.65	244°17.67 26.04	339°12.59 29.78	Procyon 244°51.06 5°9.82
21	339° 52.85	104°44.40 · · 38.18	225°45.30 · · 30.53	259°20.19 · · 26.04	354°15.17 · · 29.82	Pollux 243°17.58 27°57.97
22	354°55.31	119°43.75 38.99	240°46.52 30.41	274°22.71 26.03	9°17.76 29.87	Avior 234°14.98 -59°34.92
23	9°57.78	134°43.10 39.80	255°47.75 30.29	289°25.24 26.03	24°20.34 29.91	Suhail 222°46.66 -43°31.60
Mer. _I	pass. 22:20	ν -0.6 $'$ d 0.8 $'$ m-3.95	$ u 1.2' \ d$ -0.1' m0.30	$\nu 2.5' \ d$ -0.0' m-2.57	$\nu 2.6' \ d0.0' \ m0.72$	Miaplacidus 221°38.76 -69°48.73
						Alphard 217°48.12 -8°45.75
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.87 11°50.87
0	25°0.24	149°42.44 \$20°40.60	270°48.98 N22°30.17	304°27.76 N22°26.02	39°22.92 \$08°29.95	Dubhe 193°41.74 61°36.94
1	40°2.70	164°41.79 41.41	285°50.20 30.05	319°30.29 26.02	54°25.50 30.00	Denebola 182°25.46 14°26.11 Gienah 175°44.14 -17°40.60
2	55°5.17	179°41.13 42.22	300°51.43 29.94	334°32.81 26.02	69°28.08 30.04	Acrux 173°1.09 -63°14.03
3	70°7.63	194°40.48 · · 43.02	315°52.66 · · 29.82	349°35.34 · · 26.01	84°30.66 · · 30.08	Gacrux 171°52.51 -57°14.96
4	85° 10.10	209°39.82 43.83	330°53.89 29.70	4°37.86 26.01	99°33.24 30.13	Alioth 166°13.67 55°49.53
5	100° 12.56	224°39.17 44.63	345°55.12 29.58	19°40.39 26.00	114°35.82 30.17	Spica 158°22.86 -11°17.32
6 7	115° 15.02 130° 17.49	239°38.51 \$20°45.43 254°37.85 46.23	0°56.35 N22°29.46 15°57.58 29.34	34°42.92 N22°26.00 49°45.45 26.00	129°38.40 \$08°30.21 144°40.98 30.26	Alkaid 152°52.63 49°11.44
8	130 17.49 145°19.95	254° 37.85 46.23 269° 37.19 47.03	15°57.58 29.34 30°58.81 29.22	49°45.45 26.00 64°47.97 25.99	144°40.98 30.26 159°43.56 30.30	Hadar 148°37.01 -60°29.51
9	160°22.42	284°36.53 · · 47.83	46° 0.04 · · 29.10	79°50.50 · · 25.99	174°46.14 · · · 30.34	Menkent 147°58.29 -36°29.43
10	175°24.88	299°35.87 48.63	61°1.27 28.98	94°53.03 25.98	189°48.72 30.39	Arcturus 145°48.44 19°3.32
11	190°27.34	314°35.22 49.43	76°2.50 28.86	109°55.56 25.98	204°51.30 30.43	Rigil Kent. 139°41.29 -60°56.26 Kochab 137°20.82 74°3.27
12	205°29.81	329°34.56 \$20°50.22	91°3.74 N22°28.74	124°58.09 N22°25.97	219°53.88 S08°30.47	Zuben'ubi 136°56.58 -16°8.60
13	220°32.27	344°33.89 51.02	106°4.97 28.62	140°0.62 25.97	234°56.46 30.51	Alphecca 126°4.23 26°38.01
14	235°34.74	359°33.23 51.81	121°6.21 28.50	155°3.15 25.97	249°59.04 30.56	Antares 112°16.37 -26°29.22
15	250° 37.20	14°32.57 · · 52.61	136°7.44 · · 28.39	170°5.68 · · 25.96	265°1.62 · · 30.60	Atria 107°11.15 -69°4.49
16 17	265° 39.66 280° 42.13	29°31.91 53.40 44°31.25 54.19	151°8.68 28.27 166°9.91 28.15	185°8.21 25.96 200°10.74 25.95	280°4.19 30.64 295°6.77 30.69	Sabik 102°3.23 -15°45.31
18	295° 44.59	59°30.59 \$20°54.98	181°11.15 N22°28.03	215°13.27 N22°25.95	310°9.35 \$08°30.73	Shaula 96°10.87 -37°7.38
19	310°47.06	74°29.92 55.77	196°12.39 27.91	230°15.80 25.94	325°11.93 30.77	Rasalhague 95°58.92 12°32.65
20	325° 49.52	89°29.26 56.56	211°13.63 27.79	245°18.33 25.94	340°14.51 30.81	Eltanin 90°42.51 51°29.35 Kaus Aust. 83°32.92 -34°22.45
21	$340^{\circ}51.98$	104°28.59 · · 57.35	226°14.87 · · 27.67	260°20.86 · · 25.93	355°17.09 · · 30.85	Kaus Aust. 83°32.92 -34°22.45 Vega 80°33.49 38°48.61
22	355° 54.45	119°27.93 58.14	241°16.10 27.55	275°23.40 25.93	10°19.67 30.90	Nunki 75°48.09 -26°16.01
23	10°56.91	134°27.26 58.92	256°17.34 27.43	290°25.93 25.93	25°22.24 30.94	Altair 62°0.16 8°56.15
Mer	pass. 22:16	ν-0.7' d0.8' m-3.95	ν1.2' d-0.1' m0.29	ν2.5' d-0.0' m-2.58	ν2.6' d0.0' m0.72	Peacock 53°5.92 -56°39.53
	<u> </u>					Deneb 49°25.85 45°22.37
ть	CHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.85 9°59.45
Thu 0	GHA 25° 59.38	GHA Dec 149°26.60 \$20°59.71	GHA Dec 271°18.59 N22°27.31	GHA Dec 305°28.46 N22°25.92	GHA Dec 40°24.82 S 08°30.98	Al Na'ir 27°32.87 -46°50.58
1	41°1.84	164°25.93 21°0.49	286°19.83 27.19	320°31.00 25.92	55°27.40 31.02	Fomalhaut 15°14.46 -29°29.48 Scheat 13°45.15 28°13.21
2	56°4.30	179°25.26 1.28	301°21.07 27.07	335°33.53 25.91	70°29.98 31.07	Markab 13°29.87 15°20.46
3	71°6.77	194°24.60 · · 2.06	316°22.31 · · 26.95	350°36.07 · · 25.91	85°32.55 · · 31.11	
4	86°9.23	209°23.93 2.84	331°23.55 26.83	5°38.60 25.90	100°35.13 31.15	Oct 15 Tue SHA Mer.pass
5	101°11.70	224°23.26 3.62	346°24.80 26.71	20°41.14 25.90	115°37.71 31.19	Venus 125°56.90 14:01
6	116°14.16	239°22.59	1°26.04 N22°26.59	35°43.67 N22°25.89	130°40.29	Mars 246°18.60 05:58 Jupiter 279°26.17 03:46
7 8	131° 16.62 146° 19.09	254°21.92 5.18 269°21.25 5.96	16°27.28 26.47 31°28.53 26.35	50°46.21 25.89 65°48.75 25.88	145°42.86 31.27 160°45.44 31.32	Saturn 14°19.84 21:23
9	140 19.09 161°21.55	284°20.58 · · 6.73	46°29.78 · · 26.23	80°51.28 · · 25.88	175°48.02 · · 31.36	
10	176°24.02	299° 19.91 7.51	61°31.02 26.11	95°53.82 25.87	190°50.59 31.40	Oct 16 Wed SHA Mer.pass
11	191°26.48	314°19.24 8.28	76°32.27 25.99	110°56.36 25.87	205°53.17 31.44	Venus 124°42.20 14:02
12	206°28.95	329°18.57 S 21°9.06	91°33.52 N22°25.87	125°58.90 N22°25.87	220°55.75 S 08°31.48	Mars 245°48.74 05:56 Jupiter 279°27.52 03:42
13	221°31.41	344°17.90 9.83	106°34.76 25.75	141°1.43 25.86	235°58.32 31.52	Saturn 14°22.68 21:19
14	236° 33.87	359°17.23 10.60	121°36.01 25.63	156° 3.97 25.86	251°0.90 31.57	
15 16	251°36.34 266°38.80	14°16.55 · · 11.37 29°15.88 12.14	136°37.26 · · 25.51 151°38.51 25.39	171°6.51 · · · 25.85 186°9.05	266°3.47 · · 31.61 281°6.05 31.65	Oct 17 Thu SHA Mer.pass
16 17	281°41.27	29° 15.88 12.14 44° 15.21 12.91	151°38.51 25.39 166°39.76 25.27	186° 9.05 25.85 201° 11.59 25.84	281°6.05 31.65 296°8.62 31.69	Venus 123°27.22 14:03 Mars 245°19.21 05:54
18	296° 43.73	59°14.53 S21°13.68	181°41.01 N22°25.15	216°14.13 N22°25.84	311°11.20 S08°31.73	Mars 245°19.21 05:54 Jupiter 279°29.09 03:37
19	311°46.19	74°13.86 14.45	196°42.27 25.03	231°16.67 25.83	326°13.78 31.77	Saturn 14°25.44 21:15
20	326° 48.66	89° 13.18 15.21	211°43.52 24.91	246°19.21 25.83	341°16.35 31.81	
21	341°51.12	104°12.50 · · 15.98	226°44.77 · · 24.79	261°21.75 · · 25.82	356°18.93 · · 31.85	Horizontal parallax
22	356° 53.59	119°11.83 16.74	241°46.02 24.67	276°24.30 25.82	11°21.50 31.89	Venus: 0.1
23	11°56.05	134°11.15 17.50	256°47.28 24.55	291°26.84 25.81	26°24.08 31.93	Mars: 0.1
Mer.	pass. 22:12	ν-0.7' d0.8' m-3.96	$\nu 1.2' \ d$ -0.1' m0.27	ν2.5′ d-0.0′ m-2.59	$\nu 2.6' \ d0.0' \ m0.73$	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.50	S08°37.04	35°8.32	10.3'	S 06°41.68	-17.5'	60.6'
1	198°33.64	37.97	49°37.63	10.3'	06°24.17	-17.6'	60.7'
2 3	213°33.78 228°33.92	38.89 •• 39.81	64°6.95 78°36.27	10.3' 10.3'	06°6.61 05°49.00	-17.6' -17.7'	60.7' 60.7'
4	243°34.06	40.73	93°5.60	10.3	05°31.35	-17.7'	60.7'
5	258°34.19	41.66	107°34.94	10.3'	$05^{\circ}13.64$	-17.7'	60.8'
6	273°34.33	S08°42.58	122°4.28	10.3'	S04°55.90	-17.8'	60.8'
7 8	288°34.47 303°34.61	43.50 44.42	136°33.62 151°2.96	10.3' 10.3'	04°38.11 04°20.29	-17.8' -17.9'	60.8' 60.8'
9	318°34.74	• • 45.34	165°32.31	10.3	04°2.42	-17.9'	60.9'
10	333°34.88	46.26	180°1.65	10.3'	03°44.52	-17.9'	60.9'
11	348°35.02	47.18	194°30.99	10.3'	03°26.58	-18.0'	60.9'
12 13	3°35.16 18°35.29	\$08°48.10 49.02	209°0.32 223°29.65	10.3' 10.3'	\$03°8.62 02°50.62	-18.0' -18.0'	60.9' 60.9'
14	33°35.43	49.94	237°58.98	10.3	02°32.59	-18.1	61.0'
15	48°35.56	• • 50.86	252°28.30	10.3'	$02^{\circ}14.54$	-18.1'	61.0'
16	63°35.70	51.78	266°57.60	10.3'	01°56.46	-18.1'	61.0'
17 18	78°35.84 93°35.97	52.70 \$08°53.62	281°26.90 295°56.19	10.3' 10.3'	01°38.36 S01°20.24	-18.1' -18.1'	61.0' 61.0'
19	95 35.97 108°36.11	54.54	310°25.47	10.3	01°2 10	-10.1 -18.2'	61.1
20	123°36.24	55.46	324°54.73	10.2	00°43.95	-18.2	61.1'
21	138°36.37	• • 56.38	339°23.97	10.2'	$00^{\circ}25.78$	-18.2'	61.1'
22	153°36.51	57.30	353°53.20	10.2'	S00°7.60	-18.2'	61.1'
23	168°36.64	58.21	8°22.42	10.2'	N00°10.60	18.2'	61.1'
	SD = 16.0'	d = 0.9'		SI	D = 16.5'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°36.78	S08°59.13	22°51.61	10.2'	N00°28.80	18.2'	61.1'
1	198°36.91 213°37.04	09°0.05	37°20.78 51°49.94	10.2' 10.1'	00°47.01 01°5.22	18.2' 18.2'	61.1' 61.2'
2	213°37.04 228°37.18	0.97 •• 1.88	66°19.07	10.1'	01°5.22 01°23.43	18.2'	61.2'
4	243°37.31	2.80	80°48.17	10.1	01°41.65	18.2'	61.2'
5	258°37.44	3.72	95°17.25	10.1'	01°59.86	18.2'	61.2'
6	273°37.57	S09°4.63	109°46.31	10.0'	N02°18.07	18.2'	61.2'
7	288°37.71	5.55	124°15.34	10.0'	02°36.28 02°54.47	18.2'	61.2'
8 9	303°37.84 318°37.97	6.47 • • 7.38	138°44.34 153°13.31	10.0' 9.9'	02°54.47 03°12.66	18.2' 18.2'	61.2' 61.2'
10	333°38.10	8.30	167°42.24	9.9'	03°30.83	18.2	61.2'
11	348°38.23	9.21	182°11.15	9.9'	03°48.99	18.1'	61.3'
12	3°38.36	S09°10.13	196°40.02	9.8'	N04°7.13	18.1'	61.3'
13 14	18°38.49 33°38.62	11.04 11.96	211°8.86 225°37.66	9.8' 9.8'	04°25.25 04°43.36	18.1' 18.1'	61.3' 61.3'
15	48°38.75	12.87	240°6.42	9.7	05°1.44	18.1	61.3
16	63°38.88	13.79	254°35.15	9.7'	05°19.49	18.0'	61.3'
17	78°39.01	14.70	269°3.83	9.6'	05°37.52	18.0'	61.3'
18	93°39.14	S09°15.61	283°32.48	9.6'	N05°55.52 06°13.48	18.0'	61.3'
19 20	108°39.27 123°39.40	16.53 17.44	298°1.08 312°29.64	9.6' 9.5'	06°13.48 06°31.42	17.9' 17.9'	61.3' 61.3'
21	138°39.53	• 18.35	326°58.15	9.5'	06°49.31	17.9'	61.3'
22	153°39.65	19.27	341°26.62	9.4'	$07^{\circ}7.17$	17.8'	61.3'
23	168°39.78	20.18	355°55.04	9.4'	07°24.99	17.8'	61.3'
	SD = 16.0'	d = 0.9'		SI	D = 16.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°39.91	S09°21.09	10°23.42	9.3'	N07°42.77	17.7'	61.3'
1 2	198°40.04 213°40.16	22.00 22.92	24°51.74 39°20.02	9.3' 9.2'	08°0.50 08°18.19	17.7' 17.6'	61.3' 61.3'
3	213 40.10 228°40.29	• • 23.83	59 20.02 53°48.24	9.2'	08°35.82	17.6'	61.3
4	243°40.42	24.74	68°16.42	9.1'	08°53.41	17.5'	61.3'
5	258°40.54	25.65	82°44.53	9.1'	09°10.94	17.5'	61.3'
6 7	273°40.67 288°40.80	S09°26.56 27.47	97°12.60 111°40.61	9.0' 9.0'	N09°28.42 09°45.83	17.4' 17.4'	61.3' 61.3'
8	288 40.80 303°40.92	27.47	111°40.61 126°8.56	9.0 8.9'	10°3.19	17.4 17.3'	61.3
9	318°41.05	• • 29.29	140°36.46	8.8'	10° 3.19	17.2'	61.3
10	333°41.17	30.20	155°4.30	8.8'	10°37.72	17.2'	61.3'
11	348°41.30	31.11	169°32.08	8.7'	10°54.89	17.1'	61.3'
12 13	3°41.42 18°41.54	\$09°32.02 32.93	183°59.80 198°27.45	8.7' 8.6'	N11°11.98 11°29.01	17.0' 17.0'	61.3' 61.3'
14	33°41.67	33.84	212°55.05	8.5'	11°45.96	16.9	61.3'
15	48°41.79	• • 34.75	227°22.58	8.5'	12°2.84	16.8'	61.3'
16	63°41.92	35.66	241°50.05	8.4'	12°19.64	16.7'	61.2'
17 18	78°42.04 93°42.16	36.56 \$09°37.47	256°17.46 270°44.80	8.3' 8.3'	12°36.36 N12°53.00	16.6' 16.6'	61.2' 61.2'
18 19	93°42.16 108°42.28	38.38	270°44.80 285°12.08	8.3'	13°9.56	16.5	61.2'
20	123°42.41	39.29	299°39.28	8.1	13°26.03	16.4	61.2
21	138°42.53	• • 40.20	314°6.43	8.1'	13°42.41	16.3'	61.2'
22 23	153°42.65 168°42.77	41.10	328°33.50 343°0.50	8.0' 7.9'	13°58.70 14°14.90	16.2'	61.2' 61.2'
23	SD = 16.0'	$\frac{42.01}{d = 0.9'}$	343 0.50		D = 16.7'	16.1'	01.2
	טט = 10.0	u = 0.9		51	J = 10.7°		

Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	05:02	06:20	07:31	15:58	17:09	18:27
N 70°	05:05	06:15	07:19	16:10	17:14	18:24
68°	05:07	06:11	07:09	16:20	17:18	18:22
66°	05:09	06:08	07:01	16:29	17:21	18:20
64°	05:10	06:05	06:54	16:36	17:24	18:19
62°	05:11	06:03	06:48	16:42	17:27	18:18
60°	05:12	06:00	06:43	16:47	17:29	18:17
N 58°	05:13	05:58	06:38	16:52	17:31	18:17
56°	05:13	05:56	06:34	16:56	17:33	18:16
54°	05:14	05:55	06:30	16:59	17:35	18:16
52°	05:14	05:53	06:27	17:03	17:37	18:16
50°	05:14	05:51	06:24	17:06	17:39	18:16
45°	05:14	05:48	06:17	17:13	17:42	18:16
N 40°	05:13	05:45	06:12	17:18	17:46	18:17
35°	05:12	05:42	06:07	17:23	17:49	18:18
30°	05:11	05:39	06:03	17:28	17:52	18:20
20°	05:07	05:33	05:55	17:35	17:58	18:23
N 10°	05:03	05:27	05:49	17:42	18:03	18:28
0°	04:57	05:21	05:42	17:49	18:10	18:34
S 10°	04:50	05:14	05:36	17:55	18:17	18:42
20°	04:40	05:06	05:29	18:03	18:25	18:51
30°	04:27	04:56	05:20	18:11	18:35	19:04
35°	04:19	04:50	05:16	18:16	18:42	19:13
40°	04:09	04:42	05:10	18:21	18:49	19:23
45°	03:57	04:34	05:04	18:28	18:58	19:35
S 50°	03:41	04:22	04:56	18:36	19:10	19:51
52°	03:33	04:17	04:53	18:39	19:15	19:59
54°	03:25	04:11	04:49	18:43	19:21	20:08
56°	03:15	04:05	04:45	18:48	19:28	20:18
58°	03:03	03:57	04:40	18:53	19:35	20:30
S 60°	02:49	03:49	04:34	18:58	19:44	20:45
	N4			ı	N 4	

Lat.		Moonris	е		Moonse	t
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	16:37	15:57	15:09	02:27	05:01	07:43
N 70°	16:35	16:04	15:29	02:36	04:59	07:26
68°	16:33	16:10	15:44	02:44	04:57	07:13
66°	16:31	16:15	15:57	02:50	04:55	07:03
64°	16:29	16:19	16:08	02:55	04:53	06:54
62°	16:28	16:23	16:17	03:00	04:52	06:46
60°	16:27	16:26	16:25	03:04	04:51	06:40
N 58°	16:26	16:29	16:32	03:07	04:50	06:34
56°	16:25	16:31	16:39	03:10	04:49	06:29
54°	16:24	16:34	16:44	03:13	04:48	06:25
52°	16:23	16:36	16:49	03:15	04:47	06:21
50°	16:23	16:38	16:54	03:18	04:47	06:17
45°	16:21	16:42	17:04	03:22	04:45	06:09
N 40°	16:20	16:45	17:13	03:26	04:44	06:03
35°	16:19	16:49	17:20	03:30	04:43	05:57
30°	16:18	16:51	17:27	03:33	04:42	05:52
20°	16:16	16:56	17:38	03:38	04:40	05:44
N 10°	16:15	17:01	17:48	03:42	04:39	05:36
0°	16:13	17:05	17:58	03:46	04:37	05:29
S 10°	16:12	17:09	18:07	03:51	04:36	05:22
20°	16:11	17:13	18:18	03:55	04:35	05:15
30°	16:09	17:18	18:30	04:00	04:33	05:07
35°	16:08	17:21	18:37	04:02	04:32	05:02
40°	16:07	17:25	18:45	04:05	04:31	04:57
45°	16:06	17:29	18:54	04:09	04:29	04:51
S 50°	16:04	17:34	19:05	04:13	04:28	04:43
52°	16:04	17:36	19:11	04:15	04:27	04:40
54°	16:03	17:39	19:17	04:17	04:26	04:36
56°	16:02	17:41	19:23	04:19	04:26	04:32
58°	16:01	17:44	19:31	04:22	04:25	04:28
S 60°	16:00	17:48	19:39	04:25	04:24	04:23

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Day	00 ^h	12 ^h	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-100%
15	14:14	14:21	11:46	22:25	10:00	
16	14:27	14:33	11:45	23:17	10:51	
17	14:40	14:46	11:45	-:-	11:43	

October 18, 19, 20 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	26° 58.51	149°10.47 S 21°18.27	271°48.53 N22°24.43	306°29.38 N22°25.81	41°26.65 \$08°31.98	
1	42°0.98	164°9.80 19.03	286°49.79 24.31	321°31.92 25.80	56°29.22 32.02	Alpheratz 357°34.68 29°13.80 Ankaa 353°6.93 -42°10.27
2	57°3.44	179°9.12 19.79	301°51.04 24.19	336°34.47 25.80	71°31.80 32.06	Ankaa 353°6.93 -42°10.27 Schedar 349°30.77 56°40.54
3	72°5.91	194°8.44 · · 20.55	316°52.30 · · 24.06	351°37.01 · · 25.79	86°34.37 · · 32.10	Diphda 348°47.18 -17°50.96
4	87°8.37	209°7.76 21.30	331°53.56 23.94 346°54.81 23.82	6°39.55 25.79	101°36.95 32.14 116°39.52 32.18	Achernar 335°19.72 -57°6.60
5 6	102° 10.83 117° 13.30	224°7.08 22.06 239°6.40 \$21°22.82	346°54.81 23.82 1°56.07 N22°23.70	21°42.10 25.78 36°44.64 N22°25.78	116°39.52 32.18 131°42.10 \$08°32.22	Hamal 327°51.10 23°34.88
7	132° 15.76	254°5.72 23.57	16°57.33 23.58	51°47.19 25.77	146°44.67 32.26	Polaris 313°41.46 89°22.02
8	147° 18.23	269°5.04 24.33	31°58.59 23.46	66°49.73 25.77	161°47.24 32.30	Acamar 315°11.51 -40°12.14
9	$162^{\circ}20.69$	284°4.36 · · 25.08	46°59.85 · · 23.34	81°52.28 · · 25.76	176°49.82 · · 32.34	Menkar 314°6.07 4°11.35 Mirfak 308°28.12 49°56.93
10	177°23.16	299°3.67 25.83	62°1.11 23.22	96°54.83 25.75	191°52.39 32.38	Aldebaran 290°39.61 16°33.62
11	192°25.62	314°2.99 26.59 329°2.31 \$21°27.34	77°2.37 23.10 92°3.64 N22°22.98	111°57.37 25.75	206°54.96 32.42	Rigel 281°3.87 -8°10.18
12 13	207° 28.08 222° 30.55	329°2.31	92°3.64 N22°22.98 107°4.90 22.86	126°59.92 N22°25.74 142°2.47 25.74	221°57.54 \$08°32.46 237°0.11 32.50	Capella 280°21.92 46°1.28
14	237°33.01	359°0.94 28.83	122°6.16 22.74	157° 5.01 25.73	252°2.68 32.54	Bellatrix 278°22.92 6°22.45
15	252°35.48	14°0.26 · · 29.58	137°7.42 · · 22.62	172°7.56 · · 25.73	267°5.26 · · 32.58	Elnath 278°1.92 28°37.70
16	267°37.94	28°59.57 30.33	152°8.69 22.50	187°10.11 25.72	282°7.83 32.62	Alnilam 275°37.77 -1°11.00 Betelgeuse 270°52.16 7°24.82
17	282°40.40	43°58.88 31.07	167° 9.95 22.38	202°12.66 25.72	297°10.40 32.66	Canopus 263°52.29 -52°42.14
18	297° 42.87	58°58.20 S21°31.82	182°11.22 N22°22.25	217°15.21 N22°25.71	312°12.97 \$08°32.70	Sirius 258°26.33 -16°44.75
19 20	312°45.33 327°47.80	73°57.51 32.56 88°56.83 33.30	197°12.48 22.13 212°13.75 22.01	232°17.76 25.71 247°20.31 25.70	327°15.54 32.74 342°18.12 32.78	Adhara 255° 5.95 -29° 0.02
21	342°50.26	103°56.14 · · 34.05	227°15.02 · · 21.89	262°22.86 · · 25.70	357°20.69 · · 32.82	Procyon 244°51.04 5°9.82
22	357° 52.72	118°55.45 34.79	242°16.29 21.77	277°25.41 25.69	12°23.26 32.85	Pollux 243°17.55 27°57.96
23	12°55.19	133°54.76 35.53	257°17.56 21.65	292°27.96 25.68	27°25.83 32.89	Avior 234°14.94 -59°34.92 Suhail 222°46.64 -43°31.60
Mer	pass. 22:08	ν-0.7' d0.8' m-3.96	ν1.3' d-0.1' m0.26	ν2.5' d-0.0' m-2.59	ν2.6' d0.0' m0.73	Suhail 222°46.64 -43°31.60 Miaplacidus 221°38.71 -69°48.73
IVICI.	Puss. 22.00	- 0.1 do.0 iii-3.90	ν 1.5 U-0.1 III0.20	ν Δ.Ο α-0.0 HI-Δ.J9	ν Δ.υ	Alphard 217°48.10 -8°45.76
. .	CIIA	CHA	CHA	CHA	CHA	Regulus 207°34.85 11°50.86
Sat	GHA 27° 57 65	GHA Dec 148°54.07 \$21°36.26	GHA Dec 272°18.82 N22°21.53	GHA Dec 307°30.51 N22°25.68	GHA Dec 42°28.40 S 08°32.93	Dubhe 193°41.72 61°36.93
0 1	27°57.65 43°0.12	148°54.07 S 21°36.26 163°53.38 37.00	272 18.82 N22 21.53 287°20.09 21.41	307°30.51 N22°25.68 322°33.06 25.67	42°28.40 \$08°32.93 57°30.97 32.97	Denebola 182°25.45 14°26.10
2	58°2.58	178°52.69 37.74	302°21.36 21.29	337°35.62 25.67	72°33.55 33.01	Gienah 175°44.13 -17°40.60
3	73°5.05	193°52.00 · · 38.47	317°22.64 · · 21.17	352°38.17 · · 25.66	87°36.12 · · 33.05	Acrux 173°1.07 -63°14.01 Gacrux 171°52.49 -57°14.94
4	88°7.51	208°51.31 39.21	332°23.91 21.05	7°40.72 25.66	102°38.69 33.09	Alioth 166°13.67 55°49.52
5	103°9.97	223°50.62 39.94	347°25.18 20.92	22°43.27 25.65	117°41.26 33.13	Spica 158°22.86 -11°17.31
6	118° 12.44	238°49.93 S21°40.68	2°26.45 N22°20.80	37°45.83 N22°25.65	132°43.83	Alkaid 152°52.63 49°11.43
7 8	133° 14.90 148° 17.37	253°49.24 41.41 268°48.55 42.14	17°27.72 20.68 32°29.00 20.56	52°48.38 25.64 67°50.94 25.63	147°46.40 33.21 162°48.97 33.24	Hadar 148°37.01 -60°29.50
9	163° 19.83	283°47.85 · · 42.87	47°30.27 · · 20.44	82°53.49 · · 25.63	177°51.54 · · 33.28	Menkent 147°58.29 -36°29.43
10	178° 22.29	298° 47.16 43.60	62°31.55 20.32	97°56.05 25.62	192°54.11 33.32	Arcturus 145°48.44 19°3.31
11	193°24.76	313°46.46 44.32	77°32.82 20.20	112°58.60 25.62	207°56.68 33.36	Rigil Kent. 139°41.29 -60°56.25 Kochab 137°20.85 74°3.26
12	208°27.22	328°45.77 S 21°45.05	92°34.10 N22°20.08	128°1.16 N22°25.61	222°59.25 \$08°33.40	Zuben'ubi 136°56.58 -16°8.60
13	223°29.69	343°45.08 45.78	107°35.38 19.96	143°3.71 25.61	238°1.82 33.44	Alphecca 126°4.24 26°38.01
14	238°32.15	358°44.38 46.50	122°36.66 19.84	158° 6.27 25.60	253°4.39 33.48	Antares 112°16.38 -26°29.21
15 16	253° 34.62 268° 37.08	13°43.68 · · 47.22 28°42.99 47.95	137°37.93 ·· 19.71 152°39.21 19.59	173°8.83 · · 25.59 188°11.39 25.59	268°6.96 · · 33.51 283°9.53	Atria 107°11.18 -69°4.47
17	283°39.54	43°42.29 48.67	167°40.49 19.47	203°13.94 25.58	298°12.10 33.59	Sabik 102°3.25 -15°45.31
18	298°42.01	58°41.59 S 21°49.39	182°41.77 N22°19.35	218°16.50 N22°25.58	313°14.67 S 08°33.63	Shaula 96°10.89 -37°7.38 Rasalhague 95°58.93 12°32.65
19	313°44.47	73°40.90 50.11	197°43.05 19.23	233°19.06 25.57	328°17.24 33.67	Eltanin 90°42.53 51°29.35
20	328° 46.94	88°40.20 50.83	212°44.33 19.11	248°21.62 25.56	343°19.81 33.70	Kaus Aust. 83°32.94 -34°22.45
21	343°49.40	103°39.50 · · 51.55	227°45.62 · · 18.99	263°24.18 · · 25.56	358°22.37 · · 33.74	Vega 80°33.51 38°48.61
22 23	358° 51.86 13° 54.33	118°38.80 52.26 133°38.10 52.98	242°46.90 18.87 257°48.18 18.75	278°26.74 25.55 293°29.30 25.55	13°24.94 33.78 28°27.51 33.82	Nunki 75°48.11 -26°16.01
						Altair 62°0.17 8°56.15
Mer.	pass. 22:05	ν-0.7' d0.7' m-3.96	ν1.3' d-0.1' m0.25	ν2.6' d-0.0' m-2.60	$\nu 2.6' \ d0.0' \ m0.74$	Peacock 53°5.95 -56°39.53 Deneb 49°25.87 45°22.37
						Enif 33°38.86 9°59.45
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.89 -46°50.59
0	28° 56.79	148°37.40 S21°53.69	272°49.47 N22°18.62	308°31.86 N22°25.54	43°30.08	Fomalhaut 15°14.47 -29°29.48
1 2	43°59.26 59°1.72	163°36.70 54.41 178°36.00 55.12	287°50.75 18.50 302°52.04 18.38	323°34.42 25.53 338°36.98 25.53	58°32.65 33.89 73°35.22 33.93	Scheat 13°45.16 28°13.22
3	74°4.19	193°35.30 · · 55.83	317°53.32 · · 18.26	353°39.54 · · 25.52	88°37.78 · · 33.97	Markab 13°29.87 15°20.47
4	89°6.65	208°34.59 56.54	332°54.61 18.14	8°42.10 25.52	103°40.35 34.01	Oct 18 Fri SHA Mer.pass
5	$104^{\circ}9.11$	223°33.89 57.25	347°55.89 18.02	23°44.66 25.51	118°42.92 34.04	Venus 122°11.96 14:04
6	119° 11.58	238°33.19 S21°57.96	2°57.18 N22°17.90	38°47.23 N22°25.50	133°45.49	Mars 244°50.02 05:52
7	134° 14.04	253°32.49 58.67	17°58.47 17.78	53°49.79 25.50	148°48.05 34.12	Jupiter 279°30.87 03:33 Saturn 14°28.14 21:11
8 9	149° 16.51 164° 18.97	268°31.78 21°59.37 283°31.08 22°0.08	32°59.76 17.65 48°1.05 · · 17.53	68°52.35 25.49 83°54.92 •• 25.48	163°50.62 34.16 178°53.19 · · 34.19	
10	179°21.43	298°30.37 0.78	63°2.34 17.41	98°57.48 25.48	193°55.75 34.23	Oct 19 Sat SHA Mer.pass
11	194°23.90	313°29.67 1.49	78° 3.63 17.29	114°0.05 25.47	208°58.32 34.27	Venus 120°56.42 14:05 Mars 244°21.17 05:50
12	209°26.36	328°28.96 S 22°2.19	93°4.92 N22°17.17	129°2.61 N22°25.47	224°0.89 \$08°34.30	Mars 244°21.17 05:50 Jupiter 279°32.86 03:29
13	224°28.83	343°28.26 2.89	108° 6.21 17.05	144°5.18 25.46	239° 3.45 34.34	Saturn 14°30.75 21:06
14	239°31.29	358°27.55 3.59	123°7.50 16.93	159°7.74 25.45	254°6.02 34.38 269°8.59 · · 34.41	
15 16	254° 33.76 269° 36.22	13°26.84 · · 4.29 28°26.13 4.99	138°8.80 · · 16.81 153°10.09 16.68	174°10.31 · · 25.45 189°12.87 25.44	269°8.59 · · 34.41 284°11.15 34.45	Oct 20 Sun SHA Mer.pass Venus 119°40.61 14:06
17	284°38.68	43°25.43 5.69	168°11.39 16.56	204°15.44 25.43	299°13.72 34.49	Mars 243°52.67 05:48
18	299°41.15	58°24.72 S 22°6.38	183°12.68 N22°16.44	219°18.01 N22°25.43	314°16.28 \$08°34.52	Jupiter 279°35.07 03:25
19	314°43.61	73°24.01 7.08	198°13.98 16.32	234°20.57 25.42	329°18.85 34.56	Saturn 14°33.29 21:02
20	329°46.08	88°23.30 7.77	213°15.27 16.20	249°23.14 25.41	344°21.42 34.60	Horizontal parallax
21 22	344° 48.54 359° 51.00	103°22.59 · · 8.47 118°21.88 9.16	228°16.57 · · 16.08 243°17.87 15.96	264°25.71 · · 25.41 279°28.28 25.40	359°23.98 · · 34.63 14°26.55 34.67	Venus: 0.1
23	14° 53.47	133°21.17 9.85	258°19.17 15.84	294°30.85 25.40	29°29.11 34.71	Mars: 0.1
		$\frac{153 \text{ ZI.II}}{\nu - 0.7' d0.7' \text{ m} - 3.97}$	ν1.3' d-0.1' m0.23		$\frac{23.23.11}{\nu 2.6' \ d0.0' \ m0.74}$	
ivier.	pass. 22:01	ν-υ.ι αυ.ι III-3.91	ν1.3 U-U.1 IIIU.23	ν2.6' d-0.0' m-2.61	ν2.0 d0.0 m0.74	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°42.89	S09°42.92	357°27.44	7.9'	N14°31.00	16.0'	61.2'
1	198°43.01 213°43.14	43.82 44.73	11°54.30 26°21.10	7.8' 7.7'	14°47.01 15°2.92	15.9' 15.8'	61.1' 61.1'
2	213 43.14 228°43.26	· · 45.63	20 21.10 40°47.82	7.7'	15 2.92 15°18.72	15.8	61.1
4	243°43.38	46.54	55°14.48	7.6'	15°34.43	15.6'	61.1'
5	258°43.50	47.45	69°41.06	7.5'	15°50.03	15.5'	61.1'
6	273°43.62 288°43.74	S09°48.35	84°7.57 98°34.01	7.4'	N16°5.52 16°20.90	15.4'	61.1'
7 8	288°43.74 303°43.85	49.26 50.16	98°34.01 113°0.37	7.4' 7.3'	16°20.90 16°36.17	15.3' 15.2'	61.0' 61.0'
9	318°43.97	51.06	127°26.66	7.2'	16°51.33	15.0'	61.0'
10	333°44.09	51.97	141°52.88	7.1'	$17^{\circ}6.37$	14.9'	61.0'
11	348°44.21	52.87	156°19.02 170°45.09	7.1'	17°21.29	14.8'	61.0'
12 13	3°44.33 18°44.45	S09°53.78 54.68	170°45.09 185°11.08	7.0' 6.9'	N17°36.10 17°50.78	14.7' 14.6'	61.0' 60.9'
14	33°44.56	55.58	199°37.00	6.8'	18°5.34	14.4	60.9'
15	48°44.68	• • 56.49	214°2.85	6.8'	$18^{\circ}19.77$	14.3'	60.9'
16	63°44.80	57.39	228°28.62	6.7'	18°34.08	14.2'	60.9'
17 18	78°44.91 93°45.03	58.29 \$09°59.19	242°54.32 257°19.94	6.6' 6.5'	18°48.26 N19°2.30	14.0' 13.9'	60.9' 60.8'
19	108°45.15	10° 0.10	271°45.49	6.5	19° 16.22	13.8'	60.8
20	123°45.26	1.00	286°10.96	6.4'	19°29.99	13.6'	60.8'
21	138°45.38	• • 1.90	300°36.37	6.3'	19°43.63	13.5'	60.8'
22	153°45.49	2.80	315°1.69	6.3'	19°57.13	13.4'	60.7'
23	168°45.61	3.70	329°26.95	6.2'	20° 10.50	13.2'	60.7'
	SD = 16.0'	d = 0.9'		SI	D = 16.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.72 198°45.84	S10°4.60	343°52.13 358°17.23	6.1'	N20°23.71 20°36.79	13.1'	60.7'
1 2	198°45.84 213°45.95	5.50 6.40	358°17.23 12°42.27	6.0' 6.0'	20° 36.79 20° 49.72	12.9' 12.8'	60.7' 60.6'
3	228°46.07	. 7.30	27°7.23	5.9'	21°2.50	12.6'	60.6
4	243°46.18	8.20	41°32.12	5.8'	21°15.13	12.5'	60.6'
5	258°46.29	9.10	55°56.95	5.8'	21°27.61	12.3'	60.6'
6	273°46.41	\$10°10.00	70°21.70	5.7'	N21°39.93	12.2'	60.5'
7 8	288°46.52 303°46.63	10.90 11.80	84°46.38 99°10.99	5.6' 5.5'	21°52.11 22°4.12	12.0' 11.9'	60.5' 60.5'
9	318°46.74	. 12.70	113°35.53	5.5'	22° 15.98	11.7	60.4
10	333°46.86	13.59	128°0.01	5.4'	22°27.68	11.5'	60.4
11	348°46.97	14.49	142°24.42	5.3'	22°39.22	11.4'	60.4'
12	3°47.08	S10°15.39	156°48.76	5.3'	N22°50.60	11.2'	60.3'
13 14	18°47.19 33°47.30	16.29 17.18	171°13.04 185°37.26	5.2' 5.2'	23°1.81 23°12.86	11.0' 10.9'	60.3' 60.3'
15	48°47.41	. 18.08	200°1.41	5.1'	23° 23.74	10.7	60.3
16	63°47.52	18.98	214°25.51	5.0'	23°34.45	10.5'	60.2'
17	78°47.63	19.87	228°49.54	5.0'	23°44.99	10.4'	60.2
18 19	93°47.74 108°47.85	\$10°20.77 21.67	243°13.51 257°37.43	4.9' 4.9'	N23°55.37 24°5.57	10.2' 10.0'	60.2' 60.1'
20	123°47.96	22.56	272°1.28	4.8'	24° 15.59	9.9'	60.1
21	138°48.07	• • 23.46	286°25.09	4.7'	24°25.45	9.7'	60.1'
22	153°48.18	24.35	300°48.84	4.7'	24°35.12	9.5'	60.0'
23	168°48.29	25.25	315°12.53	4.6'	24°44.63	9.3'	60.0'
	SD = 16.1'	d = 0.9'		51	D = 16.6'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°48.39 198°48.50	\$10°26.14	329°36.18	4.6'	N24°53.95	9.1'	60.0'
1 2	198°48.50 213°48.61	27.03 27.93	343°59.77 358°23.32	4.5' 4.5'	25°3.09 25°12.06	9.0' 8.8'	59.9' 59.9'
3	228°48.72	• • 28.82	12°46.82	4.5'	25°20.84	8.6'	59.9'
4	243°48.82	29.72	27°10.28	4.4'	$25^{\circ}29.44$	8.4'	59.8'
5	258°48.93	30.61	41°33.70	4.4'	25°37.86	8.2'	59.8'
6	273°49.04 288°49.14	\$10°31.50	55°57.07 70°20.40	4.3' 4.3'	N25°46.09 25°54.14	8.0' 7.9'	59.7' 59.7'
7 8	288°49.14 303°49.25	32.39 33.29	70°20.40 84°43.70	4.3'	25°54.14 26°2.00	7.9° 7.7'	59.7' 59.7'
9	318°49.35	• • 34.18	99°6.96	4.2'	26°9.68	7.5'	59.6'
10	333°49.46	35.07	113°30.19	4.2'	$26^{\circ}17.17$	7.3'	59.6'
11	348°49.56	35.96	127°53.39	4.2'	26° 24.47	7.1'	59.6'
12 13	3°49.67 18°49.77	\$10°36.85 37.74	142°16.55 156°39.69	4.1' 4.1'	N26°31.58 26°38.51	6.9' 6.7'	59.5' 59.5'
13 14	18°49.77 33°49.88	37.74 38.64	156° 39.69 171° 2.80	4.1' 4.1'	26° 45.24	6.5'	59.5° 59.4'
15	48°49.98	39.53	185°25.89	4.1'	26°51.79	6.4	59.4
16	63°50.08	40.42	199°48.96	4.0'	26°58.14	6.2'	59.4'
17	78°50.19	41.31	214°12.01	4.0'	27°4.30	6.0'	59.3'
18 19	93°50.29 108°50.39	\$10°42.20 43.09	228°35.04 242°58.06	4.0' 4.0'	N27° 10.27 27° 16.05	5.8' 5.6'	59.3' 59.3'
20	108°50.39 123°50.49	43.09 43.97	242°58.06 257°21.06	4.0'	27° 16.05 27° 21.64	5.6	59.3' 59.2'
21	138°50.60	• • 44.86	271°44.06	4.0'	27°27.03	5.2'	59.2'
22	153°50.70	45.75	286°7.04	4.0'	27° 32.23	5.0'	59.1'
23	168°50.80	46.64	300°30.02	4.0'	27° 37.24	4.8'	59.1'
	SD = 16.1'	d = 0.9'		SI	D = 16.4'		

Naut. Civil Civil Naut. N 72° 05:15 06:33 07:46 15:42 16:55 18:13 N 70° 05:16 06:27 07:32 15:56 17:01 18:11 68° 05:17 06:22 07:21 16:08 17:06 18:11 66° 05:18 06:18 07:11 16:17 17:11 18:10 62° 05:19 06:10 06:56 16:32 17:18 18:09 60° 05:19 06:07 06:50 16:38 17:21 18:09 60° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:02 06:40 16:48 17:26 18:09 52° 05:19 05:58 06:32 16:56 17:31 18:10 52° 05:19 05:58 06:32 17:00 17:33	Lat.	Twi	light	Sunrise	Sunset	Tw	ilight
N 70° 05:16 06:27 07:32 15:56 17:01 18:11 68° 05:17 06:22 07:21 16:08 17:06 18:11 66° 05:18 06:18 07:11 16:17 17:11 18:10 64° 05:19 06:14 07:03 16:25 17:15 18:10 62° 05:19 06:10 06:56 16:32 17:18 18:09 60° 05:19 06:05 06:45 16:44 17:24 18:09 N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:02 06:32 16:53 17:29 18:10 52° 05:19 05:08 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52	Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
68° 05:17 06:22 07:21 16:08 17:06 18:11 66° 05:18 06:18 07:11 16:17 17:11 18:10 64° 05:19 06:14 07:03 16:25 17:15 18:10 62° 05:19 06:10 06:56 16:32 17:18 18:09 60° 05:19 06:07 06:50 16:38 17:21 18:09 N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:05 06:45 16:44 17:26 18:09 54° 05:19 06:00 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48	N 72°	05:15	06:33	07:46	15:42	16:55	18:13
66° 05:18 06:18 07:11 16:17 17:11 18:10 64° 05:19 06:14 07:03 16:25 17:15 18:10 62° 05:19 06:10 06:56 16:32 17:18 18:09 60° 05:19 06:07 06:50 16:38 17:21 18:09 N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:02 06:40 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44	N 70°	05:16	06:27	07:32	15:56	17:01	18:11
64° 05:19 06:14 07:03 16:25 17:15 18:10 62° 05:19 06:10 06:56 16:32 17:18 18:09 60° 05:19 06:07 06:50 16:38 17:21 18:09 N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:00 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:19 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:05 17:25 17:45 18:15 30° 05:33 05:41	68°	05:17	06:22	07:21	16:08	17:06	18:11
62° 05:19 06:10 06:56 16:32 17:18 18:09 60° 05:19 06:07 06:50 16:38 17:21 18:09 N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 52° 05:19 06:02 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:10 17:20 17:45 18:15 30° 05:33 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34	66°	05:18	06:18	07:11	16:17	17:11	18:10
60° 05:19 06:07 06:50 16:38 17:21 18:09 N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:00 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:10 17:20 17:45 18:15 30° 05:33 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:24		05:19	06:14	07:03	16:25	17:15	18:10
N 58° 05:19 06:05 06:45 16:44 17:24 18:09 56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:00 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:10 17:20 17:45 18:15 30° 05:33 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:27 05:49 17:41 18:02 18:27 0° 04:56 05:21 05:42 17:48 18:09 18:34 S 10° 04:48 05:13						17:18	
56° 05:19 06:02 06:40 16:48 17:26 18:09 54° 05:19 06:00 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:10 17:20 17:45 18:15 30° 05:13 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:27 05:49 17:41 18:02 18:27 0° 04:56 05:21 05:42 17:48 18:09 18:34 S 10° 04:48 05:13	60°	05:19	06:07	06:50	16:38	17:21	18:09
54° 05:19 06:00 06:36 16:53 17:29 18:10 52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:10 17:20 17:45 18:15 30° 05:13 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:27 05:49 17:41 18:02 18:27 0° 04:56 05:21 05:42 17:48 18:09 18:34 S 10° 04:48 05:13 05:34 17:56 18:17 18:42 20° 04:38 05:04	N 58°	05:19	06:05	06:45	16:44	17:24	18:09
52° 05:19 05:58 06:32 16:56 17:31 18:10 50° 05:18 05:56 06:29 17:00 17:33 18:10 45° 05:17 05:52 06:21 17:08 17:37 18:12 N 40° 05:16 05:48 06:15 17:14 17:42 18:13 35° 05:14 05:44 06:10 17:25 17:49 18:15 30° 05:13 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:27 05:49 17:41 18:02 18:27 0° 04:56 05:21 05:42 17:48 18:09 18:34 S 10° 04:48 05:13 05:34 17:56 18:17 18:42 20° 04:38 05:04 05:26 18:04 18:26 18:53 30° 04:24 04:53		05:19	06:02	06:40	16:48	17:26	18:09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:19	06:00	06:36	16:53	17:29	18:10
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:19	05:58	06:32	16:56	17:31	18:10
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:18	05:56	06:29	17:00	17:33	18:10
35° 05:14 05:44 06:10 17:20 17:45 18:15 30° 05:13 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:27 05:49 17:41 18:02 18:27 0° 04:56 05:21 05:42 17:48 18:09 18:34 S 10° 04:48 05:13 05:34 17:56 18:17 18:42 20° 04:38 05:04 05:26 18:04 18:26 18:53 30° 04:24 04:53 05:17 18:13 18:38 19:07 35° 04:15 04:46 05:12 18:18 18:45 19:16 40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 S 50° 03:34 04:16	45°	05:17	05:52	06:21	17:08	17:37	18:12
30° 05:13 05:41 06:05 17:25 17:49 18:17 20° 05:08 05:34 05:56 17:33 17:55 18:21 N 10° 05:03 05:27 05:49 17:41 18:02 18:27 0° 04:56 05:21 05:42 17:48 18:09 18:34 S 10° 04:48 05:13 05:34 17:56 18:17 18:42 20° 04:38 05:04 05:26 18:04 18:26 18:53 30° 04:24 04:53 05:17 18:13 18:38 19:07 35° 04:15 04:46 05:12 18:18 18:45 19:16 40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 S 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10		05:16	05:48	06:15	17:14	17:42	18:13
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:14	05:44	06:10	17:20	17:45	18:15
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		05:13	05:41	06:05	17:25	17:49	18:17
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		05:08	05:34	05:56	17:33	17:55	18:21
S 10° 04:48 05:13 05:34 17:56 18:17 18:42 20° 04:38 05:04 05:26 18:04 18:26 18:53 30° 04:24 04:53 05:17 18:13 18:38 19:07 35° 04:15 04:46 05:12 18:18 18:45 19:16 40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 \$ 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06			05:27		17:41	18:02	18:27
20° 04:38 05:04 05:26 18:04 18:26 18:53 30° 04:24 04:53 05:17 18:13 18:38 19:07 35° 04:15 04:46 05:12 18:18 18:45 19:16 40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 \$ 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06	0°	04:56	05:21	05:42	17:48	18:09	18:34
30° 04:24 04:53 05:17 18:13 18:38 19:07 35° 04:15 04:46 05:12 18:18 18:45 19:16 40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 \$ 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06		04:48	05:13	05:34	17:56	18:17	18:42
35° 04:15 04:46 05:12 18:18 18:45 19:16 40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 \$ 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06		04:38	05:04	05:26	18:04	18:26	18:53
40° 04:04 04:38 05:06 18:25 18:53 19:27 45° 03:51 04:28 04:59 18:32 19:03 19:40 \$ 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06		04:24		05:17	18:13	18:38	19:07
45° 03:51 04:28 04:59 18:32 19:03 19:40 \$ 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06		04:15	04:46	05:12	18:18	18:45	19:16
S 50° 03:34 04:16 04:50 18:41 19:15 19:57 52° 03:25 04:10 04:46 18:45 19:21 20:06		04:04	04:38		18:25	18:53	19:27
52° 03:25 04:10 04:46 18:45 19:21 20:06	45°	03:51	04:28	04:59	18:32	19:03	19:40
12 1112 1111 2111 2112 2112	S 50°	03:34	04:16	04:50	18:41	19:15	19:57
E4° 02·16 04·04 04·42 10·40 10·27 20·16							
	54°	03:16	04:04	04:42	18:49	19:27	20:16
56° 03:05 03:57 04:37 18:54 19:35 20:27							
58° 02:52 03:49 04:32 19:00 19:43 20:40							
S 60° 02:37 03:39 04:26 19:06 19:53 20:56	S 60°	02:37	03:39	04:26	19:06	19:53	20:56

Lat.		Moonris	e		Moonse	t
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	13:19			11:30		
N 70°	14:29			10:22		
68°	15:07			09:47		
66°	15:33	14:43		09:21	12:14	
64°	15:54	15:33		09:02	11:25	
62°	16:11	16:04	15:53	08:46	10:54	13:13
60°	16:26	16:28	16:37	08:33	10:31	12:30
N 58°	16:38	16:47	17:06	08:22	10:13	12:01
56°	16:48	17:04	17:29	08:12	09:57	11:39
54°	16:58	17:17	17:47	08:04	09:44	11:21
52°	17:06	17:30	18:03	07:56	09:33	11:05
50°	17:14	17:40	18:17	07:49	09:23	10:52
45°	17:30	18:03	18:45	07:35	09:01	10:25
N 40°	17:44	18:21	19:07	07:23	08:44	10:03
35°	17:56	18:37	19:25	07:13	08:30	09:45
30°	18:06	18:50	19:41	07:04	08:17	09:30
20°	18:23	19:13	20:08	06:49	07:56	09:04
N 10°	18:39	19:33	20:32	06:36	07:38	08:42
0°	18:53	19:52	20:53	06:24	07:21	08:21
S 10°	19:08	20:11	21:15	06:11	07:04	08:01
20°	19:24	20:32	21:39	05:59	06:46	07:39
30°	19:42	20:56	22:07	05:44	06:25	07:13
35°	19:53	21:10	22:23	05:35	06:13	06:58
40°	20:06	21:26	22:42	05:26	06:00	06:41
45°	20:20	21:46	23:06	05:15	05:43	06:20
S 50°	20:39	22:11	23:35	05:01	05:24	05:54
52°	20:47	22:23	23:50	04:55	05:14	05:42
54°	20:57	22:37		04:48	05:04	05:27
56°	21:08	22:53		04:40	04:52	05:11
58°	21:21	23:12		04:32	04:38	04:51
S 60°	21:36	23:36		04:22	04:23	04:26

		Sun			Moon			
Day		Eqn.of Time		Mer.	Mer.Pass.		Age	
	,	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-91%	
	18	14:52	14:57	11:45	00:11	12:38		
	19	15:03	15:08	11:45	01:07	13:37		
	20	15:14	15:19	11:45	02:07	14:37		

October 21, 22, 23 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	29°55.93	148°20.46	273°20.46 N22°15.71	309°33.42 N22°25.39	44°31.68 \$08°34.74		
1	44°58.40	163°19.75 11.23	288°21.76 15.59	324°35.99 25.38	59°34.24 34.78		9°13.81 2°10.28
2	60°0.86	178°19.03 11.92	303°23.06 15.47	339°38.56 25.38	74°36.81 34.81		6°40.55
3	75°3.33	193°18.32 · · 12.61	318°24.37 · · 15.35	354°41.13 · · 25.37	89°39.37 · · 34.85		7°50.96
4	90°5.79	208° 17.61 13.29	333°25.67 15.23	9°43.70 25.36	104°41.93 34.89	1	57°6.61
5 6	105°8.25 120°10.72	223°16.89 13.98 238°16.18 \$22°14.66	348°26.97 15.11 3°28.27 N22°14.99	24°46.27 25.36 39°48.84 N22°25.35	119°44.50 34.92 134°47.06 \$08°34.96		3°34.89
7	135° 13.18	253°15.47 15.35	18°29.57 14.86	54°51.41 25.34	149°49.63 34.99		9°22.03
8	150° 15.65	268°14.75 16.03	33°30.88 14.74	69°53.99 25.34	164°52.19 35.03		0°12.15
9	$165^{\circ}18.11$	283°14.04 · · 16.71	48°32.18 · · 14.62	84°56.56 · · 25.33	179°54.75 · · 35.06	l .	4°11.35 9°56.94
10	180° 20.58	298°13.32 17.39	63°33.49 14.50	99°59.13 25.32	194°57.32 35.10		6°33.62
11	195°23.04	313°12.60 18.07	78°34.79 14.38	115° 1.70 25.32	209°59.88 35.14		8°10.19
12 13	210°25.50 225°27.97	328°11.89	93°36.10 N22°14.26 108°37.41 14.14	130° 4.28 N22° 25.31 145° 6.85 25.30	225°2.45 \$08°35.17 240°5.01 35.21	Capella 280°21.88 4	46°1.29
14	240°30.43	358° 10.45 20.10	123°38.72 14.02	160° 9.43 25.30	255°7.57 35.24		6°22.45
15	255°32.90	13°9.73 · · 20.77	138°40.02 · · 13.90	175°12.00 · · 25.29	270°10.13 · · 35.28		8°37.70
16	270°35.36	28°9.02 21.45	153°41.33 13.77	190°14.58 25.28	285°12.70 35.31		1°11.00 7°24.81
17	285° 37.82	43°8.30 22.12	168°42.64 13.65	205°17.15 25.28	300°15.26 35.35	1	24.61 2°42.15
18	300°40.29	58°7.58 S 22°22.79	183°43.95 N22°13.53	220°19.73 N22°25.27	315°17.82 \$08°35.38		6°44.76
19	315° 42.75	73°6.86 23.46	198°45.26 13.41	235°22.30 25.26	330°20.38 35.42		29°0.03
20 21	330° 45.22 345° 47.68	88°6.14 24.13 103°5.42 · · 24.80	213°46.58 13.29 228°47.89 · · 13.17	250°24.88 25.25 265°27.46 • 25.25	345°22.95 35.45 0°25.51 · · 35.49	Procyon 244°51.01	5°9.81
22	0°50.15	118°4.70 25.47	243°49.20 13.05	280°30.04 25.24	15°28.07 35.52	l .	7°57.95
23	15°52.61	133°3.97 26.13	258°50.51 12.93	295°32.61 25.23	30°30.63 35.56		9°34.92
	pass. 21:57	ν -0.7' d0.7' m-3.97	$\nu 1.3' \ d$ -0.1' m0.22	ν 2.6′ d-0.0′ m-2.61	$\nu 2.6' \ d0.0' \ m0.75$	1	3°31.60 9°48.73
ivier.p	Dass. 21:57	ν-υ.τ αυ.τ m-3.91	ν1.3 α-0.1 m0.22	ν2.0 a-0.0 m-2.01	ν2.0 du.0 mu.75		9 48.73 8°45.76
							1°50.85
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	_	1°36.91
0 1	30°55.07 45°57.54	148°3.25 \$22°26.80 163°2.53 27.46	273°51.83 N22°12.80 288°53.14 12.68	310°35.19 N22°25.23 325°37.77 25.22	45°33.19 \$08°35.59 60°35.76 35.63		4°26.09
2	61°0.00	163°2.53 27.46 178°1.81 28.13	288°53.14 12.68 303°54.46 12.56	325°37.77 25.22 340°40.35 25.21	60°35.76 35.63 75°38.32 35.66		7°40.61
3	76°2.47	193°1.08 · · 28.79	318°55.77 · · 12.44	355°42.93 · · 25.21	90°40.88 · · 35.70		3°14.00
4	91°4.93	208°0.36 29.45	333°57.09 12.32	10°45.51 25.20	105°43.44 35.73	1	7°14.94 5°49.50
5	106°7.39	222°59.64 30.11	348°58.41 12.20	25°48.09 25.19	120°46.00 35.76		1°17.32
6	121°9.86	237°58.91 S22°30.77	3°59.73 N22°12.08	40°50.67 N22°25.18	135°48.56		9°11.41
7	136° 12.32	252°58.19 31.43	19°1.05 11.96	55°53.25 25.18	150°51.12 35.83	l .	0°29.48
8 9	151° 14.79 166° 17.25	267°57.46 32.09 282°56.73 · · 32.74	34°2.37 11.84 49°3.69 · · 11.71	70°55.83 25.17 85°58.41 •• 25.16	165°53.68 35.87 180°56.24 · · 35.90		6°29.42
10	181° 19.72	297°56.01 33.40	64° 5.01 11.59	101° 0.99 25.16	195°58.80 35.94		19°3.30
11	196° 22.18	312°55.28 34.05	79° 6.33 11.47	116° 3.58 25.15	211°1.36 35.97		0°56.24
12	211° 24.64	327°54.55	94°7.65 N22°11.35	131°6.16 N22°25.14	226°3.92 \$08°36.00	l .	74°3.24 16°8.60
13	$226^{\circ}27.11$	342°53.82 35.36	109°8.97 11.23	146°8.74 25.13	241°6.48 36.04		6°38.00
14	241°29.57	357°53.10 36.01	124°10.29 11.11	161°11.32 25.13	256°9.04 36.07		6°29.21
15	256° 32.04	12°52.37 · · 36.66	139°11.62 · · 10.99	176°13.91 · · 25.12	271°11.60 · · 36.10		69°4.46
16 17	271°34.50 286°36.97	27°51.64 37.31 42°50.91 37.95	154°12.94 10.87 169°14.27 10.75	191°16.49 25.11 206°19.08 25.10	286°14.16 36.14 301°16.72 36.17	1	5°45.30
18	301°39.43	57°50.18 \$22°38.60	184°15.59 N22°10.63	221°21.66 N22°25.10	316°19.28 \$08°36.21	1	37°7.37
19	316°41.89	72°49.45 39.24	199°16.92 10.50	236°24.25 25.09	331°21.84 36.24		2°32.65
20	331°44.36	87°48.72 39.89	214° 18.25 10.38	251°26.83 25.08	346°24.40 36.27		1°29.34 4°22.45
21	346° 46.82	102°47.99 · · 40.53	229°19.58 · · 10.26	266°29.42 · · 25.07	1°26.95 · · 36.31		8°48.61
22	1°49.29	117° 47.25 41.18	244°20.90 10.14	281°32.00 25.07	16°29.51 36.34		6°16.00
23	16°51.75	132°46.52 41.82	259°22.23 10.02	296°34.59 25.06	31°32.07 36.37		8°56.15
Mer.p	pass. 21:53	ν -0.7 $'$ d0.7 $'$ m-3.98	$ u 1.3' \ d \text{-} 0.1' \ \text{m} 0.21$	$\nu 2.6' \ d$ -0.0' m-2.62	$\nu 2.6' \ d0.0' \ m0.75$		6°39.53
							5°22.38
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		9°59.45 6°50.60
0	31°54.21	147°45.79 \$22°42.46	274°23.56 N22°9.90	311°37.18 N22°25.05	46°34.63 S 08°36.41		9°29.49
1	46°56.68	162°45.06 43.10	289°24.89 9.78	326°39.76 25.04	61°37.19 36.44	1	8°13.23
2	61°59.14 77°1.61	177°44.32 43.73 192°43.59 • 44.37	304°26.23 9.66 319°27.56 • 9.54	341°42.35 25.04 356°44.94 •• 25.03	76°39.75 36.47 91°42.30 · · 36.50	Markab 13°29.87 15	5°20.47
4	92°4.07	207° 42.85 45.01	334°28.89 9.42	11°47.53 25.02	106°44.86 36.54	Oct 21 Mon SHA M	1er.pass
5	107°6.54	222°42.12 45.64	349°30.22 9.30	26°50.12 25.01	121°47.42 36.57	Venus 118°24.52	14:07
6	122°9.00	237°41.38 S 22°46.28	4°31.56 N22°9.18	41°52.71 N22°25.01	136°49.98 \$08°36.60	Mars 243°24.53	05:46
7	137° 11.46	252°40.65 46.91	19°32.89 9.06	56°55.30 25.00	151°52.53 36.64	Jupiter 279°37.48	03:21
8	152° 13.93	267°39.91 47.54	34°34.23 8.93	71°57.89 24.99	166°55.09 36.67	Saturn 14°35.74	20:58
9	167°16.39	282°39.18 · · 48.17	49°35.56 · · 8.81	87° 0.48 · · 24.98	181°57.65 · · 36.70	Oct 22 Tue SHA M	1er.pass
10 11	182° 18.86 197° 21.32	297°38.44 48.80 312°37.70 49.43	64°36.90 8.69 79°38.24 8.57	102°3.07 24.98 117°5.66 24.97	197°0.20 36.73 212°2.76 36.77	Venus 117°8.18	14:08
12	212°23.78	327°36.96 \$22°50.06	94°39.57 N22°8.45	132°8.25 N22°24.96	227°5.32 \$08°36.80	Mars 242° 56.75	05:44
13	227° 26.25	342°36.22 50.68	109°40.91 8.33	147°10.84 24.95	242°7.87 36.83	Jupiter 279°40.12	03:17
14	242°28.71	357° 35.49 51.31	124°42.25 8.21	162°13.43 24.94	257°10.43 36.86	Saturn 14°38.12	20:54
15	257°31.18	12°34.75 · · 51.93	139°43.59 · · 8.09	177°16.03 · · 24.94	272°12.99 · · 36.90		1er.pass
16	272°33.64	27°34.01 52.56	154°44.93 7.97	192°18.62 24.93	287°15.54 36.93	Venus 115°51.57	14:10
17 18	287°36.11 302°38.57	42°33.27 53.18 57°32.53 \$22°53.80	169°46.27 7.85 184°47.61 N22°7.73	207°21.21 24.92 222°23.81 N22°24.91	302°18.10 36.96 317°20.65 \$08°36.99	Mars 242°29.35	05:42
19	302 38.57 317°41.03	72°31.79 54.42	199°48.96 7.61	237°26.40 24.91	332°23.21 37.02	Jupiter 279°42.96 Saturn 14°40.42	03:13 20:50
20	332° 43.50	87°31.04 55.04	214°50.30 7.49	252°28.99 24.90	347°25.76 37.06	Jatum 14 40.42	∠0:50
21	347°45.96	102°30.30 · · 55.66	229°51.64 · · 7.37	267°31.59 · · 24.89	2°28.32 · · 37.09	Horizontal parallax	
22	2°48.43	117°29.56 56.27	244°52.99 7.25	282°34.18 24.88	17°30.87 37.12	Venus:	0.1
23	17°50.89	132°28.82 56.89	259°54.33 7.13	297°36.78 24.87	32°33.43 37.15	Mars:	0.1
Mer.p	pass. 21:49	ν-0.7' d0.6' m-3.98	ν1.3' d-0.1' m0.19	ν2.6' d-0.0' m-2.63	ν2.6' d0.0' m0.76		

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.90	S10°47.53	314°53.00	4.0'	N27°42.05	4.6'	59.1'
1	198°51.00 213°51.10	48.42	329°15.97	4.0'	27°46.67 27°51.10	4.4' 4.2'	59.0'
2	213 51.10 228°51.20	49.30 •• 50.19	343°38.95 358°1.93	4.0' 4.0'	27°55.33	4.2 4.0'	59.0' 58.9'
4	243°51.30	51.08	12°24.91	4.0'	27°59.37	3.8'	58.9'
5	258° 51.40	51.96	26°47.91	4.0'	28°3.22	3.7'	58.9'
6	273°51.50 288°51.60	\$10°52.85	41°10.91 55°33.93	4.0'	N28°6.87	3.5'	58.8'
7 8	303°51.70	53.74 54.62	69°56.96	4.0' 4.1'	28°10.33 28°13.60	3.3' 3.1'	58.8' 58.7'
9	318°51.80	55.51	84°20.01	4.1'	28°16.67	2.9'	58.7'
10	333°51.89	56.39	98°43.08	4.1'	28°19.55	2.7'	58.7'
11	348°51.99 3°52.09	57.28 \$10°58.16	113°6.18 127°29.30	4.1' 4.1'	28°22.24 N28°24.73	2.5' 2.3'	58.6'
12 13	3 52.09 18°52.19	59.05	127 29.30 141°52.44	4.1 4.2'	28°27.03	2.3 2.1'	58.6' 58.5'
14	33°52.28	10°59.93	156°15.62	4.2'	28°29.15	1.9'	58.5'
15	48° 52.38	11°0.82	170°38.83	4.2'	28°31.07	1.7'	58.5'
16	63° 52.48 78° 52.57	1.70 2.58	185°2.07 199°25.35	4.3' 4.3'	28°32.80 28°34.34	1.5' 1.4'	58.4'
17 18	93° 52.67	2.58 S11°3.47	213°48.67	4.4	28 34.34 N28°35.69	1.4	58.4' 58.3'
19	108° 52.76	4.35	228°12.03	4.4'	28°36.85	1.0'	58.3'
20	123° 52.86	5.23	242°35.43	4.5'	28°37.82	0.8'	58.3'
21	138° 52.95 153° 53.05	. 6.11	256°58.88 271°22.38	4.5'	28°38.61 28°39.20	0.6'	58.2' 58.2'
22 23	168° 53.14	6.99 7.88	271 22.38 285°45.93	4.5' 4.6'	28° 39.20 28° 39.62	0.4' 0.2'	58.2 58.1'
	SD = 16.1'	d = 0.9'			O = 16.1'	J. <u>L</u>	
	J∪ = 10.1′	u = 0.9°		31) — 10.1°		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.24	S11°8.76	300° 9.53	4.7'	N28°39.84	0.0'	58.1'
1 2	198°53.33 213°53.42	9.64 10.52	314°33.19 328°56.90	4.7' 4.8'	28°39.88 28°39.74	-0.1' -0.3'	58.1' 58.0'
3	213 53.42 228°53.52	10.52	343°20.68	4.8'	28°39.41	-0.5'	58.0'
4	243°53.61	12.28	357°44.51	4.9'	28°38.90	-0.7'	57.9'
5	258° 53.70	13.16	12°8.41	5.0'	28°38.21	-0.9'	57.9'
6 7	273°53.79 288°53.89	\$11°14.04 14.92	26°32.38 40°56.41	5.0' 5.1'	N28°37.34 28°36.29	-1.1' -1.2'	57.9' 57.8'
8	303° 53.98	15.80	55°20.51	5.2'	28°35.06	-1.2 -1.4'	57.8'
9	318°54.07	• • 16.68	69°44.68	5.2'	28°33.65	-1.6'	57.7'
10	333°54.16	17.56	84°8.93	5.3'	28°32.07	-1.8'	57.7'
11 12	348° 54.25 3° 54.34	18.43 \$11°19.31	98°33.25 112°57.65	5.4' 5.5'	28°30.31 N28°28.38	-1.9' -2.1'	57.7' 57.6'
13	18° 54.43	20.19	112 37.03 127°22.13	5.6'	28°26.27	-2.1	57.6'
14	33°54.52	21.07	141°46.68	5.6'	28°23.99	-2.5'	57.5'
15	48°54.61	• • 21.94	156°11.33	5.7'	28°21.54	-2.6'	57.5'
16 17	63°54.70 78°54.79	22.82 23.70	170°36.05 185°0.86	5.8' 5.9'	28°18.92 28°16.13	-2.8' -3.0'	57.5' 57.4'
18	93°54.88	S11°24.57	199°25.76	6.0'	N28°13.17	-3.1'	57.4'
19	108° 54.96	25.45	213°50.74	6.1'	28°10.04	-3.3'	57.3'
20	123°55.05 138°55.14	26.32 •• 27.20	228°15.82 242°40.99	6.2'	28°6.76		57.3'
21 22	158 55.14 153°55.23	· · 27.20 28.07	242 40.99 257°6.25	6.3' 6.4'	28°3.30 27°59.69	-3.6' -3.8'	57.3' 57.2'
23	168° 55.31	28.95	271°31.61	6.5'	27°55.91	-3.9'	57.2'
	SD = 16.1'	d = 0.9'		SI	D = 15.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°55.40 198°55.49	\$11°29.82 30.70	285°57.06 300°22.60	6.5' 6.6'	N27°51.97 27°47.88	-4.1' -4.3'	57.1' 57.1'
2	213°55.57	31.57	314°48.25	6.7'	27°43.62	-4.4'	57.1
3	228° 55.66	• • 32.44	329°14.00	6.8'	27°39.21	-4.6'	57.0'
4 5	243°55.74 258°55.83	33.32 34.19	343°39.84 358°5.79	6.9' 7.1'	27°34.65 27°29.93	-4.7' -4.9'	57.0' 57.0'
6	258°55.83 273°55.91	34.19 \$11°35.06	358° 5.79 12° 31.84	7.1	N27°25.06	-4.9° -5.0'	56.9
7	288°56.00	35.93	26°57.99	7.3'	27°20.05	-5.2'	56.9'
8	303°56.08	36.81	41°24.25	7.4'	27°14.88	-5.3'	56.8'
9 10	318° 56.16 333° 56.25	· · 37.68 38.55	55°50.62 70°17.08	7.5' 7.6'	27°9.56 27°4.10	-5.5' -5.6'	56.8' 56.8'
11	333 50.25 348°56.33	38.55 39.42	70 17.08 84°43.66	7.0 7.7'	27 4.10 26°58.49	-5.8'	56.7'
12	3°56.41	S11°40.29	99°10.34	7.8'	N26°52.74	-5.9'	56.7'
13	18° 56.50	41.16	113°37.14	7.9'	26°46.84	-6.0'	56.7'
14 15	33° 56.58 48° 56.66	42.03 •• 42.90	128° 4.04 142° 31.05	8.0' 8.1'	26°40.81 26°34.64	-6.2' -6.3'	56.6' 56.6'
16	63° 56.74	43.77	142 31.05 156°58.17	8.2'	26°28.33	-0.3 -6.4'	56.5
17	78° 56.82	44.64	171°25.40	8.3'	26°21.88	-6.6'	56.5'
18	93°56.91	S11°45.51	185°52.74	8.5'	N26°15.30	-6.7'	56.5
19 20	108° 56.99 123° 57.07	46.38 47.25	200°20.20 214°47.76	8.6' 8.7'	26°8.58 26°1.73	-6.8' -7.0'	56.4' 56.4'
21	123 57.07 138°57.15	47.25 · · 48.11	214 47.76 229°15.44	8.8'	25°54.75	-7.0 -7.1'	56.4'
22	153° 57.23	48.98	243°43.23	8.9'	25°47.64	-7.2'	56.3'
23	168°57.31	49.85	258°11.13	9.0'	25°40.41	-7.4'	56.3'
	SD = 16.1'	d = 0.9'		SI	O = 15.6'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:27	06:46	08:02	15:25	16:40	17:59
N 70°	05:27	06:39	07:45	15:42	16:48	17:59
68°	05:27	06:32	07:32	15:55	16:55	18:00
66°	05:27	06:27	07:21	16:06	17:00	18:00
64°	05:27	06:22	07:12	16:15	17:05	18:00
62°	05:26	06:18	07:05	16:23	17:09	18:01
60°	05:26	06:15	06:58	16:30	17:13	18:01
N 58°	05:26	06:11	06:52	16:36	17:16	18:02
56°	05:25	06:08	06:47	16:41	17:19	18:03
54°	05:24	06:06	06:42	16:46	17:22	18:03
52°	05:24	06:03	06:38	16:50	17:25	18:04
50°	05:23	06:01	06:34	16:54	17:27	18:05
45°	05:21	05:55	06:25	17:03	17:33	18:07
N 40°	05:19	05:51	06:18	17:10	17:37	18:09
35°	05:17	05:46	06:12	17:16	17:42	18:11
30°	05:15	05:42	06:07	17:22	17:46	18:14
20°	05:09	05:35	05:57	17:31	17:54	18:19
N 10°	05:03	05:28	05:49	17:40	18:01	18:26
0°	04:55	05:20	05:41	17:48	18:09	18:33
S 10°	04:46	05:11	05:33	17:56	18:17	18:42
20°	04:35	05:02	05:24	18:05	18:27	18:54
30°	04:20	04:49	05:14	18:15	18:40	19:09
35°	04:11	04:42	05:08	18:21	18:47	19:19
40°	03:59	04:33	05:02	18:28	18:56	19:30
45°	03:45	04:23	04:54	18:36	19:07	19:45
S 50°	03:27	04:10	04:44	18:46	19:20	20:04
52°	03:18	04:03	04:40	18:50	19:27	20:13
54°	03:07	03:56	04:35	18:55	19:34	20:23
56°	02:55	03:49	04:30	19:00	19:42	20:36
58°	02:41	03:40	04:24	19:07	19:51	20:50
S 60°	02:24	03:29	04:17	19:14	20:02	21:08

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°						
62°			19:13			16:07
60°	17:04	18:13	19:51	14:12	15:09	15:28
N 58°	17:44	18:50	20:18	13:32	14:31	15:01
56°	18:11	19:17	20:39	13:05	14:04	14:40
54°	18:33	19:38	20:56	12:43	13:43	14:22
52°	18:51	19:55	21:11	12:25	13:26	14:07
50°	19:07	20:10	21:24	12:10	13:10	13:54
45°	19:37	20:41	21:50	11:39	12:40	13:27
N 40°	20:02	21:04	22:11	11:15	12:16	13:05
35°	20:21	21:23	22:28	10:55	11:57	12:47
30°	20:38	21:40	22:43	10:39	11:40	12:32
20°	21:07	22:08	23:08	10:10	11:11	12:05
N 10°	21:32	22:32	23:29	09:46	10:47	11:43
0°	21:55	22:54	23:50	09:23	10:24	11:21
S 10°	22:18	23:17		09:00	10:01	11:00
20°	22:43	23:40		08:36	09:36	10:37
30°	23:12		80:00	08:07	09:07	10:10
35°	23:29		00:25	07:51	08:50	09:54
40°	23:49		00:44	07:31	08:30	09:35
45°		00:14	01:07	07:07	08:06	09:13
S 50°		00:45	01:36	06:37	07:34	08:44
52°		01:01	01:51	06:22	07:19	08:30
54°	00:08	01:19	02:08	06:04	07:00	08:13
56°	00:28	01:42	02:28	05:43	06:38	07:53
58°	00:55	02:11	02:53	05:17	06:08	07:29
S 60°	01:32	02:55	03:27	04:39	05:25	06:55

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	83-64%
21	15:24	15:28	11:45	03:08	15:39	
22	15:33	15:37	11:44	04:09	16:39	
23	15:42	15:46	11:44	05:08	17:36	

October 24, 25, 26 UT (Thu., Fri., Sat.)

h	Aries	Ve	nus	Ma	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	32°53.35	147°28.07	\$22°57.50	274°55.68	N22°7.01	312°39.38	N22°24.87	47°35.98	508°37.18	Alpheratz	357°34.68	29°13.82
1	47°55.82	162°27.33	58.12	289°57.03	6.89	327°41.97	24.86	62°38.54	37.21	Ankaa	353° 6.92	-42°10.29
2	62°58.28	177°26.59	58.73	304°58.37	6.77	342°44.57	24.85	77°41.09	37.25	Schedar	349°30.77	56°40.57
3	78°0.75	192°25.84	· · 59.34	319°59.72 335°1.07	• • 6.65	357°47.17	• • 24.84	92°43.65	•• 37.28	Diphda	$348^{\circ}47.17$	$-17^{\circ}50.97$
4 5	93°3.21 108°5.68	207°25.10 222°24.35	22°59.95 23°0.56	350°2.42	6.53 6.41	12°49.76 27°52.36	24.83 24.82	107°46.20 122°48.75	37.31 37.34	Achernar	$335^{\circ}19.71$	-57° 6.62
6	123°8.14	237°23.61	\$23°1.17	5°3.77	N22°6.29	42°54.96	N22°24.82	137°51.31	S08°37.37	Hamal	327°51.07	23°34.90
7	138° 10.60	252°22.86	1.77	20°5.12	6.17	57°57.56	24.81	152°53.86	37.40	Polaris	313°39.67	89°22.05
8	153° 13.07	267°22.12	2.38	35°6.47	6.05	73°0.16	24.80	167°56.42	37.43	Acamar Menkar	315°11.49 314°6.03	-40°12.16 4°11.35
9	$168^{\circ}15.53$	282°21.37	• • 2.98	50°7.82	• • 5.93	88°2.75	• • 24.79	182°58.97	• • 37.46	Mirfak	308°28.07	4 11.35 49°56.96
10	183° 18.00	297°20.62	3.59	65°9.18	5.81	103°5.35	24.78	198°1.52	37.49	Aldebaran	290°39.57	16°33.63
11	198° 20.46	312°19.87	4.19	80°10.53	5.69	118° 7.95	24.78	213°4.08	37.53	Rigel	281°3.82	-8°10.19
12 13	213°22.92 228°25.39	327°19.13 342°18.38	\$23°4.79 5.39	95°11.88 110°13.24	N22°5.57 5.45	133°10.55 148°13.16	N22°24.77 24.76	228°6.63 243°9.18	\$08°37.56 37.59	Capella	280°21.85	$46^{\circ}1.29$
14	243° 27.85	357° 17.63	5.99	125°14.59	5.43	163°15.76	24.75	243 9.16 258°11.73	37.62	Bellatrix	278° 22.87	6°22.45
15	258° 30.32	12°16.88	. 6.59	140°15.95	5.21	178°18.36	24.74	273°14.29	• • 37.65	Elnath	278°1.86	28°37.70
16	273°32.78	$27^{\circ}16.13$	7.19	$155^{\circ}17.31$	5.09	193°20.96	24.73	288°16.84	37.68	Alnilam	275°37.72 270°52.11	-1°11.01 7°24.81
17	288° 35.25	42°15.38	7.78	170°18.66	4.97	208°23.56	24.73	303°19.39	37.71	Betelgeuse Canopus	263°52.23	-52°42.15
18	303°37.71	57° 14.63	\$23°8.38	185°20.02	N22°4.85	223°26.16	N22°24.72	318°21.94	S08°37.74	Sirius	258° 26.27	-16°44.77
19	318° 40.17	72°13.88	8.97	200°21.38	4.73	238°28.77 253°31.37	24.71	333°24.50	37.77	Adhara	255°5.90	-29°0.04
20 21	333° 42.64 348° 45.10	87°13.13 102°12.37	9.57 •• 10.16	215°22.74 230°24.10	4.61 • • 4.49	253 31.37 268°33.97	24.70 •• 24.69	348°27.05 3°29.60	37.80 •• 37.83	Procyon	244°50.98	$5^{\circ}9.80$
22	3°47.57	102 12.37 117°11.62	10.75	245°25.46	4.49	283°36.58	24.68	18°32.15	37.86	Pollux	243°17.49	27°57.95
23	18° 50.03	132° 10.87	11.34	260°26.82	4.25	298°39.18	24.67	33°34.70	37.89	Avior	234°14.86	-59°34.92
N 4	21.45		.6′ m-3.98	$\nu 1.3' \ d-0$		-26/-10	.0′ m-2.64		.0′ m0.76	Suhail Miaplacidus	222°46.57 221°38.60	-43°31.60 -69°48.73
ivier.	pass. 21:45	ν-0.7 αυ	.0 111-3.90	ν 1.5 a -0	.1 1110.10	ν2.0 <i>a</i> -0	.0 111-2.04	ν2.0 d0	.0 1110.70	Alphard	221 38.00 217°48.05	-09 46.73 -8°45.77
										Regulus	207°34.80	11°50.84
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°41.65	61°36.89
0	33°52.49	147°10.12		275°28.18	N22°4.13	313°41.79	N22°24.67	48°37.25	S08°37.92	Denebola	$182^{\circ}25.41$	$14^{\circ}26.08$
1 2	48° 54.96 63° 57.42	162°9.36 177°8.61	12.51 13.10	290°29.55 305°30.91	4.01 3.89	328°44.39 343°47.00	24.66 24.65	63°39.80 78°42.36	37.95 37.98	Gienah	175°44.09	-17°40.61
3	78° 59.89	192°7.86	• • 13.68	320°32.27	• • 3.77	358°49.60	• • 24.64	93°44.91	• • 38.01	Acrux	173°1.01	-63°14.00
4	94°2.35	207°7.10	14.27	335°33.64	3.65	13°52.21	24.63	108°47.46	38.04	Gacrux	171°52.44	-57°14.93
5	109°4.81	222°6.35	14.85	350°35.01	3.53	28°54.81	24.62	123°50.01	38.07	Alioth Spica	166° 13.64 158° 22.83	55°49.48 -11°17.32
6	124°7.28	237°5.59	S23°15.43	5°36.37	N22°3.41	43°57.42	N22°24.61	138°52.56	S08°38.10	Alkaid	150° 22.63 152° 52.62	49°11.39
7	139°9.74	252°4.83	16.01	20°37.74	3.29	59°0.03	24.61	153°55.11	38.13	Hadar	148°36.98	-60°29.48
8	154° 12.21	267°4.08	16.59	35°39.11	3.17	74°2.64	24.60	168°57.66	38.16	Menkent	$147^{\circ}58.27$	-36°29.42
9 10	169° 14.67 184° 17.14	282°3.32 297°2.56	· · 17.17 17.75	50°40.47 65°41.84	· · 3.06 2.94	89° 5.24 104° 7.85	· · 24.59 24.58	184°0.21 199°2.76	· · 38.19 38.22	Arcturus	145°48.43	19°3.28
11	199° 19.60	312°1.81	18.33	80°43.21	2.94	119°10.46	24.56	214°5.31	38.25	Rigil Kent.	139°41.28	-60°56.23
12	214° 22.06	327°1.05	\$23°18.90	95°44.58	N22°2.70	134°13.07	N22°24.56	229°7.86	S08°38.28	Kochab	137°20.89	74°3.22
13	229° 24.53	342°0.29	19.48	110°45.95	2.58	149°15.68	24.55	244°10.41	38.31	Zuben'ubi Alphecca	136°56.57 126°4.24	-16°8.60 26°37.98
14	244°26.99	$356^{\circ}59.53$	20.05	125°47.33	2.46	164°18.29	24.54	259°12.95	38.34	Antares	112° 16.38	-26°29.21
15	259° 29.46	11°58.77	• • 20.62	140°48.70	2.34	179°20.90	• • 24.54	274°15.50	• • 38.37	Atria	107° 11.20	-69°4.46
16	274°31.92	26°58.01	21.19	155°50.07	2.22	194°23.51	24.53	289°18.05	38.39	Sabik	$102^{\circ}3.25$	$-15^{\circ}45.31$
17 18	289° 34.38 304° 36.85	41°57.25 56°56.49	21.76 S 23°22.33	170°51.45 185°52.82	2.10 N22°1.98	209°26.12 224°28.73	24.52 N22° 24.51	304°20.60 319°23.15	38.42 \$08°38.45	Shaula	96°10.90	-37°7.37
19	319°39.31	71°55.73	22.90	200°54.20	1.87	239°31.34	24.50	334°25.70	38.48	Rasalhague	95°58.94	12°32.64
20	334°41.78	86°54.97	23.46	215°55.57	1.75	254°33.95	24.49	349°28.25	38.51	Eltanin	90°42.57 83°32.95	51°29.33
21	349°44.24	101°54.21	• • 24.03	230°56.95	• • 1.63	269°36.57	• • 24.48	4°30.79	• • 38.54	Kaus Aust. Vega	83 32.95 80°33.54	-34°22.45 38°48.60
22	4°46.70	116°53.45	24.59	245°58.33	1.51	284°39.18	24.47	19°33.34	38.57	Nunki	75°48.12	
23	19°49.17	131°52.69	25.16	260°59.70	1.39	299°41.79	24.46	34°35.89	38.60	Altair	62°0.19	8°56.15
Mer.	pass. 21:41	ν-0.8′ d0	.6′ m-3.99	ν 1.4′ d-0	.1′ m0.17	ν 2.6′ d-0	.0′ m-2.64	ν 2.6′ d0	.0′ m0.76	Peacock	53°5.98	-56°39.53
	·									Deneb	49°25.91	45°22.38
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.87	9°59.45
0	34°51.63		\$23°25.72	276°1.08	N22°1.27	314°44.40	N22°24.46	49°38.44	S08°38.62	Al Na'ir	27°32.91	
1	49°54.10	161°51.16	26.28	291°2.46	1.15	329°47.02	24.45	64°40.99	38.65	Fomalhaut Scheat	15°14.48 13°45.16	-29°29.49 28°13.23
2	64°56.56	176°50.40	26.84	$306^{\circ}3.84$	1.03	344°49.63	24.44	79°43.53	38.68	Markab	13°29.88	15°20.47
3	79°59.02	191°49.63	• • 27.40	321°5.22	• • 0.92	359°52.25	• • 24.43	94°46.08	• • 38.71			
4	95°1.49	206°48.87	27.95	336° 6.61	0.80	14°54.86	24.42	109°48.63	38.74	Oct 24 Thu	SHA 114°34.72	Mer.pass 14:11
5 6	110°3.95 125°6.42	221°48.11	28.51 \$23°29.07	351°7.99 6°9.37	0.68 N22°0.56	29°57.48 45°0.09	24.41 N22°24.40	124°51.17 139°53.72	38.77 \$08°38.79	Venus Mars	242°2.33	05:40
7	140°8.88	251°46.58	29.62	21°10.76	0.44	60°2.71	24.39	154°56.27	38.82	Jupiter		03:09
8	155° 11.35	266°45.81	30.17	36°12.14	0.32	75° 5.32	24.38	169°58.81	38.85	Saturn	14°42.63	20:46
9	170°13.81	281°45.04	• • 30.73	51°13.52	• • 0.21	90°7.94	• • 24.37	185°1.36	• • 38.88	Oct 25 Fri	SHA	
10	$185^{\circ}16.27$	296°44.28	31.28	$66^{\circ}14.91$	0.09	105°10.56	24.36	200°3.91	38.91	Venus	113° 17.62	Mer.pass 14:12
11	200° 18.74	311°43.51	31.83	81°16.30	21°59.97	120°13.17	24.35	215°6.45	38.93	Mars	241°35.69	05:38
12 13	215°21.20 230°23.67	326° 42.74 341° 41.97	\$23°32.37 32.92	96°17.68 111°19.07	N21°59.85 59.73	135°15.79 150°18.41	N22°24.34 24.34	230°9.00 245°11.54	\$08°38.96 38.99	Jupiter	279°49.29	03:05
13 14	230 23.67 245°26.13	341 41.97 356°41.21	32.92 33.47	111 19.07 126°20.46	59.73 59.62	165°21.03	24.34	245 11.54 260°14.09	38.99	Saturn	14°44.76	20:42
15	260°28.59	11°40.44	• • 34.01	141°21.85	• • 59.50	180°23.65	24.32	275°16.63	• • 39.04	Oct 26 Sat	SHA	Mer.pass
16	275° 31.06	26°39.67	34.56	156°23.24	59.38	195°26.27	24.31	290°19.18	39.07	Venus	112°0.29	14:13
17	290°33.52	41°38.90	35.10	171°24.63	59.26	210°28.89	24.30	305°21.73	39.10	Mars	241°9.45	05:35
18	305°35.99		\$23°35.64	186°26.02	N21°59.15	225°31.51	N22°24.29	320°24.27	S08°39.13	Jupiter	$279^{\circ}52.77$	03:01
19	320° 38.45	71°37.36	36.18	201°27.42	59.03	240°34.13	24.28	335°26.82	39.15	Saturn	14°46.81	20:38
20 21	335°40.91 350°43.38	86°36.59 101°35.82	36.72 •• 37.26	216°28.81 231°30.20	58.91 •• 58.79	255°36.75 270°39.37	24.27 •• 24.26	350°29.36 5°31.90	39.18 •• 39.21	Horizo	ntal parallax	
22	5° 45.84	101 35.82 116°35.05	37.20	231 30.20 246°31.60	58.67	270 39.37 285°41.99	24.25	5 31.90 20°34.45	39.21		Venus:	0.1
23	20°48.31	131°34.28	38.33	261°32.99	58.56	300°44.61	24.24	35°36.99	39.26		Mars:	0.1
	pass. 21:37		.6′ m-3.99	$\nu 1.4' \ d-0$.0′ m-2.65		.0′ m0.77	<u> </u>		·
ivier.	pass. 21:31	ν-0.0 α0	.0 111-3.99	ν1.4 α-0	.1110.15	ν2.0 α-0	.0 111-2.05	ν2.5 d0	.0 1110.77			

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.38	S11°50.72	$272^{\circ}39.15$	9.1'	$N25^{\circ}33.05$	-7.5'	56.3'
1	198°57.46	51.58	287°7.28	9.2'	25°25.56	-7.6'	56.2'
2	213°57.54 228°57.62	52.45 •• 53.32	301°35.52 316°3.88	9.4' 9.5'	25°17.95 25°10.22	-7.7' -7.9'	56.2' 56.2'
4	243°57.70	54.18	330°32.35	9.6'	25°2.37	-8.0'	56.1'
5	258°57.78	55.05	345°0.93	9.7'	24°54.40	-8.1'	56.1'
6	273°57.85	S11°55.91	359°29.62	9.8'	N24°46.31	-8.2'	56.1'
7 8	288°57.93 303°58.01	56.78 57.64	13°58.43 28°27.35	9.9' 10.0'	24°38.10 24°29.78	-8.3' -8.4'	56.0' 56.0'
9	318°58.08	58.51	42°56.39	10.1	24°21.35	-8.5	56.0'
10	333°58.16	11°59.37	57°25.54	10.3'	24°12.80	-8.7'	55.9'
11	348°58.23	12°0.23	71°54.80	10.4	24°4.15	-8.8'	55.9'
12 13	3°58.31 18°58.38	\$12°1.10 1.96	86°24.17 100°53.65	10.5' 10.6'	N23°55.38 23°46.51	-8.9' -9.0'	55.9' 55.8'
14	33°58.46	2.82	115°23.25	10.7'	23°37.53	-9.1'	55.8'
15	48°58.53	• • 3.69	129°52.96	10.8'	23°28.44	-9.2'	55.8'
16	63°58.61	4.55	144°22.78 158°52.71	10.9'	23°19.25	-9.3'	55.8'
17 18	78°58.68 93°58.76	5.41 \$12°6.27	158°52.71 173°22.75	11.0' 11.1'	23°9.96 N23°0.57	-9.4' -9.5'	55.7' 55.7'
19	108°58.83	7.13	187°52.90	11.3'	22°51.08	-9.6'	55.7'
20	123°58.90	7.99	202°23.16	11.4'	22°41.49	-9.7'	55.6'
21	138°58.97	• • 8.85	216°53.52	11.5'	22°31.80	-9.8'	55.6'
22 23	153°59.05 168°59.12	9.71 10.57	231°24.00 245°54.58	11.6' 11.7'	22°22.02 22°12.15	-9.9' -10.0'	55.6' 55.5'
23	SD = 16.1'	$\frac{10.37}{d = 0.9'}$				10.0	33.3
	אכ = 10.1'	$a = 0.9^{\circ}$		51	D = 15.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.19	S12°11.43	260°25.28	11.8'	N22°2.18	-10.1'	55.5'
1 2	198°59.26 213°59.33	12.29 13.15	274°56.07 289°26.98	11.9' 12.0'	21°52.11 21°41.96	-10.2' -10.2'	55.5' 55.5'
3	213 59.33 228°59.40	. 14.01	303°57.99	12.1'	21°41.90 21°31.72	-10.2	55.4'
4	243°59.47	14.87	318°29.10	12.2'	21°21.39	-10.4'	55.4'
5	258°59.54	15.72	333°0.32	12.3'	21°10.98	-10.5'	55.4'
6 7	273°59.61 288°59.68	\$12°16.58 17.44	347°31.64 2°3.06	12.4' 12.5'	N21°0.48 20°49.89	-10.6' -10.7'	55.4' 55.3'
8	303°59.75	18.30	2 3.00 16°34.59	12.6'	20° 49.69 20° 39.22	-10.7 -10.7'	55.3'
9	318°59.82	• • 19.15	31°6.21	12.7'	20°28.47	-10.8'	55.3'
10	333°59.89	20.01	45°37.94	12.8'	20°17.64	-10.9'	55.2'
11 12	348°59.95 4°0.02	20.87 \$12°21.72	60°9.76 74°41.69	12.9' 13.0'	20°6.73 N19°55.75	-11.0' -11.1'	55.2' 55.2'
13	19° 0.09	22.58	89°13.71	13.1'	19° 44.68	-11.1 -11.1'	55.2'
14	34° 0.16	23.43	103°45.83	13.2'	19°33.54	-11.2'	55.1'
15	49°0.22	• • 24.29	118°18.04	13.3'	19°22.33	-11.3'	55.1'
16 17	64° 0.29 79° 0.36	25.14 25.99	132°50.35 147°22.75	13.4' 13.5'	19°11.04 18°59.68	-11.4' -11.4'	55.1' 55.1'
18	94° 0.42	\$12°26.85	161°55.25	13.6'	N18°48.25	-11.5'	55.0'
19	109°0.49	27.70	176°27.84	13.7'	18°36.74	-11.6'	55.0'
20	124° 0.55	28.55	191°0.52		18°25.17		55.0'
21 22	139° 0.62 154° 0.68	· · 29.41 30.26	205°33.29 220°6.15	13.9' 13.9'	18°13.54 18°1.83	-11.7' -11.8'	55.0' 55.0'
23	169° 0.75	31.11	234°39.10	14.0'	17°50.06	-11.8'	54.9'
	SD = 16.1'	d = 0.9'			D = 15.1'		
		<u> </u>					
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184° 0.81 199° 0.87	\$12°31.96 32.81	249°12.14 263°45.26	14.1' 14.2'	N17°38.22 17°26.32	-11.9' -12.0'	54.9' 54.9'
2	214° 0.94	32.81	203 45.20 278°18.47	14.2 14.3'	17 20.32 17°14.36	-12.0'	54.9' 54.9'
3	229°1.00	• • 34.52	292°51.76	14.4'	17°2.34	-12.1'	54.8'
4	244°1.06	35.37	307°25.14	14.5'	16°50.26	-12.1'	54.8'
5 6	259° 1.12 274° 1.18	36.22 \$12°37.07	321°58.60 336°32.14	14.5' 14.6'	16°38.11 N16°25.91	-12.2' -12.3'	54.8' 54.8'
7	289° 1.25	37.92	351°5.76	14.7	16°13.65	-12.3'	54.8'
8	304° 1.31	38.76	5°39.46	14.8'	$16^{\circ}1.34$	-12.4'	54.7'
9	319°1.37	• • 39.61	20°13.24	14.9'	15°48.97	-12.4'	54.7'
10 11	334° 1.43 349° 1.49	40.46 41.31	34°47.10 49°21.03	14.9' 15.0'	15°36.54 15°24.07	-12.5' -12.5'	54.7' 54.7'
12	4°1.55	\$12°42.16	63°55.04	15.1'	N15°11.54	-12.6'	54.7
13	19° 1.61	43.00	78°29.12	15.2'	14°58.95	-12.6'	54.6'
14	34° 1.67	43.85	93°3.28	15.2'	14°46.32	-12.7'	54.6'
15 16	49° 1.73 64° 1.78	•• 44.70 45.54	107°37.50 122°11.80	15.3' 15.4'	14°33.64 14°20.91	-12.7' -12.8'	54.6' 54.6'
17	79° 1.84	46.39	136°46.17	15.4' 15.4'	14 20.91 14°8.13	-12.8'	54.6'
18	94° 1.90	S12°47.24	151°20.61	15.5'	N13°55.31	-12.9'	54.6'
19	109°1.96	48.08	165°55.11	15.6'	13°42.44	-12.9'	54.5'
20 21	124°2.02 139°2.07	48.93 •• 49.77	180°29.68 195°4.32	15.6' 15.7'	13°29.52 13°16.56	-13.0' -13.0'	54.5' 54.5'
22	154° 2.13	50.61	209°39.02	15.8'	13° 3.56	-13.0'	54.5
23	169°2.19	51.46	224°13.79	15.8'	12°50.51	-13.1'	54.5'
	SD = 16.1'	d = 0.9'	-	SI	D = 15.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:40	07:00	08:18	15:08	16:26	17:46
N 70°	05:38	06:50	07:59	15:27	16:36	17:48
68°	05:37	06:43	07:44	15:43	16:44	17:49
66°	05:36	06:36	07:32	15:55	16:50	17:50
64°	05:35	06:31	07:22	16:05	16:56	17:52
62°	05:34	06:26	07:13	16:14	17:01	17:53
60°	05:33	06:22	07:05	16:22	17:05	17:54
N 58°	05:32	06:18	06:59	16:28	17:09	17:55
56°	05:31	06:14	06:53	16:34	17:13	17:56
54°	05:30	06:11	06:48	16:39	17:16	17:57
52°	05:29	06:08	06:43	16:44	17:19	17:58
50°	05:28	06:05	06:39	16:49	17:22	18:00
45°	05:25	05:59	06:29	16:58	17:28	18:02
N 40°	05:22	05:54	06:22	17:06	17:34	18:05
35°	05:19	05:49	06:15	17:13	17:39	18:08
30°	05:16	05:45	06:09	17:19	17:43	18:11
20°	05:10	05:36	05:59	17:29	17:52	18:18
N 10°	05:03	05:28	05:49	17:39	18:00	18:25
0°	04:55	05:19	05:41	17:47	18:09	18:33
S 10°	04:45	05:10	05:32	17:56	18:18	18:43
20°	04:33	05:00	05:22	18:06	18:29	18:55
30°	04:17	04:46	05:11	18:17	18:42	19:12
35°	04:07	04:38	05:05	18:24	18:50	19:22
40°	03:55	04:29	04:57	18:31	19:00	19:34
45°	03:39	04:18	04:49	18:40	19:11	19:50
S 50°	03:20	04:03	04:39	18:51	19:26	20:10
52°	03:10	03:57	04:34	18:55	19:33	20:20
54°	02:59	03:49	04:28	19:01	19:40	20:31
56°	02:46	03:41	04:22	19:07	19:49	20:45
58°	02:30	03:31	04:16	19:14	19:59	21:01
S 60°	02:11	03:20	04:08	19:21	20:11	21:20

Lat.		Moonris	e		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°			23:07			17:14
N 70°		21:02	23:32		17:47	16:47
68°		21:45	23:51		17:02	16:27
66°	19:53	22:14		17:15	16:32	16:10
64°	20:40	22:36		16:28	16:09	15:57
62°	21:10	22:53		15:57	15:51	15:45
60°	21:32	23:07		15:34	15:36	15:36
N 58°	21:50	23:19		15:15	15:23	15:27
56°	22:05	23:30		15:00	15:12	15:19
54°	22:18	23:39		14:46	15:02	15:13
52°	22:30	23:47		14:34	14:53	15:07
50°	22:40	23:55		14:24	14:45	15:01
45°	23:01		00:10	14:01	14:28	14:49
N 40°	23:18		00:23	13:44	14:14	14:39
35°	23:32		00:34	13:28	14:02	14:30
30°	23:44		00:43	13:15	13:52	14:23
20°		00:05	00:59	12:53	13:34	14:10
N 10°		00:23	01:13	12:33	13:18	13:58
0°		00:40	01:26	12:14	13:03	13:47
S 10°	00:10	00:57	01:39	11:56	12:48	13:36
20°	00:31	01:15	01:53	11:36	12:32	13:24
30°	00:56	01:35	02:09	11:12	12:13	13:10
35°	01:10	01:47	02:18	10:59	12:02	13:02
40°	01:27	02:01	02:28	10:43	11:49	12:53
45°	01:47	02:17	02:40	10:24	11:34	12:43
S 50°	02:12	02:37	02:55	10:00	11:16	12:30
52°	02:24	02:46	03:02	09:48	11:07	12:23
54°	02:38	02:57	03:09	09:35	10:57	12:17
56°	02:54	03:08	03:18	09:20	10:46	12:09
58°	03:12	03:22	03:27	09:01	10:33	12:01
S 60°	03:36	03:38	03:38	08:39	10:18	11:51

October 27, 28, 29 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$35^{\circ}50.77$	146°33.51 S 23°38.87	276°34.39 N21°58.44	315°47.23 N22°24.23	50°39.54 \$08°39.29	Alpheratz 357°34.68 29°13.82
1	50°53.23	161°32.73 39.40	291°35.78 58.32	330°49.85 24.22	65°42.08 39.31	Ankaa 353°6.93 -42°10.30
2	65°55.70 80°58.16	176°31.96 39.94 191°31.19 • 40.47	306°37.18 58.21 321°38.58 · · 58.09	345°52.48 24.21 0°55.10 · · 24.20	80°44.62 39.34 95°47.17 · · 39.37	Schedar 349° 30.77 56° 40.58
3 4	96°0.63	206°30.41 41.00	336°39.98 57.97	15°57.72 24.19	110°49.71 39.39	Diphda 348°47.17 -17°50.97
5	111°3.09	221°29.64 41.53	351°41.38 57.85	31°0.35 24.18	125°52.25 39.42	Achernar 335°19.70 -57°6.64 Hamal 327°51.07 23°34.90
6	126°5.55	236°28.87 S 23°42.06	6°42.78 N21°57.74	46°2.97 N22°24.17	140°54.80 \$08°39.45	Hamal 327°51.07 23°34.90 Polaris 313°39.22 89°22.07
7	141°8.02	251°28.09 42.58	21°44.18 57.62	61°5.59 24.16	155°57.34 39.47	Acamar 315°11.48 -40°12.17
8 9	156° 10.48 171° 12.95	266°27.32 43.11 281°26.54 · · 43.63	36°45.58 57.50 51°46.98 •• 57.39	76°8.22 24.15 91°10.84 •• 24.14	170°59.88 39.50 186°2.43 · · 39.53	Menkar 314°6.03 4°11.35
10	186° 15.41	296°25.77 44.16	66°48.39 57.27	106°13.47 24.13	201°4.97 39.55	Mirfak 308°28.05 49°56.97
11	201°17.88	311°24.99 44.68	81°49.79 57.15	121°16.10 24.12	216°7.51 39.58	Aldebaran 290°39.55 16°33.63 Rigel 281°3.80 -8°10.20
12	216°20.34	326°24.21 S 23°45.20	96°51.19 N21°57.03	136°18.72 N22°24.11	231°10.05 \$08°39.61	Rigel 281°3.80 -8°10.20 Capella 280°21.83 46°1.30
13	231°22.80 246°25.27	341°23.44 45.72 356°22.66 46.24	111°52.60 56.92 126°54.00 56.80	151°21.35 24.10 166°23.98 24.09	246°12.60 39.63	Bellatrix 278°22.85 6°22.45
14 15	240 25.27 261°27.73	356°22.66 46.24 11°21.88 • 46.76	126°54.00 56.80 141°55.41 • 56.68	166°23.98 24.09 181°26.60 •• 24.08	261°15.14 39.66 276°17.68 · · 39.68	Elnath 278°1.84 28°37.70
16	276°30.20	26°21.11 47.28	156°56.82 56.57	196°29.23 24.07	291°20.22 39.71	Alnilam 275°37.70 -1°11.01
17	291°32.66	41°20.33 47.79	171°58.23 56.45	211°31.86 24.06	306°22.76 39.74	Betelgeuse 270°52.09 7°24.81 Canopus 263°52.20 -52°42.16
18	306°35.12	56°19.55 \$23°48.31	186°59.64 N21°56.34	226°34.49 N22°24.05	321°25.30 \$08°39.76	Sirius 258°26.25 -16°44.77
19 20	321°37.59 336°40.05	71°18.77 48.82 86°17.99 49.33	202°1.04 56.22 217°2.46 56.10	241°37.12 24.04 256°39.74 24.03	336°27.85 39.79 351°30.39 39.81	Adhara 255°5.88 -29°0.04
21	351° 42.52	101°17.21 · · 49.84	232°3.87 · · 55.99	271°42.37 · · 24.02	6°32.93 · · 39.84	Procyon 244°50.96 5°9.80
22	6°44.98	116°16.43 50.35	247° 5.28 55.87	286°45.00 24.01	21°35.47 39.86	Pollux 243°17.47 27°57.95 Avior 234°14.83 -59°34.92
23	21° 47.44	131°15.65 50.86	262° 6.69 55.75	301°47.63 24.00	36°38.01 39.89	Avior 234°14.83 -59°34.92 Suhail 222°46.55 -43°31.60
Mer.	pass. 21:33	ν-0.8' d0.5' m-4.00	ν1.4' d-0.1' m0.14	ν2.6' d-0.0' m-2.66	$\nu 2.5' \ d0.0' \ m0.77$	Miaplacidus 221°38.56 -69°48.73
						Alphard 217°48.03 -8°45.77
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.78 11°50.83
0	36° 49.91	146°14.87	277°8.10 N21°55.64	316°50.26 N22°23.99	51°40.55 S08°39.91	Dubhe 193°41.62 61°36.88 Denebola 182°25.39 14°26.07
1	51°52.37	161°14.09 51.88	292°9.52 55.52	331°52.90 23.98	66°43.09 39.94	Denebola 182°25.39 14°26.07 Gienah 175°44.08 -17°40.61
2	66°54.84	176°13.31 52.38	307°10.93 55.41	346°55.53 23.97	81°45.63 39.96	Acrux 173°1.00 -63°13.98
3 4	81°57.30 96°59.76	191°12.53 · · 52.89 206°11.74 53.39	322°12.35 · · 55.29 337°13.76 55.17	1°58.16 · · 23.96 17°0.79 23.95	96°48.17 · · 39.99 111°50.71 40.01	Gacrux 171°52.43 -57°14.92
5	112°2.23	200 11.74 53.39 221°10.96 53.89	352°15.18 55.06	32° 3.42 23.94	126°53.25 40.04	Alioth 166°13.62 55°49.46
6	127°4.69	236°10.18 S 23°54.39	7°16.60 N21°54.94	47°6.06 N22°23.93	141°55.79 \$08°40.06	Spica 158°22.83 -11°17.32 Alkaid 152°52.61 49°11.37
7	$142^{\circ}7.16$	251°9.40 54.89	22°18.02 54.83	62°8.69 23.92	156°58.33 40.09	Hadar 148°36.98 -60°29.46
8	157°9.62	266°8.61 55.39	37°19.44 54.71	77°11.32 23.91	172°0.87 40.11	Menkent 147°58.26 -36°29.41
9 10	172° 12.08 187° 14.55	281°7.83 · · 55.89 296°7.05 56.39	52°20.85 · · 54.60 67°22.28 54.48	92°13.95 · · 23.90 107°16.59 23.89	187°3.41 · · 40.14 202°5.94 40.16	Arcturus 145°48.42 19°3.27
11	202° 17.01	311°6.26 56.88	82°23.70 54.37	122°19.22 23.88	217°8.48 40.19	Rigil Kent. 139°41.28 -60°56.22
12	217° 19.48	326°5.48 \$23°57.37	97°25.12 N21°54.25	137°21.86 N22°23.87	232°11.02 S 08°40.21	Kochab 137°20.90 74°3.20 Zuben'ubi 136°56.57 -16°8.60
13	232°21.94	341°4.69 57.87	112°26.54 54.14	152°24.49 23.86	247°13.56 40.24	Alphecca 126°4.24 26°37.97
14	247°24.40	356°3.91 58.36	127°27.96 54.02	167°27.13 23.85 182°29.76 · · · 23.84	262°16.10 40.26	Antares 112°16.39 -26°29.21
15 16	262°26.87 277°29.33	11°3.12 · · 58.85 26°2.33 59.34	142°29.39 · · 53.90 157°30.81 53.79	182°29.76 · · 23.84 197°32.40 23.83	277°18.64 · · 40.28 292°21.17 40.31	Atria 107°11.23 -69°4.45
17	292°31.80	41°1.55 23°59.83	172°32.24 53.67	212°35.04 23.82	307°23.71 40.33	Sabik 102°3.26 -15°45.31 Shaula 96°10.91 -37°7.37
18	307°34.26	56°0.76 S 24°0.31	187°33.67 N21°53.56	227°37.67 N22°23.81	322°26.25 S 08°40.36	Shaula 96°10.91 -37°7.37 Rasalhague 95°58.95 12°32.63
19	322°36.72	70°59.97 0.80	202°35.09 53.45	242°40.31 23.80	337°28.79 40.38	Eltanin 90°42.59 51°29.32
20 21	337°39.19 352°41.65	85°59.18 1.28 100°58.40 · · 1.77	217°36.52 53.33 232°37.95 · 53.22	257°42.95 23.79 272°45.59 · · 23.78	352°31.32 40.41 7°33.86 • 40.43	Kaus Aust. 83°32.97 -34°22.45
22	7°44.12	115°57.61 2.25	247°39.38 53.10	287°48.22 23.77	22°36.40 40.45	Vega 80°33.55 38°48.59
23	22°46.58	130°56.82 2.73	262°40.81 52.99	302°50.86 23.75	37°38.94 40.48	Nunki 75°48.14 -26°16.01 Altair 62°0.20 8°56.14
Mer	pass. 21:29	ν-0.8' d0.5' m-4.00	ν1.4' d-0.1' m0.12	ν2.6' d-0.0' m-2.66	$\nu 2.5' \ d0.0' \ m0.78$	Peacock 53°6.01 -56°39.54
						Deneb 49°25.93 45°22.38
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.88 9°59.45
0	37° 49.05	145°56.03 S24°3.21	277° 42.24 N21° 52.87	317°53.50 N22°23.74	52°41.47 \$08°40.50	Al Na'ir 27°32.93 -46°50.61 Fomalhaut 15°14.49 -29°29.50
1	$52^{\circ}51.51$	160°55.24 3.69	292°43.67 52.76	332°56.14 23.73	67°44.01 40.52	Scheat 13°45.17 28°13.24
2	67°53.97	175°54.45 4.17	307°45.10 52.64	347°58.78 23.72	82°46.54 40.55	Markab 13°29.88 15°20.48
3 4	82° 56.44 97° 58.90	190°53.66 · · 4.65 205°52.87 5.12	322°46.54 · · 52.53 337°47.97 52.41	3°1.42 · · · 23.71 18°4.06	97°49.08 · · 40.57 112°51.62	Oct 27 Sun SHA Mer.pass
5	113°1.37	220° 52.08 5.60	352°49.40 52.30	33° 6.70 23.69	127°54.15 40.62	Venus 110° 42.73 14:15
6	128°3.83	235°51.29 S 24°6.07	7°50.84 N21°52.19	48°9.34 N22°23.68	142°56.69 S 08°40.64	Mars 240°43.62 05:33
7	143°6.29	250°50.50 6.54	22°52.28 52.07	63°11.98 23.67	157°59.22 40.66	Jupiter 279° 56.46 02:56
8 9	158°8.76 173°11.22	265°49.71 7.01 280°48.92 · · 7.48	37°53.71 51.96 52°55.15 · 51.85	78°14.63 23.66 93°17.27 · · 23.65	173°1.76 40.69 188°4.30 • 40.71	Saturn 14°48.77 20:34
10	173 11.22 188° 13.69	280 48.92 · · 7.48 295°48.12 7.95	52°55.15 · · 51.85 67°56.59 51.73	93°17.27 · · · 23.65 108°19.91	188°4.30 · · 40.71 203°6.83 40.73	Oct 28 Mon SHA Mer.pass
11	203° 16.15	310°47.33 8.42	82°58.03 51.62	123°22.55 23.63	218°9.37 40.76	Venus 109°24.96 14:16
12	218° 18.61	325°46.54 S 24°8.88	97°59.47 N21°51.50	138°25.20 N22°23.61	233°11.90 S 08°40.78	Mars 240°18.20 05:31 Jupiter 280°0.36 02:52
13	233°21.08	340°45.74 9.35	113° 0.91 51.39	153°27.84 23.60	248°14.44 40.80	Saturn 14°50.64 20:30
14 15	248°23.54 263°26.01	355°44.95 9.81 10°44.16 •• 10.28	128° 2.35 51.28 143° 3.79 · · 51.16	168°30.48 23.59 183°33.13 · · 23.58	263°16.97 40.82 278°19.50 • 40.85	
16	203 20.01 278°28.47	25°43.36 10.74	158° 5.23 51.05	198°35.77 23.57	293°22.04 40.87	Oct 29 Tue SHA Mer.pass Venus 108°6.99 14:17
17	293°30.93	40°42.57 11.20	173°6.68 50.94	213°38.42 23.56	308°24.57 40.89	Mars 239°53.19 05:29
18	308°33.40	55°41.77 S24°11.66	188° 8.12 N21° 50.82	228°41.06 N22°23.55	323°27.11 \$08°40.91	Jupiter 280°4.46 02:48
19	323°35.86	70°40.98 12.11	203° 9.57 50.71	243°43.71 23.54	338°29.64 40.94	Saturn 14°52.43 20:26
20 21	338° 38.33 353° 40.79	85°40.18 12.57 100°39.39 · · 13.03	218°11.01 50.60 233°12.46 • 50.49	258°46.35 23.53 273°49.00 •• 23.52	353°32.17 40.96 8°34.71 • 40.98	Horizontal parallax
22	8° 43.25	115°38.59 13.48	248°13.91 50.37	288°51.65 23.50	23°37.24 41.00	Venus: 0.1
23	23°45.72	130°37.80 13.93	263°15.35 50.26	303°54.29 23.49	38°39.77 41.03	Mars: 0.1
Mer.	pass. 21:25	ν-0.8' d0.5' m-4.01	ν1.4' d-0.1' m0.11	ν2.6' d-0.0' m-2.67	ν2.5' d0.0' m0.78	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°2.24	S12°52.30	238° 48.61	15.9'	N12° 37.43	-13.1'	54.5'
1	199°2.30 214°2.35	53.14	253°23.50 267°58.45	15.9'	12°24.30 12°11.13	-13.2' -13.2'	54.4' 54.4'
2	214 2.35 229°2.41	53.99 •• 54.83	207 30.45 282°33.45	16.0' 16.1'	12 11.13 11°57.93	-13.2'	54.4'
4	244°2.46	55.67	297°8.52	16.1'	11°44.68	-13.3	54.4'
5	259°2.52	56.51	311°43.64	16.2'	11°31.40	-13.3'	54.4'
6 7	274°2.57 289°2.62	\$12°57.36 58.20	326° 18.81 340° 54.04	16.2' 16.3'	N11°18.08 11°4.73	-13.4' -13.4'	54.4' 54.3'
8	289 2.62 304°2.68	58.20 59.04	355° 29.33	16.3	11 4.73 10°51.34	-13.4' -13.4'	54.3'
9	319°2.73	12°59.88	10°4.66	16.4	10°37.92	-13.5'	54.3'
10	334°2.78	13°0.72	24° 40.05	16.4'	10°24.47	-13.5'	54.3'
11 12	349°2.83 4°2.89	1.56 \$13°2.40	39° 15.49 53° 50.97	16.5' 16.5'	10° 10.98 N09° 57.46	-13.5' -13.5'	54.3' 54.3'
13	4 2.09 19°2.94	3.24	68° 26.50	16.6	09° 43.91	-13.5' -13.6'	54.3'
14	34°2.99	4.07	83°2.08	16.6'	09°30.34	-13.6'	54.3'
15	49°3.04	• • 4.91	97° 37.71	16.7'	09°16.73	-13.6'	54.2'
16 17	64°3.09 79°3.14	5.75 6.59	112°13.38 126°49.09	16.7' 16.8'	09°3.09 08°49.43	-13.7' -13.7'	54.2' 54.2'
18	94°3.19	513°7.43	141° 24.84	16.8'	N08° 35.74	-13.7'	54.2'
19	109°3.24	8.26	156°0.64	16.8'	08°22.02	-13.7'	54.2'
20	124°3.29	9.10	170° 36.47	16.9'	08°8.28	-13.8'	54.2'
21	139°3.34 154°3.39	• • 9.94	185° 12.35 199° 48.26	16.9'	07°54.52 07°40.73	-13.8'	54.2'
22 23	169°3.43	10.77 11.61	214° 24.20	16.9' 17.0'	07 40.73 07°26.91	-13.8' -13.8'	54.2' 54.2'
_5	SD = 16.1'	d = 0.8'			D = 14.9'	_0.0	
	3D = 10.1	u = 0.0°		31	J — 14.9°		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°3.48	S13°12.44	229°0.19	17.0'	N07°13.08	-13.9'	54.1'
1 2	199°3.53 214°3.58	13.28 14.11	243°36.20 258°12.25	17.1' 17.1'	06° 59.22 06° 45.35	-13.9' -13.9'	54.1' 54.1'
3	214 3.56 229°3.62	• 14.11	272° 48.34	17.1'	06°31.45	-13.9'	54.1'
4	244°3.67	15.78	287° 24.45	17.1'	$06^{\circ}17.53$	-13.9'	54.1'
5	259°3.72	16.61	302°0.59	17.2'	06°3.60	-14.0'	54.1'
6 7	274°3.76 289°3.81	\$13°17.44 18.28	316°36.76 331°12.96	17.2' 17.2'	N05°49.65 05°35.68	-14.0' -14.0'	54.1' 54.1'
8	304°3.85	19.11	345°49.19	17.2	05°21.69	-14.0' -14.0'	54.1'
9	319°3.90	• • 19.94	0°25.44	17.3'	05°7.69	-14.0'	54.1'
10	334°3.94	20.77	15°1.71	17.3'	04°53.67	-14.0'	54.1'
11 12	349°3.99 4°4.03	21.60 S 13°22.43	29°38.01 44°14.33	17.3' 17.3'	04°39.64 N04°25.60	-14.0' -14.1'	54.1' 54.0'
13	4 4.03 19°4.07	23.27	58° 50.67	17.3 17.4'	04° 11.54	-14.1 -14.1'	54.0'
14	34°4.12	24.10	73°27.03	17.4	03°57.48	-14.1'	54.0'
15	49°4.16	• • 24.93	88°3.41	17.4	03°43.40	-14.1'	54.0'
16 17	64°4.20 79°4.25	25.75 26.58	102°39.81 117°16.23	17.4' 17.4'	03°29.31 03°15.21	-14.1' -14.1'	54.0' 54.0'
18	94°4.29	S13°27.41	131° 52.65	17.4	N03°1.10	-14.1	54.0'
19	109°4.33	28.24	146°29.10	17.5'	02°46.98	-14.1'	54.0'
20	124°4.37	29.07	161°5.56	17.5'	02°32.85		54.0'
21 22	139°4.41 154°4.45	· · 29.90 30.72	175° 42.03 190° 18.51	17.5' 17.5'	02°18.72 02°4.58	-14.1' -14.1'	54.0' 54.0'
23	169°4.49	31.55	204° 55.00	17.5'	02 4.56 01°50.44	-14.1'	54.0'
	SD = 16.1'	d = 0.8'			D = 14.8'		
	<u> </u>	<u>u = 0.0</u>		اد	D = 14.0		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°4.53	\$13°32.38	219°31.50	17.5'	N01°36.29 01°22.14	-14.2'	54.0'
1 2	199°4.57 214°4.61	33.20 34.03	234°8.01 248°44.52	17.5' 17.5'	01°22.14 01°7.98	-14.2' -14.2'	54.0' 54.0'
3	229°4.65	• • 34.85	263°21.04	17.5	00°53.82	-14.2'	54.0'
4	244°4.69	35.68	277°57.57	17.5'	00°39.66	-14.2'	54.0'
5	259°4.73 274°4.76	36.50 \$13°37.33	292°34.09 307°10.63	17.5' 17.5'	00°25.50 N00°11.33	-14.2' -14.2'	54.0' 53.9'
6 7	274°4.76 289°4.80	38.15	307° 10.63 321° 47.16	17.5' 17.5'	S00°2.83	-14.2' 14.2'	53.9'
8	304°4.84	38.97	336° 23.69	17.5	$00^{\circ}17.00$	14.2'	53.9'
9	319°4.87	• • 39.80	351°0.22	17.5'	00°31.16	14.2'	53.9'
10	334°4.91 349°4.95	40.62	5°36.75	17.5'	00°45.32 00°59.47	14.2'	53.9'
11 12	349°4.95 4°4.98	41.44 \$13°42.26	20° 13.28 34° 49.81	17.5' 17.5'	501° 13.63	14.2' 14.1'	53.9' 53.9'
13	19°5.02	43.08	49° 26.33	17.5	01°27.78	14.1'	53.9'
14	34°5.05	43.91	64°2.84	17.5'	$01^{\circ}41.92$	14.1'	53.9'
15	49°5.09	• • 44.73	78°39.35	17.5'	01°56.06	14.1'	53.9'
16 17	64°5.12 79°5.16	45.55 46.37	93° 15.85 107° 52.33	17.5' 17.5'	02°10.19 02°24.31	14.1' 14.1'	53.9' 53.9'
18	94°5.19	\$13°47.19	107 32.33 122°28.81	17.5'	S02°38.43	14.1	53.9'
19	109°5.22	48.01	137°5.28	17.5'	02°52.54	14.1'	53.9'
20	124°5.26	48.83	151°41.74	17.4	03°6.64	14.1'	53.9'
21 22	139°5.29 154°5.32	• • 49.64 50.46	166° 18.18 180° 54.61	17.4' 17.4'	03°20.73 03°34.81	14.1' 14.1'	53.9' 53.9'
23	169°5.35	51.28	195°31.02	17.4	03°48.87	14.1	53.9
	SD = 16.1'	d = 0.8'		SI	D = 14.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	05:52	07:13	08:35	14:51	16:13	17:34
N 70°	05:49	07:02	08:13	15:13	16:24	17:36
68°	05:47	06:53	07:56	15:30	16:33	17:39
66°	05:45	06:46	07:42	15:44	16:40	17:41
64°	05:43	06:39	07:31	15:55	16:47	17:43
62°	05:41	06:34	07:21	16:05	16:53	17:45
60°	05:40	06:29	07:13	16:13	16:58	17:47
N 58°	05:38	06:24	07:06	16:21	17:02	17:48
56°	05:36	06:20	06:59	16:27	17:06	17:50
54°	05:35	06:17	06:54	16:33	17:10	17:52
52°	05:33	06:13	06:48	16:38	17:13	17:53
50°	05:32	06:10	06:44	16:43	17:17	17:55
45°	05:29	06:03	06:33	16:53	17:24	17:58
N 40°	05:25	05:57	06:25	17:02	17:30	18:02
35°	05:22	05:52	06:18	17:09	17:35	18:05
30°	05:18	05:47	06:11	17:16	17:40	18:09
20°	05:11	05:37	06:00	17:27	17:50	18:16
N 10°	05:03	05:28	05:50	17:38	17:59	18:24
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:44	05:09	05:31	17:57	18:19	18:44
20°	04:31	04:58	05:20	18:07	18:30	18:57
30°	04:14	04:43	05:08	18:19	18:45	19:14
35°	04:03	04:35	05:01	18:27	18:53	19:25
40°	03:50	04:25	04:54	18:35	19:04	19:38
45°	03:34	04:13	04:44	18:44	19:16	19:55
S 50°	03:13	03:57	04:33	18:56	19:31	20:17
52°	03:02	03:50	04:28	19:01	19:39	20:27
54°	02:50	03:42	04:22	19:07	19:47	20:39
56°	02:36	03:33	04:15	19:14	19:57	20:54
58°	02:19	03:22	04:08	19:21	20:07	21:12
S 60°	01:58	03:10	04:00	19:29	20:20	21:34

Lat.		Moonris	e		Moonset	;
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°		01:20	03:18	16:26	15:52	15:20
N 70°		01:30	03:19	16:13	15:47	15:23
68°		01:39	03:20	16:03	15:43	15:25
66°	00:05	01:45	03:21	15:54	15:40	15:27
64°	00:17	01:51	03:21	15:47	15:37	15:29
62°	00:28	01:56	03:22	15:40	15:35	15:30
60°	00:36	02:01	03:22	15:34	15:33	15:31
N 58°	00:44	02:04	03:23	15:29	15:31	15:32
56°	00:51	02:08	03:23	15:25	15:29	15:33
54°	00:56	02:11	03:23	15:21	15:28	15:34
52°	01:02	02:14	03:24	15:17	15:26	15:35
50°	01:07	02:16	03:24	15:14	15:25	15:36
45°	01:17	02:21	03:25	15:07	15:22	15:38
N 40°	01:25	02:26	03:25	15:01	15:20	15:39
35°	01:33	02:30	03:25	14:55	15:18	15:40
30°	01:39	02:33	03:26	14:51	15:16	15:41
20°	01:50	02:39	03:27	14:42	15:13	15:43
N 10°	02:00	02:44	03:27	14:35	15:10	15:45
0°	02:09	02:49	03:28	14:28	15:08	15:46
S 10°	02:18	02:54	03:28	14:21	15:05	15:48
20°	02:27	02:59	03:29	14:14	15:02	15:49
30°	02:38	03:04	03:30	14:05	14:59	15:51
35°	02:44	03:08	03:30	14:00	14:57	15:52
40°	02:51	03:11	03:30	13:55	14:55	15:54
45°	02:59	03:16	03:31	13:48	14:52	15:55
S 50°	03:09	03:21	03:32	13:40	14:49	15:57
52°	03:13	03:23	03:32	13:37	14:48	15:57
54°	03:18	03:26	03:32	13:33	14:46	15:58
56°	03:24	03:29	03:33	13:28	14:44	15:59
58°	03:30	03:32	03:33	13:23	14:42	16:00
S 60°	03:37	03:35	03:33	13:17	14:40	16:01

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-11%	
27	16:09	16:12	11:44	08:19	20:39		
28	16:14	16:16	11:44	08:58	21:18		
29	16:18	16:20	11:44	09:37	21:56		

October 30, 31, 01 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	38° 48.18	145°37.00 \$24°14.39	278°16.80 N21°50.15	318°56.94 N22°23.48	53°42.31	
1	53°50.65	160°36.20 14.84	293°18.25 50.03	333°59.59 23.47	68°44.84 41.07	Alpheratz 357°34.69 29°13.83 Ankaa 353°6.94 -42°10.32
2	$68^{\circ}53.11$	175°35.40 15.29	308°19.70 49.92	349° 2.24 23.46	83°47.37 41.09	Ankaa 353°6.94 -42°10.32 Schedar 349°30.78 56°40.59
3	83°55.57	190°34.61 · · 15.74	323°21.15 · · 49.81	4°4.89 · · 23.45	98°49.90 · · 41.11	Diphda 348°47.18 -17°50.98
4	98°58.04	205°33.81 16.18	338°22.61 49.70	19°7.53 23.44	113°52.44 41.13	Achernar 335°19.71 -57°6.65
5 6	114°0.50 129°2.97	220°33.01 16.63 235°32.21 \$24°17.08	353°24.06 49.58 8°25.51 N21°49.47	34°10.18 23.43 49°12.83 N22°23.41	128°54.97 41.16 143°57.50 \$08°41.18	Hamal 327°51.07 23°34.91
7	144°5.43	250°31.41 17.52	23°26.97 49.36	64°15.48 23.40	159°0.03 41.20	Polaris 313°38.77 89°22.09
8	159°7.89	265°30.61 17.96	38°28.42 49.25	79°18.13 23.39	174°2.56 41.22	Acamar 315°11.47 -40°12.18
9	$174^{\circ}10.36$	280°29.81 · · 18.40	53°29.88 · · 49.14	94°20.78 · · 23.38	189°5.10 · · 41.24	Menkar 314°6.02 4°11.34 Mirfak 308°28.04 49°56.98
10	189° 12.82	295°29.01 18.84	68°31.33 49.02	109°23.43 23.37	204°7.63 41.26	Aldebaran 290°39.54 16°33.63
11	204° 15.29	310°28.21 19.28 325°27.41 \$24°19.72	83°32.79 48.91	124°26.08 23.36	219°10.16 41.29	Rigel 281°3.79 -8°10.20
12 13	219°17.75 234°20.21	325°27.41 \$24°19.72 340°26.61 20.16	98°34.25 N21°48.80 113°35.71 48.69	139°28.74 N22°23.35 154°31.39 23.33	234°12.69 \$08°41.31 249°15.22 41.33	Capella 280°21.81 46°1.31
14	249°22.68	355°25.81 20.59	128°37.17 48.58	169°34.04 23.32	264°17.75 41.35	Bellatrix 278°22.83 6°22.44
15	$264^{\circ}25.14$	10°25.01 · · 21.03	143°38.63 · · 48.47	184°36.69 · · 23.31	279°20.28 · · 41.37	Elnath 278°1.83 28°37.70 Alnilam 275°37.68 -1°11.02
16	279° 27.61	25°24.21 21.46	158°40.09 48.36	199°39.35 23.30	294°22.81 41.39	Alnilam 275°37.68 -1°11.02 Betelgeuse 270°52.07 7°24.81
17	294°30.07	40°23.41 21.89	173°41.55 48.24	214°42.00 23.29	309°25.34 41.41	Canopus 263°52.18 -52°42.17
18	309°32.54	55°22.60 \$24°22.33	188°43.01 N21°48.13	229°44.65 N22°23.28	324°27.87	Sirius 258°26.24 -16°44.78
19 20	324°35.00 339°37.46	70°21.80 22.75 85°21.00 23.18	203°44.48 48.02 218°45.94 47.91	244°47.31 23.26 259°49.96 23.25	339°30.40 41.45 354°32.93 41.47	Adhara 255°5.86 -29°0.05
21	354°39.93	100°20.20 · · 23.61	233°47.40 · · 47.80	274°52.61 · · 23.24	9°35.46 · · 41.49	Procyon 244°50.94 5°9.79
22	9°42.39	115°19.39 24.04	248°48.87 47.69	289°55.27 23.23	24°37.99 41.51	Pollux 243°17.44 27°57.94
23	24° 44.86	130°18.59 24.46	263°50.34 47.58	304°57.93 23.22	39°40.52 41.53	Avior 234°14.79 -59°34.93 Suhail 222°46.52 -43°31.61
Mer	pass. 21:21	ν-0.8' d0.5' m-4.01	ν1.4' d-0.1' m0.09	ν2.6' d-0.0' m-2.68	$\nu 2.5' \ d0.0' \ m0.79$	Miaplacidus 221°38.51 -69°48.72
						Alphard 217°48.01 -8°45.78
Thu	CHA	CHA Doc	CHA Dos	CHA Dos	CHA Dos	Regulus 207°34.76 11°50.82
Thu 0	GHA 39° 47.32	GHA Dec 145°17.78 S 24°24.89	GHA Dec 278°51.80 N21°47.47	GHA Dec 320°0.58 N22°23.21	GHA Dec 54°43.05 \$08°41.55	Dubhe 193°41.59 61°36.87
1	54° 49.78	160°16.98 25.31	293°53.27 47.36	335° 3.24 23.19	69°45.58 41.58	Denebola 182°25.38 14°26.06
2	69°52.25	175°16.18 25.73	308°54.74 47.25	350° 5.89 23.18	84°48.11 41.60	Gienah 175°44.07 -17°40.61 Acrux 173°0.98 -63°13.97
3	84°54.71	190°15.37 · · 26.15	323°56.21 · · 47.14	5°8.55 · · 23.17	99°50.64 · · 41.62	Gacrux 171°52.41 -57°14.91
4	99°57.18	205°14.57 26.57	338°57.68 47.03	20°11.21 23.16	114°53.17 41.64	Alioth 166°13.61 55°49.44
5 6	114°59.64	220°13.76 26.99	353°59.15 46.92	35°13.86 23.15	129°55.69 41.66	Spica 158°22.82 -11°17.32
7	130°2.10 145°4.57	235°12.95 \$24°27.40 250°12.15 27.82	9°0.62 N21°46.81 24°2.10 46.70	50°16.52 N22°23.13 65°19.18 23.12	144°58.22 \$08°41.68 160°0.75 41.70	Alkaid 152°52.61 49°11.36
8	160°7.03	265°11.34 28.23	39°3.57 46.59	80°21.84 23.11	175°3.28 41.72	Hadar 148°36.97 -60°29.45
9	175°9.50	280°10.54 · · 28.65	54°5.04 · · 46.48	95°24.50 · · 23.10	190°5.81 · · 41.73	Menkent 147°58.26 -36°29.40 Arcturus 145°48.42 19°3.26
10	$190^{\circ}11.96$	295°9.73 29.06	69° 6.52 46.37	110°27.16 23.09	205°8.33 41.75	Rigil Kent. 139°41.28 -60°56.20
11	205° 14.42	310°8.92 29.47	84°7.99 46.26	125°29.81 23.07	220°10.86 41.77	Kochab 137°20.91 74°3.18
12	220°16.89	325°8.11 \$24°29.88	99°9.47 N21°46.15	140°32.47 N22°23.06	235°13.39	Zuben'ubi 136°56.57 -16°8.60
13 14	235° 19.35 250° 21.82	340°7.31 30.29 355°6.50 30.70	114°10.95 46.04 129°12.42 45.93	155°35.13 23.05 170°37.79 23.04	250°15.92 41.81 265°18.44 41.83	Alphecca 126°4.25 26°37.96
15	265°24.28	10°5.69 · · 31.10	144°13.90 · · 45.82	185°40.46 · · 23.03	280°20.97 · · 41.85	Antares 112°16.40 -26°29.20
16	280°26.74	25°4.88 31.51	159°15.38 45.71	200°43.12 23.01	295°23.50 41.87	Atria 107°11.25 -69°4.43 Sabik 102°3.27 -15°45.31
17	295°29.21	40°4.07 31.91	174°16.86 45.60	215°45.78 23.00	310°26.02 41.89	Shaula 96°10.92 -37°7.36
18	310°31.67	55°3.26 S24°32.31	189°18.34 N21°45.49	230°48.44 N22°22.99	325°28.55	Rasalhague 95°58.97 12°32.63
19	325°34.14 340°36.60	70°2.45 32.71 85°1.64 33.11	204°19.83 45.38 219°21.31 45.27	245°51.10 22.98 260°53.76 22.97	340°31.07 41.93 355°33.60 41.95	Eltanin 90°42.62 51°29.31
20 21	355°39.06	85°1.64 33.11 100°0.83 · · 33.51	219°21.31 45.27 234°22.79 • 45.17	260°53.76 22.97 275°56.43 •• 22.95	355°33.60 41.95 10°36.13 · · 41.97	Kaus Aust. 83°32.98 -34°22.45
22	10°41.53	115°0.02 33.91	249°24.28 45.06	290°59.09 22.94	25°38.65 41.98	Vega 80°33.57 38°48.59
23	25°43.99	129°59.21 34.31	264°25.76 44.95	306°1.75 22.93	40°41.18 42.00	Nunki 75°48.15 -26°16.01 Altair 62°0.22 8°56.14
Mer r	pass. 21:17	ν-0.8' d0.4' m-4.02	ν1.5' d-0.1' m0.08	ν2.7' d-0.0' m-2.68	$\nu 2.5' \ d0.0' \ m0.79$	Peacock 53°6.04 -56°39.54
		2 0.0 00.1 111 7.02	21.0 0 0.1 1110.00		22.3 40.0 1110.13	Deneb 49°25.95 45°22.38
F!	CIIA	CUA D	CHA De-	CHA De-	CHA De-	Enif 33°38.90 9°59.45
Fri 0	GHA 40° 46.46	GHA Dec 144°58.40 S 24°34.70	GHA Dec 279°27.25 N21°44.84	GHA Dec 321°4.42 N22°22.92	GHA Dec 55°43.70 S 08°42.02	Al Na'ir 27°32.95 -46°50.62
1	55° 48.92	159° 57.59 35.10	294°28.73 44.73	336°7.08 22.90	70°46.23 42.04	Fomalhaut 15°14.50 -29°29.51 Scheat 13°45.19 28°13.24
2	$70^{\circ}51.39$	174°56.78 35.49	309°30.22 44.62	351°9.75 22.89	85°48.75 42.06	Markab 13°29.90 15°20.48
3	85° 53.85	189°55.97 · · 35.88	324°31.71 · · 44.51	6°12.41 · · 22.88	100°51.28 · · 42.08	
4	100°56.31	204°55.16 36.27	339°33.20 44.41	21°15.07 22.87	115°53.80 42.10	Oct 30 Wed SHA Mer.pass Venus 106°48.82 14:18
5 6	115°58.78 131°1.24	219°54.34 36.66 234°53.53 \$24°37.05	354°34.69 44.30 9°36.18 N21°44.19	36°17.74 22.86 51°20.41 N22°22.84	130°56.33 42.11 145°58.85 \$08°42.13	Venus 106°48.82 14:18 Mars 239°28.62 05:26
7	131 1.24 146°3.71	249°52.72 37.44	24°37.67 44.08	66°23.07 22.83	161°1.38 42.15	Jupiter 280°8.76 02:44
8	161°6.17	264°51.91 37.82	39°39.16 43.98	81°25.74 22.82	176°3.90 42.17	Saturn 14°54.12 20:22
9	176°8.63	279°51.09 · · 38.21	54°40.66 · · 43.87	96°28.41 · · 22.81	191°6.42 · · 42.19	Oct 31 Thu SHA Mer.pass
10	191°11.10	294°50.28 38.59	69°42.15 43.76	111°31.07 22.79	206°8.95 42.20	Oct 31 Thu SHA Mer.pass Venus 105°30.46 14:20
11	206°13.56	309°49.47 38.97	84°43.64 43.65	126°33.74 22.78	221°11.47 42.22	Mars 239°4.48 05:24
12 13	221°16.03 236°18.49	324°48.65 \$24°39.35 339°47.84 39.73	99°45.14 N21°43.55 114°46.64 43.44	141°36.41 N22°22.77 156°39.08 22.76	236°13.99 \$08°42.24 251°16.52 42.26	Jupiter 280°13.26 02:39
14	251°20.95	354°47.02 40.11	129°48.13 43.33	171°41.74 22.74	266°19.04 42.28	Saturn 14°55.73 20:18
15	$266^{\circ}23.42$	9°46.21 · · 40.49	144°49.63 · · 43.23	186°44.41 · · 22.73	281°21.56 · · 42.29	Nov 01 Fri SHA Mer.pass
16	281°25.88	24°45.40 40.86	159°51.13 43.12	201°47.08 22.72	296°24.09 42.31	Venus 104°11.95 14:21
17	296°28.35	39°44.58 41.24	174°52.63 43.01	216°49.75 22.70	311°26.61 42.33	Mars 238°40.79 05:22
18 19	311°30.81 326°33.27	54°43.76 S24°41.61 69°42.95 41.98	189°54.13 N21°42.91 204°55.63 42.80	231°52.42 N22°22.69 246°55.09 22.68	326°29.13 \$08°42.35 341°31.65 42.36	Jupiter 280°17.96 02:35
20	320 33.27 341°35.74	84°42.13 42.36	219°57.13 42.69	240 55.09 22.68 261°57.76 22.67	356°34.18 42.38	Saturn 14°57.25 20:14
21	356° 38.20	99°41.32 · · 42.73	234°58.63 · · 42.59	277°0.43 · · 22.65	11°36.70 · · 42.40	Horizontal parallax
22	11°40.67	114°40.50 43.09	250°0.14 42.48	292°3.10 22.64	26°39.22 42.41	Venus: 0.1
23	26°43.13	129°39.68 43.46	265°1.64 42.37	307° 5.77 22.63	41°41.74 42.43	Mars: 0.1
Mer.	pass. 21:13	ν-0.8' d0.4' m-4.02	ν1.5' d-0.1' m0.06	ν2.7' d-0.0' m-2.69	ν2.5' d0.0' m0.80	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 5.38	\$13°52.10	210°7.42	17.4'	S04°2.93	14.0'	53.9'
1	199° 5.42 214° 5.45	52.91 53.73	224°43.80 239°20.16	17.4'	04°16.97 04°31.00	14.0'	53.9'
2	214 5.45 229° 5.48	54.55	259 20.10 253°56.50	17.3' 17.3'	04 31.00 04°45.01	14.0' 14.0'	53.9' 53.9'
4	244° 5.51	55.36	268°32.83	17.3'	04°59.01	14.0'	53.9'
5	259° 5.54	56.18	283°9.13	17.3'	05°12.99	14.0'	53.9'
6	274° 5.57 289° 5.60	\$13°56.99 57.81	297°45.40 312°21.66	17.3' 17.2'	\$05°26.96 05°40.90	13.9' 13.9'	53.9' 53.9'
7 8	289 5.60 304° 5.63	58.62	312 21.00 326°57.89	17.2'	05 40.90 05°54.83	13.9'	53.9'
9	319° 5.65	13°59.44	341°34.09	17.2'	06°8.74	13.9'	53.9'
10	334° 5.68	$14^{\circ}0.25$	356°10.27	17.2'	06°22.64	13.9'	53.9'
11 12	349° 5.71 4° 5.74	1.06 \$14°1.88	10°46.42 25°22.54	17.1' 17.1'	06°36.51 \$06°50.36	13.8' 13.8'	53.9' 53.9'
13	19° 5.76	2.69	25 22.54 39°58.63	17.1	07°4.18	13.8	53.9'
14	34° 5.79	3.50	54°34.69	17.0'	07°17.99	13.8'	53.9'
15	49°5.82	• • 4.31	69°10.72	17.0'	07°31.77	13.8'	53.9'
16 17	64° 5.84 79° 5.87	5.12 5.93	83°46.72 98°22.69	17.0' 16.9'	07°45.52 07°59.26	13.7' 13.7'	53.9' 54.0'
18	94° 5.89	5.93 \$14°6.74	112°58.62	16.9	508°12.96	13.7	54.0'
19	109°5.92	7.55	127°34.51	16.9'	08°26.64	13.7'	54.0'
20	124°5.94	8.36	142°10.37	16.8'	08°40.29	13.6'	54.0'
21 22	139° 5.97 154° 5.99	· · 9.17 9.98	156°46.19 171°21.97	16.8' 16.7'	08°53.91 09°7.51	13.6' 13.6'	54.0' 54.0'
23	154 5.99 169° 6.02	9.98 10.79	171 21.97 185°57.71	16.7'	09 7.51 09°21.07	13.5	54.0'
	SD = 16.1'	d = 0.8'			0 = 14.7'		
				JL			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184° 6.04 199° 6.06	\$14°11.60 12.41	200°33.42 215°9.08	16.7' 16.6'	\$09°34.60 09°48.11	13.5' 13.5'	54.0' 54.0'
2	214°6.09	13.21	215°9.08 229°44.70	16.6'	10° 1.57	13.5	54.0'
3	229° 6.11	• • 14.02	244°20.27	16.5'	10°15.01	13.4'	54.0'
4	244°6.13	14.83	258°55.80	16.5'	10°28.41	13.4'	54.0'
5 6	259° 6.15 274° 6.17	15.63 \$14°16.44	273°31.29 288°6.73	16.4' 16.4'	10°41.78 \$10°55.11	13.3' 13.3'	54.0' 54.0'
7	289° 6.19	17.24	302°42.13	16.3'	11°8.40	13.3'	54.0'
8	304° 6.21	18.05	317°17.47	16.3'	11°21.66	13.2'	54.0'
9	319° 6.23	•• 18.85	331°52.77	16.2'	11°34.88	13.2'	54.0'
10 11	334° 6.25 349° 6.27	19.66 20.46	346°28.02 1°3.21	16.2' 16.1'	11°48.06 12°1.19	13.1' 13.1'	54.0' 54.0'
12	4° 6.29	\$14°21.26	15°38.36	16.1	\$12°14.29	13.1	54.0'
13	19°6.31	22.07	$30^{\circ}13.45$	16.0'	12°27.35	13.0'	54.0'
14	34°6.33	22.87	44°48.49 59°23.48	16.0'	12°40.36	13.0'	54.1'
15 16	49° 6.35 64° 6.37	· · 23.67 24.47	73°58.41	15.9' 15.9'	12°53.33 13°6.25	12.9' 12.9'	54.1' 54.1'
17	79° 6.38	25.28	88°33.29	15.8'	13°19.13	12.8'	54.1'
18	94°6.40	\$14°26.08	103°8.11	15.8'	S13°31.97	12.8'	54.1'
19 20	109° 6.42 124° 6.43	26.88	117°42.87 132°17.57	15.7' 15.6'	13°44.75 13°57.49	12.7' 12.7'	54.1' 54.1'
21	139° 6.45	27.68 •• 28.48	132 17.57 146°52.21	15.6'	13 57.49 14°10.18	12.6'	54.1'
22	154°6.47	29.28	161°26.80	15.5'	14°22.81	12.6'	54.1'
23	169°6.48	30.07	176°1.32	15.5'	14°35.40	12.5'	54.1'
	$SD = 16.1^{\prime}$	d = 0.8'		SE	0 = 14.7'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 6.50	\$14°30.87	190°35.78	ν 15.4'	\$14°47.94	12.5'	54.1'
1	199°6.51	31.67	$205^{\circ}10.18$	15.3'	$15^{\circ}0.42$	12.4'	54.1'
2	214° 6.53 229° 6.54	32.47	219°44.51	15.3'	15°12.85	12.4'	54.1'
3 4	229°6.54 244°6.55	· · 33.27 34.06	234°18.78 248°52.99	15.2' 15.1'	15°25.22 15°37.54	12.3' 12.3'	54.1' 54.2'
5	259° 6.57	34.86	263°27.13	15.1'	$15^{\circ}49.80$	12.2'	54.2'
6	274°6.58	S14°35.66	278°1.20	15.0'	\$16°2.00	12.1'	54.2'
7 8	289° 6.59 304° 6.60	36.45 37.25	292°35.21 307°9.14	14.9' 14.9'	16°14.15 16°26.23	12.1' 12.0'	54.2' 54.2'
9	304 6.60 319°6.62	38.04	307 9.14 321°43.01	14.9 14.8'	16°26.23	12.0'	54.2'
10	334° 6.63	38.84	$336^{\circ}16.81$	14.7'	$16^{\circ}50.22$	11.9'	54.2'
11	349° 6.64	39.63	350°50.54	14.7'	17°2.12	11.8'	54.2'
12 13	4° 6.65 19° 6.66	\$14°40.42 41.22	5°24.20 19°57.79	14.6' 14.5'	\$17°13.96 17°25.73	11.8' 11.7'	54.2' 54.2'
14	34°6.67	42.01	34°31.30	14.4'	17°37.44	11.6'	54.2'
15	49°6.68	• • 42.80	49°4.74	14.4'	$17^{\circ}49.08$	11.6'	54.3'
16	64° 6.69	43.59	63°38.11	14.3'	18°0.65	11.5'	54.3'
17 18	79° 6.70 94° 6.71	44.39 \$14°45.18	78°11.41 92°44.63	14.2' 14.1'	18°12.15 \$18°23.59	11.4' 11.4'	54.3' 54.3'
19	109° 6.72	45.16	107°17.77	14.1'	18°34.95	11.4	54.3'
20	124°6.72	46.76	121°50.84	14.0'	18°46.24	11.2'	54.3'
21	139° 6.73	• • 47.55	136°23.83	13.9'	18°57.46 19°8.60	11.1'	54.3'
22 23	154° 6.74 169° 6.75	48.34 49.13	150°56.75 165°29.58	13.8' 13.8'	19°8.60 19°19.67	11.1' 11.0'	54.3' 54.3'
_5	SD = 16.1'	d = 0.8'			0 = 14.8'	11.0	00
	JD — 10.1	<u>u — 0.0</u>		JL	_ 17.0		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	06:04	07:27	08:53	14:32	15:59	17:21
N 70°	06:00	07:14	08:28	14:58	16:12	17:25
68°	05:57	07:04	08:09	15:17	16:22	17:29
66°	05:54	06:55	07:53	15:33	16:31	17:32
64°	05:51	06:48	07:41	15:46	16:38	17:35
62°	05:49	06:41	07:30	15:56	16:45	17:37
60°	05:46	06:36	07:21	16:05	16:50	17:40
N 58°	05:44	06:31	07:13	16:14	16:56	17:42
56°	05:42	06:26	07:06	16:21	17:00	17:44
54°	05:40	06:22	06:59	16:27	17:04	17:46
52°	05:38	06:18	06:54	16:33	17:08	17:48
50°	05:37	06:15	06:49	16:38	17:12	17:50
45°	05:32	06:07	06:38	16:49	17:20	17:54
N 40°	05:28	06:00	06:28	16:58	17:26	17:58
35°	05:24	05:54	06:20	17:06	17:32	18:02
30°	05:20	05:49	06:13	17:13	17:38	18:06
20°	05:12	05:39	06:01	17:26	17:48	18:15
N 10°	05:04	05:29	05:50	17:37	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:43	05:08	05:30	17:57	18:19	18:45
20°	04:29	04:56	05:19	18:09	18:32	18:59
30°	04:11	04:41	05:06	18:22	18:47	19:17
35°	03:59	04:31	04:58	18:29	18:56	19:29
40°	03:45	04:21	04:50	18:38	19:07	19:43
45°	03:28	04:08	04:40	18:48	19:20	20:00
S 50°	03:06	03:51	04:27	19:01	19:37	20:23
52°	02:54	03:44	04:22	19:07	19:45	20:35
54°	02:41	03:35	04:15	19:13	19:54	20:48
56°	02:26	03:25	04:08	19:20	20:04	21:04
58°	02:07	03:13	04:01	19:28	20:16	21:23
S 60°	01:43	03:00	03:52	19:37	20:30	21:49

Lat.		Moonris	e	Moonset		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	05:15	07:22	10:15	14:46	14:04	12:38
N 70°	05:07	07:02	09:18	14:57	14:26	13:38
68°	05:01	06:46	08:44	15:06	14:44	14:13
66°	04:55	06:33	08:20	15:13	14:58	14:38
64°	04:51	06:23	08:01	15:19	15:10	14:58
62°	04:47	06:14	07:46	15:25	15:20	15:14
60°	04:44	06:07	07:34	15:30	15:28	15:27
N 58°	04:41	06:00	07:23	15:34	15:36	15:39
56°	04:38	05:54	07:13	15:38	15:43	15:49
54°	04:36	05:49	07:05	15:41	15:49	15:58
52°	04:34	05:45	06:58	15:44	15:54	16:06
50°	04:32	05:40	06:51	15:47	15:59	16:14
45°	04:27	05:31	06:37	15:53	16:10	16:29
N 40°	04:24	05:24	06:25	15:58	16:19	16:42
35°	04:21	05:17	06:15	16:03	16:27	16:53
30°	04:18	05:12	06:07	16:07	16:33	17:03
20°	04:14	05:02	05:52	16:13	16:45	17:20
N 10°	04:10	04:54	05:39	16:19	16:56	17:34
0°	04:06	04:46	05:27	16:25	17:06	17:48
S 10°	04:03	04:38	05:16	16:31	17:15	18:02
20°	03:59	04:30	05:03	16:37	17:26	18:17
30°	03:55	04:21	04:49	16:44	17:38	18:34
35°	03:52	04:15	04:40	16:48	17:45	18:44
40°	03:49	04:09	04:31	16:53	17:53	18:56
45°	03:46	04:02	04:20	16:58	18:03	19:09
S 50°	03:42	03:54	04:07	17:05	18:14	19:26
52°	03:41	03:50	04:01	17:08	18:20	19:34
54°	03:39	03:46	03:55	17:11	18:25	19:43
56°	03:37	03:41	03:47	17:15	18:32	19:52
58°	03:34	03:36	03:39	17:19	18:39	20:04
S 60°	03:32	03:30	03:29	17:23	18:48	20:17

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	28-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%
30	16:22	16:23	11:44	10:16	22:35	
31	16:24	16:25	11:44	10:56	23:16	
01	16:26	16:27	11:44	11:38	-:-	

November 02, 03, 04 UT (Sat., Sun., Mon.)

h	Aries	Ve	nus	М	ars	Jup	oiter	Sat	urn	_
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	41°45.60	144°38.87	S24°43.83	280°3.14	N21°42.27	322°8.45	N22°22.62	56°44.26	S08°42.45	
1	56° 48.06	159°38.05	44.19	295°4.65	42.16	337°11.12	22.60	71°46.78	42.47	
2	71°50.52	174°37.23	44.56	310°6.16	42.06	352°13.79	22.59	86°49.31	42.48	
3	$86^{\circ}52.99$	189°36.42	• • 44.92	325°7.66	• • 41.95	7°16.46	• • 22.58	101°51.83	• • 42.50	
4	101°55.45	204°35.60	45.28	$340^{\circ}9.17$	41.85	$22^{\circ}19.14$	22.56	116°54.35	42.52	
5	116° 57.92	219°34.78	45.64	$355^{\circ}10.68$	41.74	$37^{\circ}21.81$	22.55	131°56.87	42.53	
6	132°0.38	234°33.96	S24°46.00	10°12.19	N21°41.63	52°24.48	N22°22.54	146°59.39	S08°42.55	
7	147°2.84	249°33.14	46.36	25°13.70	41.53	67°27.16	22.52	162°1.91	42.57	
8	162°5.31	264°32.32	46.72	40°15.21	41.42	82°29.83	22.51	177°4.43	42.58	
9	177°7.77	279°31.50	• • 47.07	55°16.72	• • 41.32	97°32.51	• • 22.50	192°6.95	• • 42.60	
10	192°10.24	294°30.69 309°29.87	47.43	70°18.24 85°19.75	41.21	112°35.18 127°37.86	22.49	207°9.47 222°11.99	42.61	
11 12	207° 12.70 222° 15.16	309 29.87 324° 29.05	47.78 \$24°48.13	85 19.75 100°21.27	41.11 N21°41.01	127 37.86 142°40.53	22.47 N22°22.46	222 11.99 237°14.51	42.63 \$08°42.65	
13	237° 17.63	324 29.05 339°28.23	48.48	100 21.27 115°22.78	40.90	142 40.53 157°43.21	22.45	252°17.03	42.66	İ
14	252° 20.09	354° 27.41	48.83	130°24.30	40.80	172°45.89	22.43	267°19.55	42.68	
15	267°22.56	9°26.59	• • 49.18	145°25.81	• • 40.69	187°48.56	22.42	282°22.07	42.70	
16	282°25.02	24°25.77	49.53	160°27.33	40.59	202°51.24	22.41	297°24.59	42.71	
17	297°27.49	39°24.94	49.87	175°28.85	40.48	217°53.92	22.39	312°27.10	42.73	
18	312°29.95	54°24.12	\$24°50.22	190°30.37	N21°40.38	232°56.59	N22°22.38	327°29.62	S08°42.74	
19	327°32.41	69°23.30	50.56	205°31.89	40.28	247°59.27	22.37	342°32.14	42.76	
20	342°34.88	84°22.48	50.90	220°33.41	40.17	263°1.95	22.35	357°34.66	42.77	
21	357° 37.34	99° 21.66	• • 51.24	235°34.93	• • 40.07	278°4.63	• • 22.34	12°37.18	• • 42.79	
22	12° 39.81	114°20.84	51.58	250°36.45	39.97	293°7.31	22.33	27°39.70	42.80	
23	27° 42.27	129°20.01	51.92	265°37.98	39.86	308° 9.99	22.31	42°42.21	42.82	
Mer.p	pass. 21:09	ν -0.8' d0	.4′ m-4.03	$\nu 1.5' \ d-0$	0.1' m0.04	$\nu 2.7' \ d-0$.0′ m-2.70	$\nu 2.5' \ d0$.0′ m0.80	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	42° 44.73	144° 19.19	\$24°52.26	280°39.50	N21°39.76	323°12.67	N22°22.30	57°44.73	S08°42.84	
1	57° 47.20	159° 18.37	52.59	295°41.03	39.66	338° 15.35	22.29	72°47.25	42.85	
2	72°49.66	174° 17.55	52.93	310°42.55	39.55	353°18.03	22.27	87°49.77	42.87	
3	87°52.13	189°16.72	• • 53.26	325°44.08	• • 39.45	8°20.71	22.26	102°52.28	• • 42.88	
4	102°54.59	204°15.90	53.60	340°45.61	39.35	23°23.39	22.25	117°54.80	42.90	
5	$117^{\circ}57.06$	219°15.08	53.93	355°47.14	39.24	38°26.07	22.23	132°57.32	42.91	
6	132°59.52	234°14.25	S24°54.26	10°48.66	N21°39.14	53°28.75	N22°22.22	147°59.83	508°42.93	
7	148°1.98	249°13.43	54.58	25°50.19	39.04	68°31.43	22.21	163°2.35	42.94	
8	163°4.45	264°12.61	54.91	40°51.72	38.94	83°34.12	22.19	178°4.87	42.95	
9	178°6.91	279°11.78	• • 55.24	55°53.26	• • 38.83	98°36.80	• • 22.18	193°7.38	• • 42.97	
10	193°9.38	294°10.96	55.56	70°54.79	38.73	113°39.48	22.17	208°9.90	42.98	
11	208° 11.84 223° 14.30	309°10.13 324°9.31	55.89 \$24°56.21	85°56.32	38.63 N21°38.53	128°42.17 143°44.85	22.15 N22°22.14	223°12.41 238°14.93	43.00 \$08°43.01	
12 13	223 14.30 238° 16.77	324 9.31 339°8.48	56.53	100°57.86 115°59.39	N21 38.53 38.43	143 44.85 158°47.53	22.13	258 14.93 253°17.45	43.03	
14	253° 10.77	354°7.66	56.85	131°0.93	38.33	173°50.22	22.13	268°19.96	43.04	
15	268°21.70	9°6.83	57.17	146°2.46	• • 38.22	188°52.90	22.10	283°22.48	• • 43.06	
16	283°24.16	24°6.01	57.49	161°4.00	38.12	203°55.59	22.08	298°24.99	43.07	
17	298° 26.63	39°5.18	57.80	176°5.54	38.02	218°58.27	22.07	313°27.51	43.08	
18	313°29.09	54°4.35	S24°58.12	191°7.08	N21°37.92	234° 0.96	N22°22.06	328°30.02	508°43.10	
19	328°31.55	69°3.53	58.43	206°8.62	37.82	249°3.64	22.04	343°32.54	43.11	
20	343°34.02	84°2.70	58.75	221°10.16	37.72	264° 6.33	22.03	358°35.05	43.13	
21	358°36.48	99°1.88	• • 59.06	236°11.70	• • 37.62	279°9.02	• • 22.02	13°37.56	• • 43.14	
22	13° 38.95	114°1.05	59.37	251°13.24	37.52	294°11.70	22.00	28°40.08	43.15	
23	28°41.41	129°0.22	59.68	266°14.78	37.42	309°14.39	21.99	43°42.59	43.17	
Mer.p	pass. 21:06	ν -0.8′ d0	.3′ m-4.03	$ u$ 1.5 $^{\prime}$ d-0	$0.1' \; \text{m} 0.03$	$\nu 2.7' \ d-0$.0′ m-2.70	$\nu 2.5' \ d0$.0' m0.81	
				-						
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	43°43.87	143°59.39	S24°59.99	281°16.33	N21°37.32	324°17.08	N22°21.97	58°45.11	S08°43.18	
1	58°46.34	158°58.57	0.29	296°17.87	37.22	339°19.76	21.96	73°47.62	43.19	
2	73°48.80	173°57.74	0.60	311°19.42	37.12	354°22.45	21.95	88°50.13	43.21	
3	88°51.27	188° 56.91	• • 0.90	326°20.96	• • 37.02	9°25.14	•• 21.93	103°52.65	• • 43.22	H
4	103°53.73	203°56.08	1.20	341°22.51	36.92	24°27.83	21.92	118°55.16	43.23	
5	118° 56.20	218°55.26	1.51	356°24.06	36.82	39°30.52	21.90	133°57.67	43.25	
6	133°58.66	233°54.43	\$25°1.81	11°25.61	N21°36.72	54°33.21	N22°21.89	149°0.18	\$08°43.26	
7	149°1.12 164°3.59	248°53.60	2.11	26°27.16	36.62	69°35.90	21.88	164°2.70	43.27	
8 9	164°3.59 179°6.05	263°52.77 278°51.94	2.40 · · 2.70	41°28.71 56°30.26	36.52 · · 36.42	84°38.59 99°41.28	21.86 •• 21.85	179°5.21 194°7.72	43.29 •• 43.30	Ļ
10	179 0.05 194°8.52	278 51.94 293°51.11	3.00	71°31.81	36.32	99 41.28 114°43.97	21.83	209°10.23	43.30	
11	209° 10.98	308° 50.28	3.29	86°33.37	36.22	129°46.66	21.82	209 10.23 224°12.75	43.32	
12	209 10.90 224° 13.44	323°49.45	\$25°3.58	101°34.92	N21°36.12	144°49.35	N22°21.81	239°15.26	508°43.34	
13	239° 15.91	338°48.62	3.88	116°36.47	36.02	159°52.04	21.79	254°17.77	43.35	
14	254° 18.37	353°47.79	4.17	131°38.03	35.93	174°54.73	21.78	269°20.28	43.36	L
15	269°20.84	8°46.96	• • 4.46	146°39.59	• • 35.83	189°57.43	• • 21.76	284°22.79	• • 43.38	N
16	284°23.30	23°46.13	4.74	161°41.14	35.73	$205^{\circ}0.12$	21.75	299°25.30	43.39	'
17	299° 25.77	38°45.30	5.03	176°42.70	35.63	$220^{\circ}2.81$	21.73	314°27.81	43.40	
18	314°28.23	53° 44.47	\$25°5.32	191°44.26	N21°35.53	235° 5.51	N22°21.72		S08°43.41	
19	329°30.69	68° 43.64	5.60	206°45.82	35.43	250°8.20	21.71	344°32.83	43.42	L
20	344°33.16	83° 42.81	5.88	221°47.38	35.34	265°10.89	21.69	359°35.34	43.44	F
21	359°35.62 14°38.09	98°41.98	· · 6.17	236°48.94 251°50.50	· · 35.24	280°13.59	• • 21.68	14°37.86	· · 43.45	
22 23	14°38.09 29°40.55	113°41.15 128°40.32	6.45 6.73	251°50.50 266°52.07	35.14 35.04	295°16.28 310°18.98	21.66 21.65	29°40.37 44°42.88	43.46 43.47	
Mer.p	pass. 21:02	ν -0.8′ d0	.3′ m-4.04	$\nu^{1.5'} d$ -0	0.1′ m0.01	$\nu^{2.7'} d-0$.0′ m-2.71	$\nu^{2.5'} d0$.0′ m0.81	

	Stars	
	SHA	Dec
Alpheratz	357°34.70	29°13.83
Ankaa Schedar	353°6.95 349°30.79	-42°10.33 56°40.61
Diphda	348°47.18	-17° 50.99
Achernar	$335^{\circ}19.72$	-57°6.67
Hamal	327°51.06	23°34.91
Polaris Acamar	313°38.18 315°11.47	89°22.11 -40°12.20
Menkar	314°6.01	4° 11.34
Mirfak	308°28.03	49°56.99
Aldebaran Rigel	290°39.52 281°3.77	16°33.62 -8°10.21
Capella	280°21.78	46°1.31
Bellatrix	278°22.82	6°22.44
Elnath Alnilam	278°1.81 275°37.67	28°37.70 -1°11.02
Betelgeuse	270°52.05	7°24.80
Canopus	$263^{\circ}52.15$	-52°42.19
Sirius	258°26.22	-16°44.79
Adhara Procyon	255°5.83 244°50.92	-29°0.06 5°9.79
Pollux	244 50.92 243°17.42	27°57.94
Avior	234°14.75	-59°34.93
Suhail	222°46.50	-43°31.61
Miaplacidus Alphard	221°38.45 217°47.99	-69°48.73 -8°45.79
Regulus	207°34.74	11°50.82
Dubhe	193°41.56	61°36.85
Denebola	182°25.37	14°26.05
Gienah Acrux	175°44.05 173°0.94	-17°40.61 -63°13.96
Gacrux	171°52.39	-57° 14.90
Alioth	166°13.60	55° 49.43
Spica Alkaid	158°22.81 152°52.60	-11°17.33 49°11.34
Hadar	152 52.00 148°36.96	-60°29.44
Menkent	147°58.25	-36°29.40
Arcturus	145°48.42	19°3.25
Rigil Kent. Kochab	139°41.27 137°20.92	-60°56.19 74°3.17
Zuben'ubi	136°56.57	-16°8.60
Alphecca	126°4.25	26°37.95
Antares Atria	112°16.40 107°11.27	-26°29.20 -69°4.42
Sabik	107 11.27 102°3.28	-09 4.42 -15°45.31
Shaula	$96^{\circ}10.93$	-37°7.36
Rasalhague	95°58.98	12°32.62
Eltanin Kaus Aust.	90°42.64 83°33.00	51°29.31 -34°22.44
Vega	80°33.59	38° 48.58
Nunki	75°48.16	-26°16.00
Altair	62°0.23 53°6.07	8°56.14 -56°39.54
Peacock Deneb	49°25.97	-56° 39.54 45° 22.38
Enif	$33^{\circ}38.91$	9°59.45
Al Na'ir	27°32.97	-46°50.62
Fomalhaut Scheat	15°14.51 13°45.20	-29°29.52 28°13.24
Markab	13°29.90	15°20.48
Nov 02 Sat	SHA	Mer.pass
Venus	102°53.27	14:22
Mars	$238^{\circ}17.55$	05:19
Jupiter Saturn	280°22.85 14°58.67	02:31 20:10
Nov 03 Sun Venus	SHA 101°34.46	Mer.pass 14:24
Venus Mars	237°54.77	05:17
Jupiter	$280^{\circ}27.93$	02:27
Saturn	15°0.00	20:06
Nov 04 Mon	SHA	Mer.pass
Venus Mars	100°15.52 237°32.45	14:25 05:14
Jupiter	280°33.20	02:22
Saturn	15°1.23	20:02
Horizon	ıtal parallax	
	Venus:	0.1
	Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.75	\$14°49.91	180°2.34	13.7'	S19°30.67	10.9'	54.3'
1	199°6.76	50.70	194°35.02	13.6'	19°41.58	10.8'	54.4'
2	214°6.76 229°6.77	51.49 •• 52.28	209°7.62 223°40.15	13.5'	19°52.42 20°3.18	10.8'	54.4'
3 4	229 6.77 244°6.78	53.06	223 40.15 238°12.59	13.4' 13.4'	20° 3.18° 20° 13.86	10.7' 10.6'	54.4' 54.4'
5	259°6.78	53.85	252°44.95	13.4	20°24.46	10.5	54.4'
6	274°6.78	S 14°54.64	267°17.23	13.2'	520°34.97	10.4'	54.4'
7	289°6.79	55.42	281°49.42	13.1'	20°45.40	10.3'	54.4'
8	304°6.79	56.21	296°21.54	13.0'	20°55.75	10.3'	54.4'
9	319°6.80 334°6.80	· · 56.99 57.78	310°53.57 325°25.53	13.0' 12.9'	21°6.01 21°16.19	10.2' 10.1'	54.4'
10 11	334 6.80 349°6.80	57.78 58.56	325 25.53 339°57.39	12.9	21 16.19 21°26.27	10.1	54.5' 54.5'
12	4°6.80	\$14°59.34	354°29.18	12.7'	S21°36.27	9.9'	54.5'
13	19°6.81	15°0.13	9°0.88	12.6'	21°46.18	9.8'	54.5'
14	34°6.81	0.91	23°32.50	12.5'	21°55.99	9.7'	54.5'
15	49°6.81 64°6.81	• • 1.69	38°4.04 52°35.49	12.5'	22°5.72 22°15.35	9.6'	54.5'
16 17	79°6.81	2.47 3.26	52 35.49 67°6.85	12.4' 12.3'	22 15.35 22°24.89	9.5' 9.4'	54.5' 54.5'
18	94°6.81	\$15° 4.04	81°38.13	12.2'	S22°34.33	9.3'	54.6'
19	109°6.81	4.82	96°9.33	12.1'	22°43.67	9.2'	54.6'
20	124°6.81	5.60	110°40.44	12.0'	$22^{\circ}52.92$	9.1'	54.6'
21	139°6.81	• • 6.38	125°11.47	11.9'	23°2.06	9.0'	54.6'
22	154°6.81	7.16	139°42.41	11.9'	23°11.11	8.9'	54.6'
23	169°6.81	7.94	154°13.27	11.8'	23°20.06	8.8'	54.6'
	SD = 16.1'	d = 0.8'		SE	D = 14.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.81	\$15°8.71	168°44.04	11.7'	S23°28.90	8.7'	54.6'
1	199°6.80	9.49	183°14.72	11.6'	23°37.64	8.6'	54.7'
2	214°6.80 229°6.80	10.27	197°45.32 212°15.84	11.5'	23°46.28 23°54.81	8.5'	54.7'
3 4	229°6.80 244°6.79	· · 11.05 11.82	212°15.84 226°46.27	11.4' 11.3'	23°54.81 24°3.24	8.4' 8.3'	54.7' 54.7'
5	259°6.79	12.60	241°16.62	11.3'	24°11.55	8.2'	54.7'
6	274°6.79	S15°13.38	255°46.88	11.2'	S24°19.76	8.1'	54.7'
7	289°6.78	14.15	$270^{\circ}17.06$	11.1'	24°27.86	8.0'	54.7'
8	304°6.78	14.93	284°47.15	11.0'	24°35.85	7.9'	54.8'
9	319°6.77 334°6.77	• • 15.70	299°17.16 313°47.08	10.9' 10.8'	24°43.72 24°51.48	7.8' 7.6'	54.8' 54.8'
10 11	334 6.77 349°6.76	16.48 17.25	313 47.08 328°16.92	10.8	24 51.48 24°59.13	7.6 7.5'	54.8'
12	4°6.76	\$15°18.02	342°46.68	10.7	\$25°6.66	7.4	54.8'
13	19°6.75	18.79	357°16.36	10.6'	25°14.08	7.3'	54.8'
14	34°6.74	19.57	11°45.95	10.5'	25°21.38	7.2'	54.8'
15	49°6.74	• • 20.34	26°15.46	10.4'	25°28.55	7.1'	54.9'
16 17	64°6.73 79°6.72	21.11 21.88	40°44.89 55°14.23	10.3' 10.3'	25°35.61 25°42.55	6.9' 6.8'	54.9' 54.9'
18	94°6.71	\$15°22.65	69°43.50	10.3	\$25°49.37	6.7	54.9'
19	109°6.70	23.42	84°12.68	10.1'	25°56.07	6.6'	54.9'
20	124°6.69	24.19	98°41.79	10.0'	26°2.64	6.4'	54.9'
21	139°6.69	• • 24.96	113°10.82	9.9'	26° 9.08	6.3'	55.0'
22 23	154°6.68 169°6.67	25.73	127°39.76 142°8.63	9.9' 9.8'	26°15.40 26°21.60	6.2'	55.0'
23		26.50	142 8.03			6.1'	55.0'
	SD = 16.1'	d = 0.8'		SE	0 = 14.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.66	S 15°27.27	156°37.43	9.7'	S26°27.66	5.9'	55.0'
1	199°6.64	28.03 28.80	171°6.14	9.6'	26°33.60	5.8'	55.0'
2	214°6.63 229°6.62	28.80	185°34.78 200°3.35	9.6' 9.5'	26°39.40 26°45.08	5.7' 5.5'	55.0' 55.1'
4	244°6.61	30.33	214°31.84	9.3 9.4'	26°50.62	5.4'	55.1'
5	259°6.60	31.10	229°0.25	9.3'	$26^{\circ}56.04$	5.3'	55.1'
6	274°6.59	S15°31.87	243°28.60	9.3'	\$27°1.31	5.1'	55.1'
7	289°6.57	32.63	257°56.87	9.2'	27°6.46	5.0'	55.1'
8 9	304°6.56 319°6.55	33.39 •• 34.16	272°25.07 286°53.20	9.1' 9.1'	27°11.46 27°16.33	4.9' 4.7'	55.1' 55.2'
10	334°6.53	34.10	301°21.26	9.1	27°10.33	4.6	55.2'
11	349°6.52	35.69	315°49.25	8.9'	27°25.66	4.5'	55.2'
12	4°6.50	S15°36.45	330°17.18	8.9'	S27°30.12	4.3'	55.2'
13	19°6.49	37.21	344°45.04	8.8'	27°34.43	4.2'	55.2'
14 15	34°6.47 49°6.46	37.97 · · 38.73	359°12.84 13°40.57	8.7' 8.7'	27°38.60 27°42.64	4.0' 3.9'	55.3' 55.3'
15 16	49 6.46 64° 6.44	39.49	28°8.24	8. <i>1</i> 8.6'	27 42.04 27°46.53	3.9 3.7'	55.3'
17	79°6.43	40.25	42°35.85	8.5'	27°50.27	3.6'	55.3'
18	94°6.41	S15°41.01	57°3.40	8.5'	S27°53.88	3.5'	55.3'
19	109°6.39	41.77	71°30.88	8.4'	27°57.33	3.3'	55.3'
20	124°6.37	42.53	85°58.31	8.4'	28° 0.64	3.2'	55.4'
21 22	139°6.36 154°6.34	· · 43.29 44.05	100°25.69 114°53.01	8.3' 8.3'	28° 3.81 28° 6.83	3.0' 2.9'	55.4' 55.4'
23	169°6.32	44.05	114 55.01 129°20.27	8.2'	28° 9.70	2.9	55.4'
	SD = 16.1'	d = 0.8'			0 = 15.0'		
	JU = 10.1	u — U.0)L	- 10.0		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	06:16	07:40	09:13	14:13	15:45	17:09
N 70°	06:11	07:26	08:43	14:43	16:00	17:15
68°	06:06	07:14	08:21	15:05	16:12	17:19
66°	06:02	07:04	08:04	15:22	16:21	17:24
64°	05:59	06:56	07:50	15:36	16:30	17:27
62°	05:56	06:49	07:38	15:48	16:37	17:30
60°	05:53	06:43	07:28	15:58	16:43	17:33
N 58°	05:50	06:37	07:20	16:06	16:49	17:36
56°	05:48	06:32	07:12	16:14	16:54	17:38
54°	05:45	06:27	07:05	16:21	16:59	17:41
52°	05:43	06:23	06:59	16:27	17:03	17:43
50°	05:41	06:19	06:54	16:33	17:07	17:45
45°	05:36	06:11	06:42	16:45	17:16	17:50
N 40°	05:31	06:04	06:32	16:55	17:23	17:55
35°	05:27	05:57	06:23	17:03	17:30	18:00
30°	05:22	05:51	06:16	17:11	17:36	18:04
20°	05:14	05:40	06:03	17:24	17:47	18:13
N 10°	05:04	05:29	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:42	05:07	05:29	17:58	18:20	18:46
20°	04:27	04:54	05:17	18:10	18:33	19:01
30°	04:08	04:38	05:03	18:24	18:50	19:20
35°	03:56	04:28	04:55	18:32	18:59	19:32
40°	03:41	04:17	04:46	18:42	19:11	19:47
45°	03:23	04:03	04:35	18:53	19:25	20:05
S 50°	02:59	03:46	04:22	19:06	19:43	20:30
52°	02:47	03:37	04:16	19:12	19:51	20:42
54°	02:33	03:28	04:09	19:19	20:01	20:57
56°	02:16	03:17	04:02	19:27	20:12	21:14
58°	01:55	03:05	03:53	19:35	20:24	21:36
S 60°	01:27	02:50	03:43	19:45	20:39	22:05

Lat.	Moonrise			Moonset		
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°	11:37			12:53		
66°	10:27			14:04		
64°	09:51	12:09		14:41	14:03	
62°	09:25	11:15	13:26	15:07	14:58	14:35
60°	09:06	10:42	12:20	15:28	15:31	15:42
N 58°	08:49	10:19	11:45	15:45	15:56	16:16
56°	08:36	09:59	11:20	15:59	16:15	16:42
54°	08:24	09:43	11:00	16:12	16:32	17:02
52°	08:13	09:30	10:43	16:23	16:46	17:19
50°	08:04	09:18	10:29	16:33	16:58	17:34
45°	07:44	08:53	10:00	16:53	17:24	18:03
N 40°	07:29	08:33	09:37	17:10	17:44	18:26
35°	07:15	08:17	09:18	17:24	18:01	18:46
30°	07:04	08:03	09:02	17:37	18:16	19:02
20°	06:44	07:39	08:35	17:58	18:41	19:30
N 10°	06:27	07:18	08:12	18:17	19:03	19:54
0°	06:12	06:59	07:50	18:34	19:24	20:16
S 10°	05:56	06:40	07:29	18:52	19:44	20:39
20°	05:39	06:20	07:06	19:10	20:06	21:03
30°	05:20	05:57	06:39	19:32	20:31	21:31
35°	05:09	05:43	06:24	19:45	20:47	21:47
40°	04:57	05:28	06:06	20:00	21:04	22:07
45°	04:42	05:09	05:44	20:17	21:25	22:30
S 50°	04:24	04:46	05:16	20:39	21:52	23:00
52°	04:15	04:35	05:03	20:50	22:05	23:15
54°	04:06	04:22	04:47	21:02	22:20	23:33
56°	03:55	04:08	04:29	21:15	22:38	23:54
58°	03:43	03:52	04:07	21:32	23:00	
S 60°	03:29	03:32	03:39	21:51	23:28	

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age 1-3
,	00 ^h	12 ^h	Pass	Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-6%
02	16:27	16:27	11:44	12:23	00:00	
03	16:27	16:27	11:44	13:11	00:47	(2,230)
04	16:27	16:26	11:44	14:03	01:37	

November 05, 06, 07 UT (Tue., Wed., Thu.)

CHA	h	Aries	Venus	Mars	Jupiter	Saturn
0 44"40.01 18"379.00 529"7.00 281"55.63 921"40.05 325"12.17 102"21.83 50"45.38 508"43.49 1 1 50"60.04 34.57 1 50"50.0 3.86 50.0 3.86 50.0 3.86 50.0 3.86 50.0 3.86 50.0 3.86 50.0 3.86 50.0 3.85 50.0 50.0 50.0 50.0 50.0 50.0 50.0 5	Tue	GHΔ	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 99*49.4 93 18*38.60 7.28 209*55.20 34.85 300*24.77 21.02 7*47.89 43.50 18*35.00 17.33 7.78 21.12 7.78 21.12 7*47.89 43.50 1.33 205*58.30 3.00 10.00 1.20 11.00 10.00 1.20 11.00 10.00 1.20 11.00 10.00 1.20 11.0						
2 71 47 99 173 78 2 7.00 21 10 10 10 10 10 10 10 10 10 10 10 10 10						
3 89°9.41 1 20°9.52 1 30°3.54 6 311 341°59.90 1 35.5 6 30°2.97 6 21.99 10°5.91 2 43.5 1 510°5.34 218°3.33 3 8.38 39°7.46 34.66 40°3.51 5 21.66 1341°57.93 43.5 1 510°5.34 218°3.33 8 38°3.57 16.08 34.66 40°3.51 5 21.66 1341°57.93 43.5 1 510°5.34 218°3.35 218°3.34 218°3.35 3 8.38 39°7.46 34.66 40°3.51 5 21.66 1341°57.93 43.5 1 510°5.34 218°3.35 3 8.38 39°7.46 34.66 40°3.51 5 21.66 1341°57.93 43.5 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 30°4.35 1 510°5.34 1						
6 100*5287 2393-360 811 341*399 339*5146 34.6 40*35.15 21.56 134*57.95 43.54 51.57 1.50*52.4 218*3.3 38*33 39*14.6 34.6 40*35.15 21.56 134*57.95 43.55 127.0 10.10*21.4 37.6 40*35.15 1.50*04.4 5.56*43.5 127.0 10.10*21.4 37.6 127.1 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12						
5 119°55 34 218°58 33 8 38 357°146 34 466 0 136°75 12 15°164 508°135 43 18°57 38 18						
6 134°5700 26 248°33.68 6.92 27°400 34.27 57°3785 N22°21.55 136°0.44 586°43.57 10°1005 26 248°33.68 6.92 27°400 34.27 57°400 34.27 57°3785 N22°21.55 136°5.95 4.35°5 10°1015 110 27°53.20 1						
7 150*02.6 4.9*35.66 8.9.2 27*4.60 3.427 0*40.55 21.53 165*2.95 43.57 9 10*10*51.9 2.06*35.9 0.9 4.5 5*7*7.74 34.08 10*0*45.94 21.50 10*5*1.0*7 4.35.9 10*10*5*1.0*7 4.35.9 10*0*5*1.9 2.05*1.0*7 4.35.9 10*0*5*1.9 2.05*1.0*7 4.35.9 10*0*5*1.0*7 4.35.9 10*0*5*1.0*10*10*7 4.35.0 10*0*5*1.0*10*10*7 4.35.0 10*0*10*10*10*10*7 4.35.0 10*0*10*10*10*10*10*10*10*10*10*10*10*10						
8 1697273 20878283 9.19 42°6.17 34.17 84.26 12 34.17 84.26 12 34.06 100°4564 2.15 100°15767 37 4.359 10 100°1576 207331.17 9.79 77.74 33.06 100°4564 2.14 9.210°10.47 43.60 11 201°10.12 306°3.03 2.9 10.8 11.17 10.00 31.09 11.00°1576 4.12 2.14 72 225°12.08 4.351 11.17 11.10 11.						
9 10/519 29/31/17 972 77302 3330 15/546 12/49 20/10/47 43.60 10 1957 66 293*31.7 972 77302 3308 155*464 2149 20/10/47 43.60 11 20/10/10/2 30/50/30/33 90 87*710/80 33.80 10/5134 2149 20/10/10/47 43.60 11 20/10/10/2 30/50/50/30/30/30/30 90 87*710/80 33.80 10/5134 21/47 225*112.90 43.61 13 240*15/05 38*20/67 10/51 11/714/64 33.70 16/55/67 11/51/46 225*11.40 500*43.82 13 240*15/05 38*20/67 10/51 11/714/64 33.70 16/55/67 11/51/46 225*11.40 500*43.82 15 200*19/98 8*20/00 11.03 147*719 33.41 10/61/46 21/42 225*12.00 43.63 16 205*2244 22*26*17 11.20 16/2*18.77 33.41 200*48.83 21.40 300*25.52 43.66 18 315*2737 37*25/50 525*11.80 10/2*2103 N21*33.22 225*15/50 21.39 315*28.03 43.68 18 315*2737 37*25/50 525*11.80 10/2*2103 N21*33.22 225*15/50 21.39 315*28.03 43.69 18 315*2737 37*25/50 525*11.80 10/2*2103 N21*33.22 225*15/50 21.39 315*28.03 43.69 18 315*2737 31*25/50 525*11.80 10/2*2103 N21*33.22 225*15/50 21.39 315*28.03 43.69 18 315*2737 31*25/50 525*11.80 10/2*2103 N21*33.22 225*15/50 21.39 315*28.30 43.69 18 315*2737 31*25/50 525*11.80 10/2*2103 N21*33.22 225*15/50 21.39 315*24.50 43.72 22 15*37/23 315*21.6 12.81 225*22.82 33.83 226*15/50 41.21 318 00*35.35 43.72 22 15*37/33 315*21.6 12.81 225*22.82 33.83 226*15/50 41.21 318 00*35.35 43.72 22 15*37/33 315*21.7 12.81 31.81 225*23.85 32.75 311*23.74 21.30 45*43.06 43.72 23 30*39.69 126*20.33 13.06 26*729.83 32.75 311*23.74 21.30 45*43.06 43.72 24 10*57.04 21.41 21.4						
10 10 10 10 10 10 10 10						
11 220°10 12 200°30 33 90 87°10 80 33.89 130°51 34 2147 225°12.08 43.61 12 220°12 93 332°02 95°510 25 121°12 46 721°31 145°54 40 227°12 46 220°15 45 250°18 43.61 45°51 51 45°51 45°51 45°51 51 51 51 51 51 51 51						
12 226*12.59 338*28.67 10.51 11*1*14.04 33.70 160*56.74 21*34 24*0*15.49 508*43.62 14.02 30*15.65 338*28.74 30 10.77 132*15.61 33.60 17*5*96.43 21*43 270*20.50 43.64 15.27*19.98 8*27.00 11.03 147*17.19 33.51 191*21.33 21*42 23*20*20.50 43.64 15.27*19.98 8*27.00 11.03 147*17.19 33.51 191*21.33 21*42 23*20*20.50 43.66 15.28*22.44 23*20*20.52 21*55.51 11.55 11*7*17.19 33.51 191*21.33 21*42 23*20*20*20 43.66 15.20 11*55 11*55 11*57*17*19 33.41 200*48.3 21*40 300*25.52 43.66 11*30*20*20*30*30*30*20*30 83*228.33 11.55 11*50*20*20*20*20*20*20*20*20*20*20*20*20*20						
13 26°15.05 338°28.07 10.51 117"14.04 33.70 100"56.74 21.45 25°18.00 43.64 15 270°19.09 82°27.00 11.03 147"17.19 135.51 191°2.13 21.42 286°23.01 1 .43.05 15 270°19.09 82°27.00 11.03 147"17.19 135.51 191°2.13 21.42 286°23.01 1 .43.05 16 208°22.44 23°5.07 1 .12 0 10"51.877 33.31 1 200°48.01 21.43 200°25.52 4 .36.66 13.00"25.24 33.35 200°25.52 4 .36.66 13.00 28.24 1 .20 1		225° 12.59	323°29.50 \$25°10.25	102°12.46 N21°33.79	145°54.04 N22°21.46	240°15.49 \$08°43.62
15 28°22.44 23°6.17 11.29 16'218.77 33.51 191°21.3 21.42 28°23.01 ·	13	240°15.05				
16 285 224 23 261 71 11 29 162 187 33 41 2006 48.5 21.40 3006 36.5 24.36 43.68 18 315 27.37 27.77 27.20 33.32 221 75.53 21.39 3106 308 3	14	255° 17.51	353°27.83 10.77	132°15.61 33.60	175°59.43 21.43	270°20.50 43.64
18 318°27.37 53°24.90 52°11.80 122.19 127.2132 230°10.24 122°13.39 315°28.03 4.4 43.70 193 39°29.38 68°23.66 12.03 122°12.95 123°13.22 230°10.24 122°13.19 330°30.33 530°43.66 120 330°29.38 58°23.66 12.31 22°22.59 9 33.03 260°15.64 21.34 10°35.55 43.71 12°21.15°37.22 11°3°21.61 12.81 25°22.85 23°3.03 260°15.64 21.34 10°35.55 43.71 12°21.15°37.23 11°3°21.61 12.81 25°22.85 23°3.24 250°21.23 11°3°21.65 1.43°13.04 13.73 15°38.05 1.43°12.34 11°3°21.05 12.81 25°22.85 23°3.24 250°21.23 11°3°21.05 1.43°13.06 25°7°29.83 32.75 311°23.74 21.30 45°43.06 43.74 14.75	15					285°23.01 · · 43.65
18 315°27.37 53°24.50 525°11.00 192°21.93 N21°33.22 236°10.24 N22°21.37 330°30.53 508°4.38 02 345°32.30 83°22.83 1.21 1222°25.00 33.03 3260°15.64 21.34 30°35.55 43.71 21.0°34.76 98°21.99 1.256 227°26.67 3.294 281°18.34 21.33 15°38.05 × 43.72 22 15°37.23 13°37.05 12.81 222°25.00 33.03 3.066°15.64 21.34 30°35.55 43.71 22 30°39.60 128°20.33 13.06 252°20.25 32.04 290°21.04 21.31 30°40.56 43.73 40°22.33 13.06 20°72.08 33.27 5311°23.74 21.30 45°43.00 43.74 40°50.00 128°20.33 13.06 26°72.08 33.27 5311°23.74 21.30 45°43.00 43.74 40°50.00 128°20.33 13.06 26°72.08 33.27 5311°23.74 21.30 45°43.00 43.74 40°50.00 128°20.33 13.06 26°72.08 33.27 5311°23.74 21.30 45°43.00 43.74 40°50.00 128°20.30 13.00 128°20						
19 330°29.83 68°23.66 1.206 20°23.51 33.13 251°12.94 21.36 345°33.04 43.70 20 345°3.203 68°22.93 12.31 12.20°5.06 7 32.94 281°18.34 21.33 15°38.05 43.72 21 15°37.22 113°21.16 12.81 222°25.96 33 32.76 281°18.34 21.33 15°38.05 43.72 22.15°37.22 113°21.16 12.81 222°23.26 32.82 296°21.04 21.31 30°40.56 43.73 23.30°39.69 128°20.33 ′m-4.04						
221 0"3476 99"2199 1.256 227"2667 3.394 281"18.34 2.233 15"38.05 + 43.72						
221 15/37/20 137/2116 12.81 25/27/26.67 32.94 296/2104 21.31 307/40.66 43.72 23.307/30.69 1287/20.33 13.06 2507/29.83 33.75 3111/23.74 21.30 45/43.06 43.74 43.7						
22						
Mer. pass. 20:58 ν-0.8′ d'0.3′ m·4.04 ν1.6′ d·0.1′ m·0.00 ν2.7′ d·0.0′ m·2.71 ν2.5′ d/0.0′ m/8.2 Wed GHA GHA Dec GHA AU						
Wed GHA GHA Gec GHA Dec GHA GHA <td>23</td> <td>30°39.69</td> <td>128°20.33 13.06</td> <td>267°29.83 32.75</td> <td></td> <td>45°43.06 43.74</td>	23	30°39.69	128°20.33 13.06	267°29.83 32.75		45°43.06 43.74
0	Mer.p	pass. 20:58	ν -0.8′ d0.3′ m-4.04	$ u 1.6' \ d$ -0.1' m-0.00	$\nu 2.7' \ d$ -0.0' m-2.71	ν2.5′ d0.0′ m0.82
0						
0	Wed	GHΔ	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 60°44 62 18°18.66 13.56 29°733.00 32.56 341°29.15 21.27 75°48.07 43.76 32.87 30°49.55 188°16.99 14.05 312°34.95 32.47 386°31.85 21.25 90°90.58 43.77 39°49.55 120°95.01 203°16.15 14.29 342°37.67 32.28 26°37.26 21.22 120°55.59 43.79 51.00°95.18 43.80 4						
2 75°4708 173°17.82 13.80 312°34.59 32.47 356°31.85 21.25 90°50.58 43.77 4 105°52.01 203°16.15 14.29 32°17.65 32.29 46°37.26 21.24 105°53.09 43.78 4 105°52.01 203°16.15 14.29 32°17.65 32.29 46°37.26 21.24 105°55.99 43.79 5 120°44.8 218°15.31 14.53 357°39.55 32.19 41°39.96 21.21 135°56.81 0 43.80 6 135°56.94 233°14.48 525°14.78 15.22 40.94 N21°32.10 56°42.67 N22°21.19 151°0.05 506°43.81 7 150°9.00 248°13.64 15.02 27°42.33 32.00 56°42.67 N22°21.19 151°0.06 506°43.81 8 166°1.87 263°12.81 15.25 42°44.12 31.91 86°48.08 21.16 181°5.61 43.83 181°43.3 278°11.97 15.49 57°4.57 2.31 82 101°50.78 21.15 196°8.11 43.83 10 196°6.00 293°11.14 15.73 72°47.31 31.73 116°53.49 21.13 211°10.62 43.85 11 211°9.05 308°10.30 15.96 87°48.00 31.63 313°56.19 21.12 226°13.12 43.85 12 226°11.73 332°0.46 525°16.20 102°50.50 N21°3.154 146°58.00 N22°2.10 241°15.63 508°43.86 12 226°11.73 332°0.46 525°16.20 102°50.50 N21°3.154 146°58.00 N22°2.10 241°15.63 508°43.86 13 241°14.19 335°7.79 16.66 132°53.99 31.36 177°43.17 21.07 271°20.63 43.88 15 271°19.12 8°6.95° 16.89 147°55.29 31.27 120°7.02 21.66 286°23.14 43.89 16 286°21.58 23°6.12 17.12 162′56.68 31.17 207°17.02 21.60 286°23.14 43.89 17 301°24.05 38°5.28 17.34 177°55.88 31.08 222°12.44 21.03 316°26.14 43.89 18 316°26.51 55°44.44 525°17.57 17°58.48 31.08 222°17.65 20.99 346°33.15 43.94 21 1°33.90 96°1.93 18.24 238°4.89 30.72 222°32.77 20.99 610°38.15 43.94 21 1°33.90 96°1.93 18.24 238°4.89 30.72 222°32.77 20.99 610°38.15 43.94 22 10°36.37 113°1.09 18.46 253°6.49 30.63 222°17.65 20.99 346°33.15 43.94 21 1°33.60 40°2.70 4.05 22 10°36.67 113°1.09 18.46 253°6.94 30.63 222°17.65 20.99 16°36.66 43.99 3 10°48.69 187°55.91 19.55 328°14.52 13.00 182°35.3 20.89 110°53.16 43.99 3 10°48.69 187°55.91 19.55 328°14.52 13.00 182°35.3 20.89 110°53.65 44.00 4 106°51.15 202°56.00 19.76 343°16.13 30.09 222°11.00 206°31.64 43.90 3 10°48.69 187°55.91 19.55 328°14.82 12.20 180°5.3 20.99 110°36.66 44.00 4 10°3.37 48.55 20 20.99 183°3.5 20.99 19°38.65 44.00 4 10°3.3						
3 90°49.55 188°16.99 · · 14.05 327°36.18 · · 32.37 · 11°34.56 · · 21.24 105°55.09 · · 44.78 · 10°55.01 20°16.15 · 14.9 342°37.76 32.28 2 26°37.26 21.22 120°55.59 · 44.379 · 5 · 120°54.48 218°15.31 · 14.53 357°39.35 32.19 · 41°39.96 · 21.21 135°58.10 · 43.80 · 15.00 · 120°54.48 · 120°14.48 · 120°44.49 · 120°44.49 · 12						
105°52.01 203°16.15 14.29 342°37.76 32.28 26°37.26 21.22 120°55.59 43.79 5 120°54.48 218°15.31 14.81 357°39.35 32.19 41°39.06 21.21 135°56.10 43.80 6 138°56.94 223°14.48 525°14.78 12°40.94 N21°32.10 56°42.67 N22°21.19 151°0.60 508°43.81 7 150°59.40 248°13.64 15.00 27°42.33 32.00 71°43.7 21.18 151°0.60 508°43.81 8 166°1.87 263°12.81 15.25 42°44.12 31.91 86°40.08 21.16 181°5.61 43.83 9 131°4.33 276°11.97 15.49 57°45.72 31.82 101°50.78 21.15 196°8.11 43.84 10 196°6.80 293°11.14 15.73 72°47.31 31.73 116°53.49 21.13 211°10.62 43.85 11 211°9.26 306°10.30 15.96 87°48.90 31.63 131°55.19 21.12 226°13.12 43.85 12 226°11.17 323°9.46 525°16.20 102°50.50 N21°3.15 416°58.90 N22°2.110 241°15.63 508°43.86 13 241°14.19 338°8.63 16.43 117°52.99 31.45 162°1.61 21.09 256°18.13 43.87 14 256°1.66 335°3.779 16.66 132°53.69 31.36 177°4.31 21.07 272°0.63 43.88 15 2271°19.12 8°6.95 16.89 147°55.29 31.27 192°7.02 21.06 286°23.14 43.89 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°28.14 43.91 13 316°26.15 33°4.44 525°17.57 193°0.08 N21°3.99 237°15.14 N22°21.01 3316°28.14 43.91 13 316°36.1 438°3.44 525°17.57 193°0.08 N21°3.99 237°15.14 N22°21.01 3316°28.14 43.94 21 1°33.90 98°1.93 18.24 238°4.89 30.72 226°23.77 20.06 61°38.15 43.94 21 1°33.90 98°1.93 18.24 238°4.89 30.72 226°23.77 20.09 61°48.16 43.94 21 1°33.90 98°1.93 18.24 238°4.89 30.72 282°23.77 20.09 61°48.16 43.94 21 1°33.90 98°1.93 18.24 238°4.89 30.72 238°4.89 20.95 31°4.65 43.94 21 1°33.90 98°1.93 18.24 238°4.89 30.72 238°4.89 20.95 31°4.65 43.94 21 1°33.90 98°1.93 18.24 238°4.99 30.54 312°3.64 508°5.16 43.94 21						
5 120°54 48 218°15.31						
6 135°56.94 233°14.48 525°14.78 12°40.94 N21°22.10 56°42.67 N22°21.19 151°0.60 508°43.81 7 150°59.40 248°13.64 150°2 27°42.33 32.00 71°43.73 21.18 151°0.60 508°43.81 8 166°1.87 263°12.81 15.25 42°44.12 31.91 86°48.08 21.16 181°5.61 43.83 9 181°43.3 278°11.07 1.154 40 57°45.72 31.82 101°50.78 21.15 196°8.11 143.84 10 196°6.80 293°11.14 15.73 72°47.31 31.73 116°53.49 21.13 211°10.62 43.85 11 211°9.26 308°10.30 15.96 87°48.00 31.63 131°56.19 21.12 226°13.12 43.85 11 211°10.62 43.85 11 210°10.62 43.85 11 2						
8 166°1.87 263°12.81 15.25 42°44.12 31.91 86°48.08 21.16 181°5.61 43.83 9 181°4.33 278°11.97 1.54.9 57°48.72 31.82 101°50.78 21.15 16°8.11 .43.84 10 196°6.80 293°11.14 15.73 72°47.31 31.73 116°83.49 21.13 211°10.62 43.85 11 211°9.26 308°10.30 15.96 87°48.90 31.63 131°56.19 21.12 226°13.12 43.85 12 226°11.73 323°9.46 525°16.20 102°50.50 N21°31.54 146°58.90 N22°23.10 241°15.63 508°43.86 13 241°14.19 338°8.63 16.43 117°52.09 31.45 166°8.10 21.09 256°18.13 43.87 14 256°16.65 353°7.79 16.66 132°53.69 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 1.689 147°55.29 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 1.689 147°55.29 31.27 192°7.02 21.06 286°23.14 43.89 16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 43.90 31°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°28.14 43.91 318°32.89 68°3.61 17.79 208°1.68 30.09 252°17.05 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°35.65 43.94 21 1°33.99 86°1.93 18.24 238°4.89 30.72 222°32.77 20.09 46°33.15 43.93 22 16°36.37 113°1.09 18.46 253°6.89 30.03 252°17.05 20.99 346°33.15 43.99 22 16°36.37 113°1.09 18.46 253°6.89 30.03 37°25.08 20.95 31°40.65 43.99 42 16°43.76 157°55.58 19.12 298°11.31 30.36 432°3.11 20.09 76°48.16 43.99 31°3.66 43.99 31°3.66 42.21 12°55.69 187°56.91 298°1.13 30.27 357°56.62 20.98 1°35.66 43.99 41 106°51.15 202°56.07 19.76 343°1.29 30.27 382°3.14 N22°2.10 16°38.15 143°9.99 31°3.66 43.99 31°3.66 60 20.99 31°3.66 43.99 31°3.66 43.99 31°3.66 60 20.99 31°3.66 43.99 31°3.66 60 20.99 31°3.66 44.00 46°41.30 142°59.42 225°18.90 288°9.70 N21°30.45 327°31.40 N22°20.92 61°45.66 508°43.97 15°55.55 21°55.5	6	135°56.94	233°14.48 S 25°14.78	12°40.94 N21°32.10		151°0.60 \$08°43.81
8 166°1.87 263°12.81 15.25 42°44.12 31.91 86°48.08 21.16 181°5.61 43.83 9 181°4.33 278°11.97 1.54.9 57°48.72 31.82 101°50.78 21.15 16°8.11 .43.84 10 196°6.80 293°11.14 15.73 72°47.31 31.73 116°83.49 21.13 211°10.62 43.85 11 211°9.26 308°10.30 15.96 87°48.90 31.63 131°56.19 21.12 226°13.12 43.85 12 226°11.73 323°9.46 525°16.20 102°50.50 N21°31.54 146°58.90 N22°23.10 241°15.63 508°43.86 13 241°14.19 338°8.63 16.43 117°52.09 31.45 166°8.10 21.09 256°18.13 43.87 14 256°16.65 353°7.79 16.66 132°53.69 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 1.689 147°55.29 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 1.689 147°55.29 31.27 192°7.02 21.06 286°23.14 43.89 16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 43.90 31°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°28.14 43.91 318°32.89 68°3.61 17.79 208°1.68 30.09 252°17.05 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°35.65 43.94 21 1°33.99 86°1.93 18.24 238°4.89 30.72 222°32.77 20.09 46°33.15 43.93 22 16°36.37 113°1.09 18.46 253°6.89 30.03 252°17.05 20.99 346°33.15 43.99 22 16°36.37 113°1.09 18.46 253°6.89 30.03 37°25.08 20.95 31°40.65 43.99 42 16°43.76 157°55.58 19.12 298°11.31 30.36 432°3.11 20.09 76°48.16 43.99 31°3.66 43.99 31°3.66 42.21 12°55.69 187°56.91 298°1.13 30.27 357°56.62 20.98 1°35.66 43.99 41 106°51.15 202°56.07 19.76 343°1.29 30.27 382°3.14 N22°2.10 16°38.15 143°9.99 31°3.66 43.99 31°3.66 60 20.99 31°3.66 43.99 31°3.66 43.99 31°3.66 60 20.99 31°3.66 43.99 31°3.66 60 20.99 31°3.66 44.00 46°41.30 142°59.42 225°18.90 288°9.70 N21°30.45 327°31.40 N22°20.92 61°45.66 508°43.97 15°55.55 21°55.5		150° 59.40	248° 13.64 15.02	27°42.53 32.00		
10 196°6.80 293°11.14 15.73 72°47.31 31.73 116°53.49 21.13 211°10.62 43.85 11 211°9.26 388°10.30 15.96 87°48.90 31.63 131°56.19 21.12 226°13.12 43.85 12 226°11.73 333°9.46 \$25°16.20 102°50.50 N21°31.54 146°58.90 N22°21.10 241°15.63 \$08°43.86 13 241°14.19 338°8.63 16.43 117°52.09 31.45 162°1.61 21.09 25°18.13 43.87 14 256°16.65 535°7.79 16.66 132°53.69 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 · 16.89 147°55.29 · 31.27 192°7.02 · 21.06 266°23.14 · · · 43.89 16 28°6.15 271°19.12 8°6.95 · 16.89 147°55.29 · · 31.27 192°7.02 · · 21.06 266°23.14 · · · 43.89 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°28.44 43.91 18 316°26.51 53°4.44 \$25°17.57 193°0.08 N21°30.99 23°17.15.14 N22°21.03 316°38.14 43.91 231°28.98 68°3.61 17.79 208°1.68 30.90 252°17.85 20.99 346°33.15 43.93 20 346°31.44 38°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°265.55 43.94 22 16°36.37 113°1.09 18.46 253°56.49 30.63 297°25.99 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.66 266°8.09 30.54 312°28.66 20.99 366°36.15 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.99 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.66 266°8.09 30.54 312°28.66 20.99 366°31.6 43.96 22 76°46.22 172°57.74 19.33 313°12.91 30.27 35°5.68 20.89 91°50.66 34.99 31°9.56 60 43.99 31°9.56 60 43.99 187°56.08 232°54.39 525°2.18 19.97 358°17.74 30.00 42°44.95 20.89 19°50.66 43.99 31°15°5.68 20.99 187°56.01 19.55 328°14.52 · 30.18 12°9.35 · 20.89 19°50.66 43.99 31°29.56 60 29.90 18°55.08 20.90 19°50.66 44.01 197°5.94 202°51.04 21.02 73°25.80 29.95 11°58.51 20.67 508°44.00 12°15°4.05 60 20.90 18°35.15 44.00 197°5.94 202°51.04 21.02 73°25.80 29.95 11°58.51 20.67 508°44.00 12°15°4.05 60 20.90 18°35.17 44.00 197°5.94 202°51.04 21.02 73°25.80 29.95 11°58.51 20.66 212°15.06 44.00 12°23.47 277°51.88 20.18 133°33.26 29.90 11°58.55 247°33.15 44.00 12°25.80 29.90 11°38.56 20.90 11°38.17 44.00 12°23.47 277°51.88 20.18 133°32.26 29.20 11°8°3.37 20.00 22°55.66 44.10 11°27°4.03 37°4.05 22.21 16°33.31 37°4.85 22.21 103°39.30 N21°9.33 148°3.94 N22°20.73 242°15.67 508°	8	166°1.87	263°12.81 15.25		86°48.08 21.16	181°5.61 43.83
11 211°9.26 308°10.30 15.96 87°48.90 31.63 131°56.10 21.12 226°13.12 43.85 122 226°11.73 323°9.46 525°16.20 100°50.50 N21°31.54 146°58.90 N22°21.10 241°15.63 508°43.86 13 241°14.19 338°8.63 16.43 117°52.09 31.45 166°59.00 N22°21.00 241°15.63 508°43.86 13 241°14.19 338°8.63 16.43 117°52.09 31.45 166°51.61 21.09 256°18.13 43.87 14 256°16.65 353°7.79 16.66 132°55.69 31.36 177°4.31 21.07 271′20.63 43.88 15 271°19.12 8°6.95 16.89 147°55.29 31.27 192′70.2 22.10 266°23.14 43.89 16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 301°25.64 43.90 17 301′24.05 38°5.28 17.34 177°58.48 31.08 222′12.44 21.03 316°28.14 43.91 18 316°26.51 53°4.44 \$25°17.57 193°0.08 N21°30.99 237°15.14 N22°21.01 331°30.64 508°34.92 230°346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°35.65 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.95 22 16°36.37 113°1.09 18.46 255°6.49 30.63 297°25.98 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 268°8.09 30.54 312°28.69 20.93 46°43.16 43.99 21 61°43.76 157°8.85 19.12 298°11.31 30.36 342°34.41 20.90 76°48.16 43.99 21 61°43.76 157°8.85 19.12 298°11.31 30.36 342°34.41 20.90 76°48.16 43.99 21 61°43.76 157°8.85 19.12 298°11.31 30.36 342°34.41 20.90 76°48.16 43.99 21 61°45.66 508°43.97 318°12.99 15°46.69 20.98 116°6.69 1.06°63.16 · 43.99 21 12°56.69 20.98 21°57°5.52 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.00 140°59.15 202°51.04 21.05 50.28 18.99 20.99 182°5.67 44.03 19.95 122°56.00 20.98 113°3.00 202°55.80 20.87 106°53.16 · 43.99 21.22 88°27.79 18.80 · 20.81 138°3.32 20.75 227°13.17 44.00 11.22°8.40 307°50.20 21.22 88°27.18 29.99 15°47.66 N22°0.07 182°5.67 44.03 11°28°4.00 307°50.20 21.22 88°27.19 13.93 N21°29.31 148°3.94 N22°20.73 227°13.17 44.00 11.22°8.40 307°50.20 21.22 88°27.18 20.99 16°6.65 20.70 20.72°20.67 44.00 11.22°8.40 307°50.20 21.22 88°27.19 20.91 178°9.37 20.70 222°0.	9	181°4.33	278°11.97 · · 15.49	57°45.72 · · 31.82	101°50.78 · · 21.15	196°8.11 · · 43.84
12 226°11.73 323°9.46 525°16.20 102°50.50 N21°31.54 146°58.90 N22°21.10 241°15.63 508°43.86 13 241°4.19 338°8.63 16.43 117°52.09 31.45 162°1.61 21.09 256°18.13 43.87 14 256°16.65 353°7.79 16.66 132°53.69 31.36 177°4.31 21.07 271′20.63 43.88 15 271°19.12 8°6.95 · · · 16.89 147°55.29 · · · 31.27 192°7.02 · · · 21.06 266°23.14 · · · 43.89 16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 301°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°28.14 43.91 18 316°26.51 53°4.44 \$25°17.57 193°0.08 N21°30.99 237°15.14 N22°21.01 331°30.84 63.93 123°3.90 89°1.93 · · 18.24 238°4.89 30.72 262°23.27 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.51 267°20.56 20.98 1°35.65 43.94 22 16°36.37 113°1.09 18.46 255°6.49 30.63 297°25.98 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.95 31°40.65 43.96 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.95 31°40.65 43.96 24 31.06 43.96 24 30.06 24 312°25.00 20.93 46°31.64 43.96 24 30.06 24 312°25.00 20.93 46°31.64 43.96 250°6.09 250°1.00 20.93 46°31.64 43.96 250°1.00 20.00 20.00 30.00 20.00	10	196°6.80	293°11.14 15.73	72°47.31 31.73	116°53.49 21.13	211°10.62 43.85
13 241°14.19 338°8.63 16.43 117°52.09 31.45 162°1.61 21.09 256°18.13 43.87 14 256°16.65 338°7.79 16.66 132°353.69 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 · 16.89 147°55.29 · 31.27 192°7.02 · 21.06 286°23.14 · 43.89 16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 301°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°26.51 43.91 18 316°26.51 53°4.44 \$25°17.57 193°0.08 N21°30.99 237°15.14 N22°21.01 331°30.64 \$08°43.91 17.79 208°1.68 30.90 252°17.85 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 26°20.56 20.98 1°35.65 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.95 23 31°38.83 128°0.26 18.69 268°8.09 30.54 312°28.69 20.99 346°43.16 43.96 22 276°46.22 172°57.74 19.33 313°12.91 30.27 35°36.82 20.89 91°50.66 43.99 22 76°46.22 172°57.74 19.33 313°12.91 30.27 35°36.82 20.89 91°50.66 43.99 22 76°46.22 172°57.74 19.33 313°12.91 30.27 35°36.82 20.89 91°50.66 43.99 22 76°46.22 172°55.23 19.97 358°41.52 30.18 12°39.55 20.87 106°53.16 · 43.99 24 106°51.15 202°56.07 19.76 343°1.74 30.00 42°44.95 20.84 136°58.16 40.01 12°53.62 217°55.23 19.97 358°1.774 30.00 42°44.95 20.84 136°58.16 40.01 12°1.00 20°51.05 247°55.25 20.99 28°20.96 29.92 72°50.38 20.81 106°53.16 · 43.99 182°3.47 277°51.88 · 20.81 55°24.18 · 29.64 102°55.80 · 20.78 197°8.17 44.03 18°23.47 277°51.88 · 20.81 55°24.18 · 29.64 102°55.80 · 20.78 197°8.17 44.03 11°22°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.00 12°28.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.03 12°28.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.00 12°28.40 307°50.20 21.22 88°27.41 29.46 133°1.20 20.64 332°30.66 508°44.11 122°8.40 307°50.20 21.22 88°27.41 29.46 133°1.20 20.68 287°23.16 · 44.09 12°28.20 30°23.19 37°45.11 44.00	11	$211^{\circ}9.26$	308°10.30 15.96			226°13.12 43.85
14 256°16.65 333°7.79 16.66 132°53.69 31.36 177°4.31 21.07 271°20.63 43.88 15 271°19.12 8°6.95 · 16.89 147°55.29 · 31.27 192°7.02 · 21.06 286°23.14 · 43.89 16 268°21.58 23°6.12 17.12 162°55.88 31.17 207°9.73 21.04 301°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°28.14 43.91 18 316°26.51 53°4.44 \$252°17.57 193°0.08 N21°30.99 2178.15 21.01 331°30.64 \$208.43.92 19 331°28.98 68°3.61 17.79 208°1.68 30.90 252°17.85 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.99 1°35.65 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.95 23 31°38.83 1288°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 Mer.pass. 20:54	12					
15 271°19.12 8°6.95 · 16.89 147°55.29 · 31.27 192°7.02 · 21.06 286°23.14 · 43.89 16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 301°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 21.03 316°26.14 43.91 18 316°26.51 53°4.44 \$25°17.57 193°0.08 N21°30.99 237°15.14 N22°21.01 331°30.64 \$08°43.92 19 331°38.89 68°3.61 17.79 208°1.68 30.90 25°17.85 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.99 13°5.65 43.94 21 1°33.90 98°1-93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 29°25.98 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 21 40°40.25 40°						
16 286°21.58 23°6.12 17.12 162°56.88 31.17 207°9.73 21.04 301°25.64 43.90 17 301°24.05 38°5.28 17.34 177°58.48 31.08 222°12.44 1.03 316°26.64 43.90 18 316°26.51 53°4.44 \$25°17.57 193°0.08 N21°30.99 237°15.14 N22°21.01 331°30.64 \$08°43.92 19 331°28.98 68°3.61 17.79 208°1.68 30.90 252°17.85 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°35.65 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.96 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.96 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°26.69 20.93 46°43.16 43.96 24 20.85 20.95 21.25						
17 301° 24.05 38° 5.28 17.34 177° 58.48 31.08 222° 12.44 21.03 316° 28.14 43.91 18 316° 26.51 53° 4.44 525° 17.57 193° 0.08 N21° 30.99 237° 12.14 N22° 21.01 331° 30.64 508° 43.92 19 331° 28.98 68° 3.61 17.79 208° 1.68 30.90 252° 17.85 20.99 346° 33.15 43.93 20 346° 31.44 38° 2.77 18.02 223° 3.29 30.81 267° 20.56 20.98 1° 35.65 43.94 21 1° 33.90 98° 1.93 18.24 238° 4.89 30.63 297° 25.98 20.95 31° 40.65 43.95 23 31° 38.83 128° 0.26 18.68 268° 8.09 30.54 312° 28.69 20.95 31° 40.65 43.95 23 31° 38.83 128° 0.26 18.68 268° 8.09 30.54 312° 28.69 20.93 46° 43.16 43.96 4						
18 316°26.51 53°4.44 S25°17.57 193°0.08 N21°30.99 23°15.14 N22°21.01 331°20.64 S08°43.92 19 331°28.98 68°3.61 17.79 208°1.68 30.90 255°17.85 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.55 20.98 1°35.56 43.94 21 1°33.90 98°1.93 ·· 18.24 238°4.89 ·· 30.72 282°33.27 ·· 20.96 16°38.15 ·· 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 23 31°38.83 128°0.26 18.68 283°9.70 N21°30.45 312°28.69 20.93 46°43.16 43.96 24 24 24 25°4.25 21°2.25′40.0′ m0.82 25°1.31 30°4.65 31.20°4.25 21°2.25′40.0′ m0.82 25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.65 31°2.25°1.31 30°4.25°1.3						
19 331°28.98 68°3.61 17.79 208°1.68 30.90 252°17.85 20.99 346°33.15 43.93 20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°35.65 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 22 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 20.95						
20 346°31.44 83°2.77 18.02 223°3.29 30.81 267°20.56 20.98 1°35.65 43.94 21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · · · · · · · · · · · · · · · · · · ·						
21 1°33.90 98°1.93 · 18.24 238°4.89 · 30.72 282°23.27 · 20.96 16°38.15 · 43.94 22° 16°36.37 113°1.09 18.46 253°6.49 30.63 297°25.98 20.95 31°40.65 43.95 43.95 23 31°38.83 128°0.26 18.68 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 268°8.09 30.54 312°28.69 20.93 46°43.16 43.96 268°8.09 30.54 21.00 20.57 40.0′ m-2.72 20.5′ d0.0′ m0.82 20.56 20.56 20.5′ d0.0′ m0.82 20.56 20.5′ d0.0′ m0.82 20.5′ d0.0′ d						
22						
Mer.pass. 20:54 ν-0.8' d0.2' m-4.05 ν1.6' d-0.1' m-0.02 ν2.7' d-0.0' m-2.72 ν2.5' d0.0' m0.82						
Mer.pass. 20:54 ν -0.8′ d 0.2′ m-4.05 ν 1.6′ d -0.1′ m-0.02 ν 2.7′ d -0.0′ m-2.72 ν 2.5′ d 0.0′ m0.82 ν 2.5′ d 0.0′ m0.82 ν 2.7′ d -0.0′ m-2.72 ν 2.5′ d 0.0′ m0.82 ν 2.7′ d -0.0′ m-2.72 ν 2.5′ d 0.0′ m0.82 ν 2.7′ d -0.0′ m-2.72 ν 2.5′ d 0.0′ m0.82 ν 2.7′ d -0.0′ m-2.72 ν 2.5′ d 0.0′ m0.82 ν 2.8′ d 0.4° d 0.4° d 0.3′ d 0.4°						
Thu GHA GHA Dec GHA Gold State Sta						
0 46°41.30 142°59.42 S25°18.90 283°9.70 N21°30.45 327°31.40 N22°20.92 61°45.66 S08°43.97 1 61°43.76 157°58.58 19.12 298°11.31 30.36 342°34.11 20.90 76°48.16 43.98 2 76°46.22 172°57.74 19.33 313°12.91 30.27 357°36.82 20.89 91°50.66 43.99 391°48.69 187°56.91 · 19.55 328°14.52 · 30.18 12°39.53 · 20.87 106°53.16 · 43.99 4 106°51.15 202°56.07 19.76 343°16.13 30.09 27°42.24 20.86 121°55.66 44.00 5 121°55.60 227°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 57°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · 20.81 58°24.18 · 29.64 102°55.80 · 20.78 197°8.17 · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · 22.03 148°33.88 · 29.11 193°12.08 · 20.68 287°23.16 · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°2.262 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 508°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°2.294 20.62 347°33.16 44.12 20 347°30.58 22°40.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°30.58 22°45.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°30.58 22°45.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14	Mer.p	pass. 20:54	ν -0.8′ d 0.2′ m -4.05	$\nu 1.6' \ d$ -0.1' m-0.02	$\nu 2.7' \ d$ -0.0' m-2.72	$\nu 2.5' \ d0.0' \ m0.82$
0 46°41.30 142°59.42 S25°18.90 283°9.70 N21°30.45 327°31.40 N22°20.92 61°45.66 S08°43.97 1 61°43.76 157°58.58 19.12 298°11.31 30.36 342°34.11 20.90 76°48.16 43.98 2 76°46.22 172°57.74 19.33 313°12.91 30.27 357°36.82 20.89 91°50.66 43.99 391°48.69 187°56.91 · 19.55 328°14.52 · 30.18 12°39.53 · 20.87 106°53.16 · 43.99 4 106°51.15 202°56.07 19.76 343°16.13 30.09 27°42.24 20.86 121°55.66 44.00 5 121°55.60 227°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 57°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · 20.81 58°24.18 · 29.64 102°55.80 · 20.78 197°8.17 · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · 22.03 148°33.88 · 29.11 193°12.08 · 20.68 287°23.16 · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°2.262 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 508°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°2.294 20.62 347°33.16 44.12 20 347°30.58 22°40.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°30.58 22°45.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°30.58 22°45.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
0 46°41.30 142°59.42 S25°18.90 283°9.70 N21°30.45 327°31.40 N22°20.92 61°45.66 S08°43.97 1 61°43.76 157°58.58 19.12 298°11.31 30.36 342°34.11 20.90 76°48.16 43.98 2 76°46.22 172°57.74 19.33 313°12.91 30.27 357°36.82 20.89 91°50.66 43.99 391°48.69 187°56.91 · 19.55 328°14.52 · 30.18 12°39.53 · 20.87 106°53.16 · 43.99 4 106°51.15 202°56.07 19.76 343°16.13 30.09 27°42.24 20.86 121°55.66 44.00 5 121°55.60 227°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 57°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · 20.81 58°24.18 · 29.64 102°55.80 · 20.78 197°8.17 · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · 22.03 148°33.88 · 29.11 193°12.08 · 20.68 287°23.16 · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°2.262 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 508°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°2.294 20.62 347°33.16 44.12 20 347°30.58 22°40.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°30.58 22°45.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°30.58 22°45.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 20 347°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14	Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
1 61°43.76 157°58.58 19.12 298°11.31 30.36 342°34.11 20.90 76°48.16 43.98 2 76°46.22 172°57.74 19.33 313°12.91 30.27 357°36.82 20.89 91°50.66 43.99 31°48.69 187°56.91 · 19.55 328°14.52 · 30.18 12°39.53 · 20.87 106°53.16 · 43.99 4106°51.15 202°56.07 19.76 343°16.13 30.09 27°42.24 20.86 121°55.66 44.00 5 121°53.62 217°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 \$7°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · 20.81 58°24.18 · 29.64 102°55.80 · 20.78 197°8.17 · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · 22.03 148°33.88 · 29.11 193°12.08 · 20.68 287°23.16 · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 \$08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 · 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 258°2.96 20.60 2°35.66 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 253°22.94 20.62 347°33.16 · 44.12 20 347°30.58 82°42.65 23.01 223°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
3 91°48.69 187°56.91 · · 19.55 328°14.52 · · 30.18 12°39.53 · · 20.87 106°53.16 · · 43.99 4 106°51.15 202°56.07 19.76 343°16.13 30.09 27°42.24 20.86 121°55.66 44.00 5 121°53.62 217°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 57°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · · 20.81 58°24.18 · · 29.64 102°55.80 · · 20.78 197°8.17 · · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.08 15 272°18.26 7°46.85 · · · 22.03 148°33.88 · · · 29.11 193°12.08 · · · 20.68 287°23.16 · · · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°2.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 508°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 · · · · · · · · · · · · · · · · · · ·	1	61°43.76	157°58.58 19.12	298°11.31 30.36	342°34.11 20.90	
4 106°51.15 202°56.07 19.76 343°16.13 30.09 27°42.24 20.86 121°55.66 44.00 5 121°53.62 217°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 57°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 ··· 20.81 58°24.18 ··· 29.64 102°55.80 ··· 20.78 197°8.17 ··· 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$252°21.42 103°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 ··· 22.03 148°33.88 ··· 29.11 193°12.08 ··· 20.68 287°23.16 ··· 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$252°2.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 \$08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 ··· 23.20 238°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
5 121°53.62 217°55.23 19.97 358°17.74 30.00 42°44.95 20.84 136°58.16 44.01 6 136°56.08 232°54.39 \$25°20.18 13°19.35 N21°29.91 57°47.66 N22°20.82 152°0.67 \$08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 • 20.81 58°24.18 • 29.64 102°55.80 • 20.78 197°8.17 • 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 S25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 508°44.07 13 242°13.33						
6 136°56.08 232°54.39 \$25°20.18 13°19.35 \$N21°29.91 57°47.66 \$N22°20.82 152°0.67 \$S08°44.02 7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · · · 20.81 58°24.18 · · · 29.64 102°55.80 · · · 20.78 197°8.17 · · · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 \$N21°29.38 148°3.94 \$N22°20.73 242°15.67 \$S08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · · · 22.03 148°33.88 · · · 29.11 193°12.08 · · · 20.68 287°23.16 · · · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$256°22.62 193°38.74 \$N21°28.85 238°20.23 \$N22°20.64 332°30.66 \$S08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · · · 23.20 238°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
7 151°58.55 247°53.55 20.39 28°20.96 29.82 72°50.38 20.81 167°3.17 44.03 8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · 20.81 58°24.18 · 29.64 102°55.80 · 20.78 197°8.17 · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · 22.03 148°33.88 · 29.11 193°12.08 · 20.68 287°23.16 · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 \$08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · 23.20 238°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
8 167°1.01 262°52.72 20.60 43°22.57 29.73 87°53.09 20.79 182°5.67 44.03 9 182°3.47 277°51.88 · · 20.81 58°24.18 · · 29.64 102°55.80 · · 20.78 197°8.17 · · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 S25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 S08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · · · 22.03 148°33.88 · · · 29.11 193°12.08 · · · 20.68 287°23.16 · · · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 S25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 S08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · · · 23.20 238°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
9 182°3.47 277°51.88 · · 20.81 58°24.18 · · 29.64 102°55.80 · · 20.78 197°8.17 · · · 44.04 10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 S25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 S08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · · · 22.03 148°33.88 · · · 29.11 193°12.08 · · · 20.68 287°23.16 · · · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 S25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 S08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · · · 23.20 238°43.61 · · · 28.59 283°28.37 · · · 20.59 17°38.16 · · · 44.13 22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
10 197°5.94 292°51.04 21.02 73°25.80 29.55 117°58.51 20.76 212°10.67 44.05 11 212°8.40 307°50.20 21.22 88°27.41 29.46 133°1.23 20.75 227°13.17 44.06 12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 ··· 22.03 148°33.88 ··· 29.11 193°12.08 ··· 20.68 287°23.16 ··· 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$255°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 \$08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 ··· 23.20 238°43.61 ··· 28.59 283°28.37 ··· 20.59 17°38.16 ··· 44.13 22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14		167°1.01				
10						1 0
12 227°10.87 322°49.36 \$25°21.42 103°29.03 N21°29.38 148°3.94 N22°20.73 242°15.67 \$08°44.07 13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · · 22.03 148°33.88 · · · 29.11 193°12.08 · · · 20.68 287°23.16 · · · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 \$08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · · · 23.20 238°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						212°10.67 44.05
13 242°13.33 337°48.52 21.63 118°30.64 29.29 163°6.65 20.72 257°18.17 44.07 14 257°15.79 352°47.68 21.83 133°32.26 29.20 178°9.37 20.70 272°20.67 44.08 15 272°18.26 7°46.85 · 22.03 148°33.88 · 29.11 193°12.08 · 20.68 287°23.16 · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 \$25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 \$08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04						
14 257° 15.79 352° 47.68 21.83 133° 32.26 29.20 178° 9.37 20.70 272° 20.67 44.08 15 272° 18.26 7° 46.85 · · · 22.03 148° 33.88 · · 29.11 193° 12.08 · · · 20.68 287° 23.16 · · · 44.09 16 287° 20.72 22° 46.01 22.22 163° 35.50 29.02 208° 14.80 20.67 302° 25.66 44.10 17 302° 23.19 37° 45.17 22.42 178° 37.12 28.94 223° 17.51 20.65 317° 28.16 44.10 18 317° 25.65 52° 44.33 \$25° 22.62 193° 38.74 N21° 28.85 238° 20.23 N22° 20.64 332° 30.66 \$08° 44.11 19 332° 28.12 67° 43.49 22.81 208° 40.36 28.76 253° 22.94 20.62 347° 33.16 44.12 20 347° 30.58 82° 42.65 23.01 223° 41.98 28.67 268° 25.66 20.60 2° 35.66 44.12 21 2° 33.04 97° 41.81 · · 23.20 238° 45.23 28.59 283° 28.37 · · 20.59 17° 38.16 · · 44.13 22 17° 35.51 112° 40.97 23.39						
15 272°18.26 7°46.85 · · · 22.03 148°33.88 · · · 29.11 193°12.08 · · · 20.68 287°23.16 · · · 44.09 16 287°20.72 22°46.01 22.22 163°35.50 29.02 208°14.80 20.67 302°25.66 44.10 17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 525°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 508°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · · 23.20 238°43.61 · · 28.59 283°28.37 · · 20.59 17°38.16 · · 44.13 22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
16 287° 20.72 22° 46.01 22.22 163° 35.50 29.02 208° 14.80 20.67 302° 25.66 44.10 17 302° 23.19 37° 45.17 22.42 178° 37.12 28.94 223° 17.51 20.65 317° 28.16 44.10 18 317° 25.65 52° 44.33 S25° 22.62 193° 38.74 N21° 28.85 238° 20.23 N22° 20.64 332° 30.66 S08° 44.11 19 332° 28.12 67° 43.49 22.81 208° 40.36 28.76 253° 22.94 20.62 347° 33.16 44.12 20 347° 30.58 82° 42.65 23.01 223° 41.98 28.67 268° 25.66 20.60 2° 35.66 44.12 21 2° 33.04 97° 41.81 23.20 238° 43.61 28.59 283° 28.37 20.59 17° 38.16 44.13 22 17° 35.51 112° 40.97 23.39 253° 45.23 28.50 298° 31.09 20.57 32° 40.66 44.14 23 32° 37.97 127° 40.13 23.58 268° 46.86 28.41 313° 33.81 20.56 47° 43.15 44.14						_
17 302°23.19 37°45.17 22.42 178°37.12 28.94 223°17.51 20.65 317°28.16 44.10 18 317°25.65 52°44.33 S25°22.62 193°38.74 N21°28.85 238°20.23 N22°20.64 332°30.66 S08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · 23.20 238°43.61 · 28.59 283°28.37 · 20.59 17°38.16 · 44.13 22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						-
18 317°25.65 52°44.33 \$25°22.62 193°38.74 \$N21°28.85 238°20.23 \$N22°20.64 332°30.66 \$S08°44.11 19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 • 23.20 238°43.61 • 28.59 283°28.37 • 20.59 17°38.16 • 44.13 22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
19 332°28.12 67°43.49 22.81 208°40.36 28.76 253°22.94 20.62 347°33.16 44.12 20 347°30.58 82°42.65 23.01 223°41.98 28.67 268°25.66 20.60 2°35.66 44.12 21 2°33.04 97°41.81 · · 23.20 238°43.61 · · 28.59 283°28.37 · · 20.59 17°38.16 · · 44.13 22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
20 347° 30.58 82° 42.65 23.01 223° 41.98 28.67 268° 25.66 20.60 2° 35.66 44.12 21 2° 33.04 97° 41.81 · · 23.20 238° 43.61 · · 28.59 283° 28.37 · · 20.59 17° 38.16 · · 44.13 22 17° 35.51 112° 40.97 23.39 253° 45.23 28.50 298° 31.09 20.57 32° 40.66 44.14 23 32° 37.97 127° 40.13 23.58 268° 46.86 28.41 313° 33.81 20.56 47° 43.15 44.14						
21 2° 33.04 97° 41.81 · · · 23.20 238° 43.61 · · · 28.59 283° 28.37 · · · 20.59 17° 38.16 · · · 44.13 22 17° 35.51 112° 40.97 23.39 253° 45.23 28.50 298° 31.09 20.57 32° 40.66 44.14 23 32° 37.97 127° 40.13 23.58 268° 46.86 28.41 313° 33.81 20.56 47° 43.15 44.14						
22 17°35.51 112°40.97 23.39 253°45.23 28.50 298°31.09 20.57 32°40.66 44.14 23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
23 32°37.97 127°40.13 23.58 268°46.86 28.41 313°33.81 20.56 47°43.15 44.14						
Mer.pass. 20:50 ν -0.8' d 0.2' m-4.05 ν 1.6' d -0.1' m-0.04 ν 2.7' d -0.0' m-2.73 ν 2.5' d 0.0' m0.83	23	32° 37 07		268°46.86 28.41	313°33.81 20.56	47°43.15 44.14
νει. μεσ. 20.00 ν σ.ο ασ.2 πι τ.ου ν σ.ο αποτ. μεσ. στ.ο αποτ. στ.ο α		32 31.91	127 40.13 25.30	200 10.00 20.11	313 33.01 20.30	
	Merr					

	Stars	
	SHA	Dec
Alpheratz	357°34.70	29°13.84
Ankaa Schedar	353° 6.95 349° 30.79	-42°10.34 56°40.62
Diphda	348°47.18	-17°50.99
Achernar	$335^{\circ}19.72$	-57°6.68
Hamal	327°51.05	23°34.91
Polaris Acamar	313°37.57 315°11.46	89°22.12 -40°12.21
Menkar	314°6.00	4°11.34
Mirfak	308°28.01	49°57.00
Aldebaran Rigel	290°39.50 281°3.75	16°33.62 -8°10.22
Capella	280°21.75	46°1.31
Bellatrix	278°22.79	6°22.43
Elnath	278°1.78	28°37.70
Alnilam Betelgeuse	275°37.64 270°52.03	-1°11.03 7°24.80
Canopus	263°52.12	-52°42.20
Sirius	$258^{\circ}26.19$	-16°44.80
Adhara	255°5.81	-29°0.07
Procyon Pollux	244°50.89 243°17.39	5°9.78 27°57.93
Avior	234°14.71	-59°34.94
Suhail	222°46.46	-43°31.62
Miaplacidus	221°38.39 217°47.96	-69°48.73 -8°45.79
Alphard Regulus	217°47.96 207°34.72	-8°45.79 11°50.80
Dubhe	193°41.52	61°36.84
Denebola	$182^{\circ}25.34$	14°26.04
Gienah	175°44.03	-17°40.62
Acrux Gacrux	173°0.91 171°52.35	-63°13.96 -57°14.90
Alioth	166°13.58	55°49.41
Spica	158°22.79	-11°17.33
Alkaid	152°52.59	49°11.32
Hadar Menkent	148°36.93 147°58.24	-60°29.43 -36°29.39
Arcturus	145°48.41	19°3.24
Rigil Kent.	139°41.25	-60°56.18
Kochab	137°20.93 136°56.55	74°3.15 -16°8.60
Zuben'ubi Alphecca	130 50.55 126°4.25	-10 8.00 26°37.94
Antares	112°16.40	-26°29.20
Atria	107°11.27	-69°4.41
Sabik Shaula	102°3.28 96°10.93	-15°45.31 -37°7.35
Rasalhague	90°10.93 95°58.98	12°32.62
Eltanin	90°42.65	51°29.30
Kaus Aust.	83°33.00	-34°22.44
Vega Nunki	80°33.60 75°48.17	38°48.57 -26°16.00
Altair	62°0.24	8°56.14
Peacock	$53^{\circ}6.08$	-56°39.54
Deneb	49°25.99	45°22.38
Enif Al Na'ir	33°38.91 27°32.98	9°59.45 -46°50.63
Fomalhaut	27 32.98 15°14.52	-40 50.63 -29°29.52
Scheat	$13^{\circ}45.20$	28°13.25
Markab	13°29.91	15°20.48
Nov 05 Tue	SHA	Mer.pass
Venus	98°56.47	14:26
Mars Jupiter	237°10.62 280°38.66	05:12 02:18
Saturn	15°2.37	19:58
Nov 06 Wed	SHA	Mer.pass
Venus	97°37.34	14:28
Mars	236°49.26	05:09
Jupiter Saturn	280°44.29 15°3.41	02:14 19:54
Nov 07 Thu	SHA	Mer.pass
Venus	$96^{\circ}18.12$	14:29
Mars	236°28.40	05:07
Jupiter Saturn	280°50.10 15°4.36	02:10 19:50
		19.30
Horizon	tal parallax Venus:	0.1
	Mars:	0.1

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.30	S15°45.56	143°47.49	8.2'	S28°12.42	2.6'	55.4'
1	199°6.28	46.32	158°14.65	8.1'	28°14.99	2.4'	55.5'
2	214° 6.26 229° 6.24	47.08 •• 47.83	172°41.76 187°8.82	8.1' 8.0'	28°17.41 28°19.68	2.3' 2.1'	55.5' 55.5'
4	244° 6.22	48.59	201°35.84	8.0'	28°21.80	2.0'	55.5'
5	259°6.20	49.34	$216^{\circ}2.81$	7.9'	28°23.77	1.8'	55.5'
6	274°6.18	\$15°50.10	230°29.73	7.9'	\$28°25.59	1.7'	55.6'
7 8	289° 6.16 304° 6.14	50.85 51.61	244°56.62 259°23.46	7.8' 7.8'	28°27.25 28°28.76	1.5' 1.4'	55.6' 55.6'
9	319° 6.11	52.36	273°50.26	7.8'	28°30.11	1.2'	55.6'
10	334° 6.09	53.11	288°17.03	7.7'	28°31.31	1.0'	55.6'
11	349°6.07	53.86	302°43.75	7.7'	28°32.35	0.9'	55.7'
12 13	4° 6.05 19° 6.02	\$15°54.62 55.37	317°10.45 331°37.11	7.7' 7.6'	\$28°33.24 28°33.98	0.7' 0.6'	55.7' 55.7'
14	34° 6.00	56.12	346°3.73	7.6'	20 33.90 28°34.55	0.6	55.7'
15	49° 5.98	• • 56.87	0°30.33	7.6'	28°34.97	0.3'	55.8'
16	64° 5.95	57.62	14°56.90	7.5'	28°35.23	0.1'	55.8'
17	79°5.93 94°5.90	58.37 \$15°59.12	29°23.44	7.5'	28°35.34 \$28°35.29	-0.1'	55.8'
18 19	94 5.90 109 5.87	15° 59.12	43°49.96 58°16.45	7.5' 7.5'	28° 35.29 28° 35.07	-0.2' -0.4'	55.8' 55.8'
20	124° 5.85	16°0.61	72°42.92	7.4	28°34.70	-0.4	55.9'
21	139°5.82	• • 1.36	87°9.37	7.4'	28°34.17	-0.7'	55.9'
22	154° 5.80	2.11	101°35.80	7.4'	28°33.48	-0.8'	55.9'
23	169°5.77	2.85	116°2.21	7.4'	28°32.64	-1.0'	55.9'
	SD = 16.1'	d = 0.8'		SE	0 = 15.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.74	S16°3.60	130°28.61	7.4'	S28°31.63	-1.2'	56.0'
1	199° 5.71	4.35	144°54.99	7.4'	28°30.46	-1.3'	56.0'
2	214° 5.69 229° 5.66	5.09 •• 5.84	159°21.36 173°47.72	7.4' 7.4'	28°29.13 28°27.65	-1.5' -1.6'	56.0' 56.0'
3 4	229 5.60 244° 5.63	6.58	173 47.72 188°14.07	7.4 7.3'	28°26.00	-1.6 -1.8'	56.0'
5	259° 5.60	7.32	202°40.42	7.3'	28°24.19	-2.0'	56.1'
6	274°5.57	S16°8.07	217°6.75	7.3'	S28°22.22	-2.1'	56.1'
7	289° 5.54	8.81	231°33.09	7.3'	28°20.09	-2.3'	56.1'
8 9	304° 5.51 319° 5.48	9.55 •• 10.29	245°59.42 260°25.75	7.3' 7.3'	28°17.80 28°15.35	-2.5' -2.6'	56.1' 56.2'
10	334° 5.45	11.04	274°52.08	7.3'	28°12.74	-2.0 -2.8'	56.2
11	349° 5.42	11.78	289°18.41	7.3'	28° 9.97	-2.9'	56.2'
12	4°5.38	S 16° 12.52	303°44.74	7.3'	S28°7.04	-3.1'	56.2'
13 14	19° 5.35 34° 5.32	13.26 14.00	318°11.08 332°37.43	7.3' 7.4'	28° 3.95 28° 0.69	-3.3' -3.4'	56.3' 56.3'
15	49° 5.29	14.74	347°3.79	7.4 7.4'	26 0.09 27°57.28	-3.4 -3.6'	56.3'
16	64° 5.25	15.47	1°30.15	7.4'	27°53.71	-3.7'	56.3'
17	79° 5.22	16.21	15°56.53	7.4'	$27^{\circ}49.98$	-3.9'	56.4'
18	94°5.19 109°5.15	\$16° 16.95 17.69	30°22.92 44°49.33	7.4' 7.4'	\$27°46.08 27°42.03	-4.1'	56.4
19 20	109 5.15 124° 5.12	17.69	44 49.33 59°15.75		27° 42.03 27° 37.82	-4.2' -4.4'	56.4' 56.4'
21	139° 5.08	19.16	73°42.18	7.5'	27°33.45	-4.5'	56.5
22	154°5.05	19.90	88°8.64	7.5'	27°28.93	-4.7'	56.5'
23	169°5.01	20.63	102°35.12	7.5'	27°24.24	-4.8'	56.5'
	SD = 16.1'	d = 0.7'		SE	O = 15.3'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 4.98	S16°21.37	117°1.61	7.5'	\$27°19.39	-5.0'	56.5
1 2	199° 4.94 214° 4.90	22.10 22.83	131°28.13 145°54.68	7.5' 7.6'	27°14.39 27°9.23	-5.2' -5.3'	56.6' 56.6'
3	214 4.90 229° 4.87	23.57	145 54.08 160°21.25	7.6'	27 9.23 27°3.92	-5.5'	56.6'
4	244° 4.83	24.30	174°47.84	7.6'	26°58.44	-5.6'	56.6'
5	259° 4.79	25.03	189°14.47	7.7'	26°52.82	-5.8'	56.7'
6	274° 4.75 289° 4.71	\$16°25.76 26.50	203°41.12 218°7.80	7.7' 7.7'	\$26°47.03 26°41.09	-5.9' -6.1'	56.7' 56.7'
7 8	289° 4.71 304° 4.68	26.50	218° 7.80 232° 34.51	7.7' 7.7'	26°41.09 26°35.00	-6.1' -6.2'	56.7'
9	319° 4.64	27.96	247°1.26	7.8'	26°28.75	-6.4'	56.8'
10	334° 4.60	28.69	261°28.04	7.8'	$26^{\circ}22.34$	-6.6'	56.8'
11	349°4.56	29.42	275°54.85	7.9'	26°15.79	-6.7'	56.8'
12 13	4°4.52 19°4.48	\$16°30.15 30.87	290°21.70 304°48.59	7.9' 7.9'	\$26° 9.08 26° 2.22	-6.9' -7.0'	56.9' 56.9'
14	34° 4.43	31.60	319°15.52	7.9 8.0'	20 2.22 25°55.21	-7.0 -7.2'	56.9'
15	49°4.39	• • 32.33	333°42.48	8.0'	25°48.04	-7.3'	56.9'
16	64°4.35	33.06	348°9.48	8.0'	25°40.73	-7.5'	57.0'
17	79° 4.31 94° 4.27	33.78 \$16°34.51	2°36.52	8.1' 8.1'	25°33.27 \$25°25.66	-7.6'	57.0'
18 19	94° 4.27 109° 4.22	\$16°34.51 35.24	17°3.61 31°30.73	8.1′ 8.2′	\$25°25.66 25°17.90	-7.8' -7.9'	57.0' 57.1'
20	124° 4.18	35.96	45°57.90	8.2'	25°9.99	-8.1'	57.1
21	139° 4.14	• • 36.69	60°25.12	8.3'	25°1.93	-8.2'	57.1'
22	154°4.09	37.41	74°52.37	8.3'	24°53.73	-8.3'	57.1'
23	169° 4.05	38.13	89°19.67	8.3'	24°45.39	-8.5'	57.2'
	SD = 16.1'	d = 0.7'		SL	O = 15.4'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	06:28	07:54	09:34	13:52	15:32	16:58
N 70°	06:21	07:38	08:59	14:27	15:48	17:05
68°	06:15	07:25	08:34	14:52	16:01	17:10
66°	06:11	07:14	08:15	15:11	16:12	17:15
64°	06:06	07:04	08:00	15:27	16:22	17:20
62°	06:03	06:57	07:47	15:39	16:30	17:24
60°	05:59	06:50	07:36	15:50	16:37	17:27
N 58°	05:56	06:43	07:27	16:00	16:43	17:30
56°	05:53	06:38	07:19	16:08	16:49	17:33
54°	05:50	06:33	07:11	16:15	16:54	17:36
52°	05:48	06:28	07:05	16:22	16:58	17:39
50°	05:45	06:24	06:59	16:28	17:03	17:41
45°	05:40	06:15	06:46	16:41	17:12	17:47
N 40°	05:34	06:07	06:35	16:52	17:20	17:52
35°	05:29	06:00	06:26	17:01	17:27	17:57
30°	05:25	05:53	06:18	17:09	17:34	18:02
20°	05:15	05:41	06:04	17:23	17:46	18:12
N 10°	05:05	05:30	05:52	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:41	05:06	05:28	17:59	18:21	18:47
20°	04:25	04:53	05:16	18:12	18:35	19:02
30°	04:05	04:36	05:01	18:27	18:52	19:23
35°	03:52	04:25	04:53	18:35	19:03	19:36
40°	03:37	04:13	04:43	18:45	19:15	19:51
45°	03:18	03:59	04:31	18:57	19:30	20:11
S 50°	02:52	03:40	04:17	19:11	19:48	20:37
52°	02:39	03:31	04:11	19:18	19:57	20:50
54°	02:24	03:21	04:03	19:25	20:08	21:06
56°	02:06	03:10	03:55	19:33	20:19	21:25
58°	01:42	02:56	03:46	19:43	20:33	21:49
S 60°	01:09	02:40	03:36	19:54	20:49	22:24

Lat.		Moonris	е		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°			16:15			17:33
62°			15:09			18:39
60°	13:40	14:21	14:34	16:15	17:31	19:13
N 58°	12:58	13:44	14:09	16:58	18:07	19:38
56°	12:29	13:18	13:49	17:26	18:33	19:58
54°	12:07	12:57	13:32	17:49	18:54	20:15
52°	11:49	12:40	13:17	18:07	19:11	20:29
50°	11:33	12:25	13:04	18:22	19:26	20:41
45°	11:02	11:55	12:38	18:54	19:56	21:06
N 40°	10:38	11:31	12:17	19:18	20:19	21:26
35°	10:18	11:12	12:00	19:38	20:38	21:43
30°	10:01	10:55	11:45	19:55	20:54	21:58
20°	09:32	10:27	11:19	20:24	21:22	22:22
N 10°	09:07	10:03	10:57	20:48	21:45	22:43
0°	08:45	09:40	10:36	21:11	22:07	23:02
S 10°	08:22	09:18	10:15	21:34	22:29	23:22
20°	07:57	08:53	09:53	21:59	22:52	23:42
30°	07:29	08:25	09:27	22:27	23:19	
35°	07:12	80:80	09:11	22:44	23:35	
40°	06:52	07:49	08:54	23:04	23:54	•• ••
45°	06:29	07:25	08:32	23:28		00:16
S 50°	05:58	06:55	08:05	23:59		00:44
52°	05:43	06:39	07:51		00:14	00:58
54°	05:26	06:22	07:36		00:32	01:14
56°	05:04	06:00	07:17		00:53	01:32
58°	04:37	05:33	06:55	00:21	01:21	01:55
S 60°	03:59	04:54	06:25	00:59	02:00	02:25

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
Day	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-27%
05	16:25	16:24	11:44	14:58	02:30	
06	16:23	16:22	11:44	15:54	03:26	
07	16:20	16:18	11:44	16:49	04:22	

November 08, 09, 10 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	47° 40.44	142°39.29 \$25°23.77	283°48.48 N21°28.33	328°36.52 N22°20.54	62°45.65 \$08°44.15	
1	62°42.90	157°38.45 23.95	298°50.11 28.24	343°39.24 20.53	77°48.15 44.16	Alpheratz 357°34.70 29°13.84
2	77° 45.36	172°37.61 24.14	313°51.74 28.16	358°41.96 20.51	92°50.65 44.16	Ankaa 353°6.96 -42°10.34
3	92°47.83	187°36.77 · · 24.32	328°53.37 · · 28.07	13°44.68 · · 20.49	107°53.14 · · 44.17	Schedar 349°30.80 56°40.63 Diphda 348°47.18 -17°51.00
4	$107^{\circ}50.29$	202°35.93 24.51	343°55.00 27.98	28°47.39 20.48	122°55.64 44.18	Diphda 348°47.18 -17°51.00 Achernar 335°19.72 -57°6.69
5	$122^{\circ}52.76$	217°35.09 24.69	358°56.63 27.90	43°50.11 20.46	137°58.14 44.18	Hamal 327°51.04 23°34.92
6	137°55.22	232°34.25 S 25°24.87	13°58.26 N21°27.81	58°52.83 N22°20.44	153°0.63 S 08°44.19	Polaris 313°37.23 89°22.15
7	152°57.69	247°33.41 25.05	28°59.89 27.73	73°55.55 20.43	168°3.13 44.20	Acamar 315°11.45 -40°12.22
8	168°0.15	262°32.57 25.23	44°1.52 27.64	88°58.27 20.41	183°5.63 44.20	Menkar 314°5.99 4°11.34
9	183°2.61	277°31.73 · · 25.40	59° 3.16 · · 27.56	104° 0.99 · · 20.40	198°8.12 · · 44.21	Mirfak 308°27.99 49°57.01
10 11	198°5.08 213°7.54	292°30.89 25.58 307°30.05 25.75	74° 4.79 27.47 89° 6.43 27.39	119° 3.71 20.38 134° 6.43 20.36	213°10.62 44.21 228°13.12 44.22	Aldebaran 290°39.48 16°33.63
12	228° 10.01	322°29.21 \$25°25.93	104°8.06 N21°27.30	149° 9.15 N22° 20.35	243°15.61 \$08°44.23	Rigel 281°3.73 -8°10.23
13	243° 12.47	337°28.37 26.10	119° 9.70 27.22	164°11.87 20.33	258°18.11 44.23	Capella 280°21.72 46°1.32
14	258° 14.93	352°27.53 26.27	134°11.34 27.13	179°14.59 20.32	273°20.60 44.24	Bellatrix 278°22.77 6°22.43
15	273° 17.40	7°26.69 · · 26.44	149°12.98 · · 27.05	194°17.31 · · 20.30	288°23.10 · · 44.24	Elnath 278°1.76 28°37.71
16	$288^{\circ}19.86$	22°25.85 26.61	164°14.62 26.97	209°20.03 20.28	303°25.59 44.25	Alnilam 275°37.62 -1°11.03 Betelgeuse 270°52.00 7°24.79
17	303°22.33	37°25.01 26.78	179°16.26 26.88	224°22.76 20.27	318°28.09 44.25	Canopus 263°52.09 -52°42.21
18	318°24.79	52°24.17 S 25°26.94	194°17.90 N21°26.80	239°25.48 N22°20.25	333°30.58 S08°44.26	Sirius 258°26.17 -16°44.81
19	333°27.26	67°23.33 27.11	209°19.55 26.72	254°28.20 20.23	348°33.08 44.27	Adhara 255°5.78 -29°0.08
20	348°29.72	82°22.49 27.27	224°21.19 26.63	269°30.92 20.22	3°35.57 44.27	Procyon 244°50.87 5°9.77
21 22	3°32.18 18°34.65	97°21.65 · · 27.43 112°20.81 27.59	239°22.83 · · 26.55 254°24.48 26.47	284°33.65 · · 20.20 299°36.37 20.18	18°38.07 · · 44.28 33°40.56 44.28	Pollux 243°17.36 27°57.93
23	33°37.11	112 20.81 27.39 127°19.97 27.75	269°26.13 26.38	314°39.09 20.17	48°43.05 44.29	Avior 234°14.67 -59°34.95
			·			Suhail 222°46.43 -43°31.62
Mer.	pass. 20:46	ν -0.8' d 0.2' m-4.06	$ u 1.6' \ d$ -0.1' m-0.05	ν 2.7′ <i>d</i> -0.0′ m-2.73	$ u 2.5' \ d0.0' \ m0.83$	Miaplacidus 221°38.34 -69°48.73
						Alphard 217°47.94 -8°45.80
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.69 11°50.79 Dubhe 193°41.48 61°36.82
0	48°39.58	142°19.13 \$25°27.91	284°27.77 N21°26.30	329°41.82 N22°20.15	63°45.55 \$08°44.29	Dubhe 193°41.48 61°36.82 Denebola 182°25.32 14°26.03
1	63°42.04	157°18.29 28.06	299°29.42 26.22	344°44.54 20.13	78°48.04 44.30	Gienah 175°44.01 -17°40.62
2	78° 44.50	172°17.45 28.22	314°31.07 26.14	359°47.27 20.12	93°50.53 44.30	Acrux 173°0.88 -63°13.95
3	93°46.97	187°16.60 · · 28.37	329°32.72 · · 26.05	14°49.99 · · 20.10	108°53.03 · · 44.31	Gacrux 171°52.32 -57°14.89
4	108° 49.43	202°15.76 28.53 217°14.92 28.68	344°34.37 25.97	29°52.72 20.09	123°55.52 44.31 138°58.01 44.32	Alioth 166°13.56 55°49.39
5 6	123°51.90 138°54.36	217°14.92 28.68 232°14.08 \$25°28.83	359°36.02 25.89 14°37.68 N21°25.81	44°55.44 20.07 59°58.17 N22°20.05	138°58.01 44.32 154°0.51 \$08°44.32	Spica 158°22.78 -11°17.34
7	153° 56.83	247°13.24 28.98	29°39.33 25.73	75° 0.89 20.04	169°3.00 44.32	Alkaid 152°52.58 49°11.30
8	168° 59.29	262°12.40 29.13	44°40.99 25.65	90° 3.62 20.02	184°5.49 44.33	Hadar 148°36.91 -60°29.42
9	184°1.75	277°11.56 · · 29.27	59°42.64 · · 25.57	105°6.35 · · 20.00	199°7.98 · · 44.33	Menkent 147°58.22 -36°29.39
10	199°4.22	292°10.72 29.42	74°44.30 25.49	120° 9.07 19.99	214°10.48 44.34	Arcturus 145°48.39 19°3.22 Rigil Kent. 139°41.23 -60°56.17
11	$214^{\circ}6.68$	$307^{\circ}9.88$ 29.56	89°45.95 25.41	135°11.80 19.97	229°12.97 44.34	Kochab 137°20.93 74°3.12
12	$229^{\circ}9.15$	322°9.04 S 25°29.71	104°47.61 N21°25.32	150°14.53 N22°19.95	244°15.46 \$08°44.35	Zuben'ubi 136°56.55 -16°8.61
13	244°11.61	337°8.19 29.85	119°49.27 25.24	165°17.26 19.93	259°17.95 44.35	Alphecca 126°4.24 26°37.92
14	259° 14.07	352°7.35 29.99	134°50.93 25.16	180°19.98 19.92	274°20.44 44.35	Antares 112°16.39 -26°29.20
15	274° 16.54	7°6.51 · · 30.13	149°52.59 · · 25.08	195°22.71 · · 19.90	289°22.93 · · 44.36	Atria 107°11.27 -69°4.40
16 17	289° 19.00 304° 21.47	22°5.67 30.26 37°4.83 30.40	164°54.26 25.00 179°55.92 24.93	210°25.44 19.88 225°28.17 19.87	304°25.42 44.36 319°27.91 44.37	Sabik 102°3.27 -15°45.31
18	319°23.93	52°3.99 \$25°30.54	194°57.58 N21°24.85	240°30.90 N22°19.85	334°30.41	Shaula 96°10.93 -37°7.35
19	334°26.39	67°3.15 30.67	209°59.25 24.77	255°33.63 19.83	349°32.90 44.37	Rasalhague 95°58.98 12°32.61 Eltanin 90°42.67 51°29.28
20	349°28.86	82°2.31 30.80	225°0.91 24.69	270°36.36 19.82	4°35.39 44.38	Eltanin 90°42.67 51°29.28 Kaus Aust. 83°33.00 -34°22.44
21	4°31.32	97°1.47 · · 30.93	240°2.58 · · 24.61	285°39.09 · · 19.80	19°37.88 · · 44.38	Vega 80°33.61 38°48.56
22	19°33.79	112°0.62 31.06	255° 4.25 24.53	300°41.82 19.78	34°40.37 44.38	Nunki 75°48.17 -26°16.00
23	34°36.25	126°59.78 31.19	270° 5.91 24.45	315°44.55 19.77	49°42.86 44.39	Altair 62°0.24 8°56.13
Mer.	pass. 20:42	ν -0.8' d0.2' m-4.06	ν1.6' d-0.1' m-0.07	ν 2.7′ d-0.0′ m-2.74	$\nu 2.5' \ d0.0' \ m0.84$	Peacock 53°6.10 -56°39.53
						Deneb 49°26.01 45°22.38
C	CHA	CHA Doo	CHA Doc	CHA Dec	CHA Dec	Enif 33°38.92 9°59.45
Sun 0	GHA 49°38.72	GHA Dec 141°58.94 S 25°31.32	GHA Dec 285°7.58 N 21°24.37	GHA Dec 330°47.28 N22°19.75	GHA Dec 64°45.35 S 08°44.39	Al Na'ir 27°32.99 -46°50.63
1	64°41.18	156°58.10 31.45	300° 9.25 24.30	345°50.01 19.73	79°47.84 44.39	Fomalhaut 15°14.52 -29°29.52
2	79°43.64	171°57.26 31.57	315°10.92 24.22	0°52.74 19.71	94°50.33 44.40	Scheat 13°45.21 28°13.25 Markab 13°29.91 15°20.48
3	94°46.11	186°56.42 · · 31.70	330°12.60 · · 24.14	15°55.47 · · 19.70	109°52.81 · · 44.40	Markab 13°29.91 15°20.48
4	109° 48.57	201°55.58 31.82	345°14.27 24.06	30°58.20 19.68	124°55.30 44.40	Nov 08 Fri SHA Mer.pass
5	124°51.04	216°54.74 31.94	0°15.94 23.98	46° 0.94 19.66	139°57.79 44.41	Venus 94°58.86 14:30
6	139°53.50	231°53.89 \$25°32.06	15°17.62 N21°23.91	61°3.67 N22°19.65	155°0.28 \$08°44.41	Mars 236°8.05 05:04
7	154° 55.96	246°53.05 32.18	30°19.29 23.83	76° 6.40 19.63	170°2.77 44.41	Jupiter 280°56.09 02:05
8 9	169°58.43	261°52.21 32.30	45°20.97 23.75	91°9.13 19.61	185° 5.26 44.41	Saturn 15°5.21 19:46
	185°0.89	276°51.37 · · 32.41	60°22.65 · · 23.68	106°11.87 · · 19.59 121°14.60 19.58	200°7.75 · · 44.42	Nov 09 Sat SHA Mer.pass
10 11	200°3.36 215°5.82	291°50.53 32.53 306°49.69 32.64	75°24.33 23.60 90°26.00 23.52	121°14.60 19.58 136°17.34 19.56	215°10.23 44.42 230°12.72 44.42	Venus 93°39.55 14:32
12	230°8.28	321°48.85 \$25°32.75	105°27.68 N21°23.45	151°20.07 N22°19.54	245°15.21 \$08°44.42	Mars 235°48.20 05:02
13	245° 10.75	336°48.01 32.87	120°29.37 23.37	166°22.80 19.53	260°17.70 44.43	Jupiter 281°2.24 02:01
14	$260^{\circ}13.21$	351°47.17 32.98	135°31.05 23.30	181°25.54 19.51	275°20.18 44.43	Saturn 15°5.97 19:42
15	275° 15.68	6°46.32 · · 33.08	150°32.73 · · 23.22	196°28.27 · · 19.49	290°22.67 · · 44.43	Nov 10 Sun SHA Mer.pass
16	290° 18.14	21°45.48 33.19	165°34.41 23.15	211°31.01 19.47	305°25.16 44.43	Venus 92°20.23 14:33
17	305°20.60 320°23.07	36°44.64 33.30 51°43.80 \$25°33.40	180°36.10 23.07 195°37.79 N21°22.99	226°33.74 19.46 241°36.48 N22°19.44	320°27.65 44.44 335°30.13 \$08°44.44	Mars 235°28.87 04:59
18 19	320 23.07 335°25.53	66°42.96 33.51	210°39.47 22.99	256°39.22 19.42	350°32.62 44.44	Jupiter 281°8.56 01:56 Saturn 15°6.63 19:38
20	350°28.00	81°42.12 33.61	225°41.16 22.85	271°41.95 19.40	5°35.11 44.44	Saturn 15°6.63 19:38
21	5°30.46	96°41.28 · · 33.71	240°42.85 · · 22.77	286°44.69 · · 19.39	20°37.59 · · 44.44	Horizontal parallax
22	20°32.93	111°40.44 33.81	255°44.54 22.70	301°47.43 19.37	35°40.08 44.45	Venus: 0.1
23	35°35.39	126°39.60 33.91	270°46.23 22.62	316°50.16 19.35	50°42.56 44.45	Mars: 0.2
Mer.	pass. 20:38	ν-0.8' d0.1' m-4.07	ν1.7' d-0.1' m-0.09	ν2.7' d-0.0' m-2.74	ν2.5' d0.0' m0.84	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°4.00	S16°38.86	103°47.02	8.4'	S24°36.89	-8.6'	57.2'
1 2	199°3.96 214°3.91	39.58 40.30	118°14.42 132°41.86	8.4' 8.5'	24°28.26 24°19.48	-8.8' -8.9'	57.2' 57.3'
3	214 3.91 229°3.87	. 41.02	132 41.00 147° 9.35	6.5 8.5'	24 19.46 24°10.56	-0.9 -9.1'	57.3'
4	244°3.82	41.74	161°36.88	8.6'	24°1.50	-9.2	57.3'
5	259°3.78	42.47	176°4.47	8.6'	23°52.29	-9.3'	57.3'
6	274°3.73 289°3.68	\$16°43.19 43.91	190°32.10 204°59.78	8.7' 8.7'	\$23°42.95 23°33.47	-9.5' -9.6'	57.4' 57.4'
7 8	289 3.68 304°3.64	43.91 44.62	204 59.78 219°27.52	8.8'	23 33.47 23°23.85	-9.6 -9.8'	57.4' 57.4'
9	319°3.59	• • 45.34	233°55.30	8.8'	23°14.09	-9.9'	57.5'
10	334°3.54	46.06	248°23.13	8.9'	23°4.19	-10.0'	57.5'
11 12	349°3.49 4°3.44	46.78 \$16°47.50	262°51.02 277°18.95	8.9' 9.0'	22°54.16 522°44.00	-10.2' -10.3'	57.5' 57.5'
13	19°3.39	48.21	277 16.95 291°46.94	9.0'	22°33.70	-10.5 -10.4'	57.6'
14	34°3.34	48.93	306°14.97	9.1'	22°23.27	-10.6'	57.6'
15	49°3.29	• • 49.65	320°43.06	9.1'	22°12.70	-10.7'	57.6'
16 17	64°3.24 79°3.19	50.36 51.08	335°11.20 349°39.40	9.2' 9.2'	22°2.01 21°51.18	-10.8' -11.0'	57.7' 57.7'
18	94°3.14	\$1.00 \$16°51.79	4°7.64	9.2	S21°40.23	-11.0	57.7'
19	109°3.09	52.50	18°35.94	9.3'	21°29.15	-11.2'	57.8'
20	124°3.04	53.22	33°4.28	9.4'	21°17.94	-11.3'	57.8'
21 22	139°2.99 154°2.93	· · 53.93 54.64	47°32.68 62°1.14	9.5' 9.5'	21°6.60 20°55.14	-11.5' -11.6'	57.8' 57.8'
23	169°2.88	54.04 55.35	76°29.64	9.5 9.6'	20° 43.56	-11.0 -11.7'	57.0 57.9'
	SD = 16.1'	d = 0.7'			O = 15.6'		
	JD — 10.1	<u>u = 0.1</u>		JI			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	184°2.83 199°2.77	\$16°56.06 56.78	90°58.19 105°26.80	9.6' 9.7'	\$20°31.85 20°20.02	-11.8' -12.0'	57.9' 57.9'
2	199 2.77 214°2.72	50.78 57.49	105 26.80 119°55.45	9.7 9.7'	20°20.02	-12.0 -12.1'	57.9 58.0'
3	229°2.67	• • 58.20	134°24.16	9.8'	19°56.00	-12.2'	58.0'
4	244°2.61	58.90	148°52.92	9.8'	19°43.81	-12.3'	58.0'
5	259°2.56 274°2.50	16°59.61 \$17°0.32	163°21.73 177°50.59	9.9' 9.9'	19°31.50 \$19°19.08	-12.4'	58.1' 58.1'
6 7	274 2.50 289°2.44	1.03	177 50.59 192°19.50	9.9 10.0'	19°6.54	-12.5' -12.7'	58.1'
8	304°2.39	1.74	206°48.45	10.0'	18°53.88	-12.8'	58.2
9	319°2.33	• • 2.44	221°17.46	10.1'	18°41.11	-12.9'	58.2'
10 11	334°2.28 349°2.22	3.15 3.85	235°46.52 250°15.62	10.1' 10.2'	18°28.23 18°15.24	-13.0' -13.1'	58.2' 58.2'
12	4°2.16	\$17° 4.56	264°44.77	10.2'	S18° 2.14	-13.1	58.3
13	19°2.10	5.26	279°13.97	10.2'	17°48.93	-13.3'	58.3'
14	34°2.04	5.97	293°43.22	10.3'	17°35.61	-13.4'	58.3'
15 16	49°1.99 64°1.93	· · 6.67 7.38	308°12.51 322°41.84	10.3' 10.4'	17°22.18 17°8.65	-13.5' -13.6'	58.4' 58.4'
17	79°1.87	8.08	337°11.23	10.4	16°55.02	-13.7'	58.4
18	94°1.81	S17°8.78	351°40.65	10.5'	S16°41.28	-13.8'	58.5'
19	109°1.75	9.48	6°10.12	10.5'	16°27.44	-13.9'	58.5'
20 21	124°1.69 139°1.63	10.18 •• 10.88	20°39.63 35°9.19	10.6' 10.6'	16°13.50 15°59.45	-14.0° -14.1'	58.5' 58.6'
22	154°1.57	11.58	49°38.79	10.6'	15°45.31	-14.2'	58.6'
23	169°1.50	12.28	64°8.42	10.7'	15°31.08	-14.3'	58.6'
	SD = 16.1'	d = 0.7'		SI	D = 15.8'		
Sun 0	GHA 184°1.44	Dec S 17°12.98	GHA 78°38.10	u 10.7'	Dec \$15°16.74	d -14.4'	HP 58.7'
1	199°1.38	13.68	93°7.82	10.7	15° 2.32	-14.4 -14.5'	58.7'
2	214°1.32	14.38	107°37.58	10.8'	14°47.79	-14.6'	58.7'
3 4	229°1.26 244°1.19	· · 15.08	122°7.37 136°37.20	10.8' 10.9'	14°33.18 14°18.47	-14.7' -14.8'	58.7'
4 5	244 1.19 259°1.13	15.77 16.47	136 37.20 151° 7.07	10.9'	14° 18.47 14° 3.68	-14.8 -14.9'	58.8' 58.8'
6	274°1.06	\$17°17.17	165°36.97	10.9'	S13°48.79	-15.0'	58.8'
7	289°1.00	17.86	180°6.91	11.0'	13°33.82	-15.1'	58.9'
8	304°0.94 319°0.87	18.56 •• 19.25	194°36.88 209°6.88	11.0' 11.0'	13°18.76 13°3.62	-15.1' -15.2'	58.9' 58.9'
10	319°0.87 334°0.80	19.25	209 6.88 223°36.91	11.1'	13° 3.62 12° 48.39	-15.2 -15.3'	58.9 59.0'
11	349°0.74	20.64	238° 6.98	11.1'	12°33.08	-15.4'	59.0'
12	4°0.67	S17°21.33	252°37.07	11.1'	S12°17.69	-15.5'	59.0'
13 14	19°0.61 34°0.54	22.02 22.72	267°7.20 281°37.35	11.2' 11.2'	12°2.22 11°46.68	-15.5' -15.6'	59.1' 59.1'
15	49°0.47	• • 23.41	201 37.33 296°7.52	11.2'	11°31.05	-15.0 -15.7'	59.1'
16	64°0.40	24.10	310°37.73	11.2'	$11^{\circ}15.35$	-15.8'	59.1'
17	79°0.34	24.79	325°7.95	11.3'	10°59.57	-15.8'	59.2'
18 19	94°0.27 109°0.20	\$17°25.48 26.17	339°38.21 354°8.48	11.3' 11.3'	\$10°43.73 10°27.80	-15.9' -16.0'	59.2' 59.2'
20	109 0.20 124°0.13	26.85	8°38.77	11.3'	10°27.80 10°11.81	-16.1	59.3'
21	139°0.06	•• 27.54	23°9.09	11.3'	09°55.75	-16.1'	59.3'
22 23	153°59.99 168°59.92	28.23	37°39.42 52°9.78	11.4' 11.4'	09°39.63 09°23.43	-16.2'	59.3' 59.3'
23		28.92	52 9.78			-16.3'	59.3
	SD = 16.1'	d = 0.7'		SI	O = 16.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Julisce	Civil	Naut.
N 72°	06:39	80:80	09:58	13:29	15:18	16:47
N 70°	06:31	07:50	09:16	14:11	15:37	16:55
68°	06:25	07:35	08:47	14:39	15:52	17:02
66°	06:19	07:23	08:26	15:00	16:04	17:08
64°	06:14	07:13	08:09	15:17	16:14	17:13
62°	06:10	07:04	07:56	15:31	16:23	17:17
60°	06:06	06:56	07:44	15:43	16:30	17:21
N 58°	06:02	06:50	07:34	15:53	16:37	17:25
56°	05:59	06:44	07:25	16:02	16:43	17:28
54°	05:56	06:38	07:17	16:10	16:49	17:31
52°	05:53	06:33	07:10	16:17	16:54	17:34
50°	05:50	06:29	07:04	16:23	16:58	17:37
45°	05:43	06:19	06:50	16:37	17:09	17:44
N 40°	05:38	06:10	06:39	16:49	17:17	17:50
35°	05:32	06:02	06:29	16:58	17:25	17:55
30°	05:27	05:55	06:20	17:07	17:32	18:01
20°	05:16	05:43	06:06	17:22	17:45	18:11
N 10°	05:05	05:31	05:53	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:24	04:51	05:15	18:13	18:37	19:04
30°	04:03	04:33	04:59	18:29	18:55	19:26
35°	03:49	04:23	04:50	18:38	19:06	19:39
40°	03:33	04:10	04:40	18:49	19:19	19:56
45°	03:13	03:54	04:27	19:01	19:34	20:16
S 50°	02:46	03:35	04:13	19:16	19:54	20:44
52°	02:32	03:25	04:06	19:23	20:04	20:58
54°	02:15	03:15	03:58	19:31	20:15	21:15
56°	01:55	03:02	03:49	19:40	20:27	21:36
58°	01:28	02:48	03:39	19:50	20:42	22:04
S 60°	00:47	02:31	03:28	20:02	21:00	22:49

Lat.		Moonris	е		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°		17:13	15:51		20:22	23:30
N 70°		16:23	15:33		21:10	23:45
68°	17:22	15:51	15:18	18:21	21:40	23:58
66°	16:04	15:27	15:06	19:38	22:02	
64°	15:26	15:08	14:56	20:14	22:20	
62°	15:00	14:53	14:47	20:40	22:34	
60°	14:39	14:40	14:39	21:00	22:46	
N 58°	14:22	14:28	14:33	21:17	22:56	
56°	14:07	14:19	14:27	21:31	23:05	
54°	13:54	14:10	14:21	21:43	23:13	
52°	13:43	14:02	14:17	21:53	23:20	
50°	13:33	13:55	14:12	22:03	23:27	
45°	13:12	13:40	14:03	22:22	23:40	
N 40°	12:55	13:27	13:55	22:38	23:51	
35°	12:41	13:16	13:48	22:51	•• ••	00:01
30°	12:28	13:07	13:41	23:03		00:09
20°	12:07	12:50	13:31	23:23	•• ••	00:23
N 10°	11:48	12:36	13:21	23:40		00:35
0°	11:30	12:22	13:13	23:55		00:46
S 10°	11:13	12:09	13:04		00:11	00:58
20°	10:54	11:54	12:54	•• ••	00:28	01:10
30°	10:32	11:37	12:43	00:06	00:47	01:23
35°	10:19	11:28	12:37	00:20	00:58	01:31
40°	10:04	11:16	12:30	00:35	01:10	01:40
45°	09:46	11:03	12:21	00:54	01:25	01:50
S 50°	09:23	10:47	12:11	01:18	01:43	02:02
52°	09:13	10:39	12:06	01:29	01:51	02:08
54°	09:01	10:30	12:01	01:42	02:00	02:14
56°	08:47	10:21	11:55	01:56	02:11	02:21
58°	08:30	10:10	11:48	02:13	02:23	02:28
S 60°	08:10	09:57	11:41	02:34	02:37	02:37

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
Day	00 ^h	12 ^h	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	37-58%
08	16:16	16:14	11:44	17:43	05:16	
09	16:11	16:09	11:44	18:34	06:09	
10	16:06	16:03	11:44	19:24	07:00	

November 11, 12, 13 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	50°37.85	141°38.76 S 25°34.00	285°47.92 N21°22.55	331°52.90 N22°19.33	65°45.05
1	65° 40.32 80° 42.78	156°37.91 34.10 171°37.07 34.20	300°49.61 22.47 315°51.30 22.40	346°55.64 19.32 1°58.38 19.30	80°47.53 44.45 95°50.02 44.45
2	95° 45.25	171°37.07 34.20 186°36.23 · · 34.29	315°51.30 22.40 330°53.00 •• 22.33	1°58.38 19.30 17°1.11 · · 19.28	95°50.02 44.45 110°52.50 •• 44.45
4	110° 47.71	201°35.39 34.38	345°54.69 22.25	32° 3.85 19.26	125°54.99 44.45
5	125°50.17	216°34.55 34.47	0°56.39 22.18	47°6.59 19.25	140°57.47 44.46
6	140°52.64	231°33.71 S 25°34.56	15°58.09 N21°22.11	62°9.33 N22°19.23	155°59.96
7	155°55.10	246°32.87 34.65	30°59.78 22.04	77°12.07 19.21	171°2.44 44.46
8 9	170°57.57 186°0.03	261°32.03 34.74 276°31.19 · · 34.82	46°1.48 21.96 61°3.18 · · 21.89	92°14.81 19.19 107°17.55 · 19.17	186°4.93 44.46 201°7.41 • 44.46
10	201°2.49	291°30.35 34.91	76°4.88 21.82	107 17.35 19.17 122°20.29 19.16	216°9.90 44.46
11	216°4.96	306°29.51 34.99	91°6.58 21.75	137°23.03 19.14	231°12.38 44.46
12	231°7.42	321°28.67 S 25°35.07	106°8.29 N21°21.68	152°25.77 N22°19.12	246°14.86
13	246°9.89	336°27.83 35.15	121°9.99 21.60	167°28.51 19.10	261°17.35 44.46
14	261°12.35	351°26.99 35.23 6°26.15 · · 35.31	136°11.69 21.53 151°13.40 · · 21.46	182°31.25 19.08 197°33.99 · · 19.07	276°19.83 44.46 291°22.31 • • 44.46
15 16	276° 14.81 291° 17.28	6°26.15 · · 35.31 21°25.31 35.39	151°13.40 · · 21.46 166°15.11 21.39	197°33.99 · · 19.07 212°36.73 19.05	291°22.31 · · 44.46 306°24.80 44.46
17	306° 19.74	36°24.47 35.46	181°16.81 21.32	227°39.48 19.03	321°27.28 44.47
18	321°22.21	51°23.63 S 25°35.54	196°18.52 N21°21.25	242°42.22 N22°19.01	336°29.76
19	336° 24.67	66°22.79 35.61	211°20.23 21.18	257°44.96 18.99	351°32.24 44.47
20	351°27.13	81°21.95 35.68	226°21.94 21.11	272°47.70 18.98 287°50.45 · · 18.96	6°34.73 44.47
21 22	6°29.60 21°32.06	96°21.11 · · 35.75 111°20.27 35.82	241°23.65 · · 21.04 256°25.36 · · 20.97	287°50.45 · · 18.96 302°53.19 18.94	21°37.21 · · 44.47 36°39.69 44.47
23	36°34.53	126°19.43 35.89	271°27.08 20.90	317°55.93 18.92	51°42.17 44.47
	pass. 20:34	ν-0.8' d0.1' m-4.07	ν1.7' d-0.1' m-0.11	ν2.7' d-0.0' m-2.75	ν 2.5' d 0.0' m 0.85
ivier.p	0ass. 20:54	ν-0.6 d0.1 m-4.07	ν1.7 α-0.1 m-0.11	ν2.7 α-0.0 m-2.75	V2.5 d0.0 m0.65
_					
Tue 0	GHA 51° 36.99	GHA Dec 141°18.59 \$25°35.96	GHA Dec 286°28.79 N21°20.83	GHA Dec 332°58.68 N22°18.90	GHA Dec 66°44.65 \$08°44.47
1	66°39.45	156°17.75 36.02	301°30.50 20.76	348°1.42 18.89	81°47.13 44.47
2	81°41.92	171°16.91 36.09	316°32.22 20.69	3°4.17 18.87	96°49.62 44.47
3	96°44.38	186°16.07 · · 36.15	331°33.94 · · 20.62	18°6.91 · · 18.85	111°52.10 · · 44.47
4	111° 46.85	201°15.23 36.21	346°35.65 20.56	33° 9.65 18.83	126°54.58 44.46
5	126°49.31	216°14.39 36.27	1°37.37 20.49	48°12.40 18.81	141°57.06 44.46
6 7	141°51.78 156°54.24	231°13.55	16°39.09 N21°20.42 31°40.81 20.35	63°15.14 N22°18.80 78°17.89 18.78	156°59.54 S08°44.46 172°2.02 44.46
8	171°56.70	261°11.87 36.44	46°42.53 20.28	93°20.64 18.76	187° 4.50 44.46
9	186°59.17	276°11.03 · · 36.50	61°44.25 · · 20.22	108°23.38 · · 18.74	202°6.98 · · 44.46
10	$202^{\circ}1.63$	291°10.19 36.55	76°45.98 20.15	123°26.13 18.72	217°9.46 44.46
11	217°4.10	306°9.35 36.61	91°47.70 20.08	138°28.88 18.70	232°11.94 44.46
12 13	232°6.56 247°9.02	321°8.51 \$25°36.66 336°7.67 36.71	106°49.43 N21°20.02 121°51.15 19.95	153°31.62 N22°18.69 168°34.37 18.67	247°14.42 \$08°44.46 262°16.90 44.46
13	247 9.02 262°11.49	351°6.84 36.76	136°52.88 19.88	183°37.12 18.65	202 10.90 44.40 277°19.38 44.46
15	277° 13.95	6°6.00 · · 36.80	151°54.61 · · 19.82	198°39.86 · · 18.63	292°21.86 · · 44.46
16	$292^{\circ}16.42$	21°5.16 36.85	166°56.34 19.75	213°42.61 18.61	307°24.34 44.45
17	307° 18.88	36°4.32 36.89	181°58.07 19.68	228°45.36 18.59	322°26.81 44.45
18	322°21.34 337°23.81	51°3.48 S25°36.94 66°2.64 36.98	196°59.80 N21°19.62 212°1.53 19.55	243°48.11 N22°18.57 258°50.86 18.56	337°29.29
19 20	352°26.27	66°2.64 36.98 81°1.80 37.02	212°1.53 19.55 227°3.26 19.49	258°50.86 18.56 273°53.61 18.54	352°31.77 44.45 7°34.25 44.45
21	7°28.74	96°0.97 · · 37.06	242°5.00 · · 19.42	288°56.36 · · 18.52	22°36.73 · · 44.45
22	22°31.20	111°0.13 37.10	257° 6.73 19.36	303°59.11 18.50	37°39.21 44.45
23	37° 33.66	125°59.29 37.14	272°8.47 19.29	319°1.86 18.48	52°41.68 44.44
Mer.p	pass. 20:30	ν-0.8' d0.1' m-4.08	ν1.7' d-0.1' m-0.12	ν2.7' d-0.0' m-2.75	ν2.5' d-0.0' m0.85
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	52°36.13	140°58.45 \$25°37.17	287°10.20 N21°19.23	334°4.61 N22°18.46	67°44.16
1	67°38.59	155° 57.61 37.21	302°11.94 19.16	349°7.36 18.44	82°46.64 44.44
2	82°41.06	170°56.78 37.24	317°13.68 19.10	4°10.11 18.42	97°49.12 44.44
3 4	97° 43.52 112° 45.98	185°55.94 · · 37.27 200°55.10 37.31	332°15.42 · · 19.04 347°17.16 18.97	19°12.86 · · 18.41 34°15.61 18.39	112°51.59 · · 44.44 127°54.07 44.43
5	112 45.96 127°48.45	215°54.26 37.34	2°18.90 18.91	49°18.36 18.37	142°56.55 44.43
6	142° 50.91	230°53.43 S 25°37.36	17°20.64 N21°18.84	64°21.11 N22°18.35	157°59.02 S08°44.43
7	157° 53.38	245°52.59 37.39	32°22.39 18.78	79°23.86 18.33	173°1.50 44.43
8	172°55.84	260°51.75 37.42	47°24.13 18.72	94°26.62 18.31	188°3.98 44.42
9 10	187°58.30 203°0.77	275°50.92 · · 37.44 290°50.08 37.47	62°25.87 · · 18.66 77°27.62 18.59	109°29.37 · · 18.29 124°32.12 18.27	203°6.45 · · 44.42 218°8.93 44.42
11	203 0.77 218°3.23	305°49.24 37.49	92°29.37 18.53	139°34.87 18.26	218 8.93 44.42 233°11.40 44.42
12	233°5.70	320°48.40 S25°37.51	107°31.12 N21°18.47	154°37.63 N22°18.24	248°13.88
13	248°8.16	335°47.57 37.53	122°32.87 18.41	169°40.38 18.22	263°16.35 44.41
14	263°10.63	350°46.73 37.55	137°34.62 18.35	184°43.13 18.20	278°18.83 44.41
15 16	278°13.09	5°45.90 · · 37.56	152°36.37 · · 18.28	199°45.89 · · 18.18	293°21.30 · · 44.41
16 17	293° 15.55 308° 18.02	20° 45.06 37.58 35° 44.22 37.59	167°38.12 18.22 182°39.87 18.16	214°48.64 18.16 229°51.39 18.14	308°23.78 44.40 323°26.25 44.40
18	308 18.02 323°20.48	50°43.39 S25°37.61	197°41.63 N21°18.10	244°54.15 N22°18.12	338°28.73 S08°44.40
19	338° 22.95	65°42.55 37.62	212°43.38 18.04	259°56.90 18.10	353°31.20 44.39
20	353°25.41	80°41.72 37.63	227°45.14 17.98	274°59.66 18.08	8°33.68 44.39
21	8°27.87	95°40.88 · · 37.64	242°46.89 · · 17.92	290°2.41 · · 18.06	23°36.15 · · 44.39
22 23	23°30.34 38°32.80	110°40.04 37.65 125°39.21 37.65	257°48.65 17.86 272°50.41 17.80	305°5.17 18.05 320°7.93 18.03	38°38.62 44.38 53°41.10 44.38
			-		
Mer.p	pass. 20:26	ν-0.8' d0.0' m-4.08	ν1.7' d-0.1' m-0.14	ν2.8′ d-0.0′ m-2.76	ν2.5' d-0.0' m0.86

	Stars	
	SHA	Dec
Alpheratz	357°34.71	29° 13.85
Ankaa Schedar	353°6.97 349°30.81	-42°10.36 56°40.64
Diphda	348°47.19	-17°51.01
Achernar	335°19.73	-57°6.71
Hamal Polaris	327°51.04 313°37.18	23°34.92 89°22.17
Acamar	$315^{\circ}11.45$	-40°12.24
Menkar	314°5.98	4°11.33
Mirfak Aldebaran	308°27.98 290°39.47	49°57.02 16°33.63
Rigel	281°3.72	-8°10.23
Capella	280°21.70	46°1.33 6°22.43
Bellatrix Elnath	278°22.76 278°1.74	0 22.43 28°37.71
Alnilam	275°37.61	-1°11.04
Betelgeuse	270°51.99 263°52.07	7°24.79 -52°42.22
Canopus Sirius	263 52.07 258°26.15	-52 42.22 -16°44.81
Adhara	255°5.76	-29°0.09
Procyon	244°50.84	5°9.77
Pollux Avior	243°17.33 234°14.64	27°57.92 -59°34.95
Suhail	222°46.41	-43°31.63
Miaplacidus	221°38.29	-69°48.74
Alphard Regulus	217°47.91 207°34.67	-8°45.81 11°50.79
Dubhe	193°41.44	$61^{\circ}36.81$
Denebola	182°25.30	14°26.02
Gienah Acrux	175°43.99 173°0.85	-17°40.62 -63°13.94
Gacrux	171°52.30	-57° 14.88
Alioth	166°13.53	55°49.37
Spica Alkaid	158°22.77 152°52.56	-11°17.34 49°11.28
Hadar	148°36.90	-60°29.41
Menkent	147°58.21	-36°29.39
Arcturus Rigil Kent.	145°48.39 139°41.22	19°3.21 -60°56.16
Kochab	137°20.92	74°3.10
Zuben'ubi	136°56.54	-16°8.61
Alphecca Antares	126°4.24 112°16.39	26°37.91 -26°29.20
Atria	107°11.29	-69°4.39
Sabik	102°3.28	-15°45.31
Shaula Rasalhague	96°10.94 95°58.99	-37°7.35 12°32.60
Eltanin	90°42.68	51°29.27
Kaus Aust.	83°33.01	-34°22.43
Vega Nunki	80°33.63 75°48.18	38°48.55 -26°16.00
Altair	62°0.26	8°56.13
Peacock	53°6.12	-56°39.54
Deneb Enif	49°26.03 33°38.94	45°22.38 9°59.45
Al Na'ir	27°33.01	-46°50.64
Fomalhaut	15°14.54	-29°29.53
Scheat Markab	13°45.22 13°29.92	28°13.25 15°20.48
Nov 11 Mon	SHA	Mer.pass
Venus	91°0.90	14:34
Mars	235°10.07 281°15.05	04:56 01:52
Jupiter Saturn	15°7.20	19:34
Nov 12 Tue	SHA	Mer.pass
Venus	89°41.60	14:36
Mars Jupiter	234°51.80 281°21.69	04:54 01:48
Saturn	15°7.66	19:30
Nov 13 Wed	SHA	Mer.pass
Venus	88°22.32	14:37
Mars Jupiter	234°34.07 281°28.48	04:51 01:43
Saturn	15°8.03	19:26
Horizor	ıtal parallax	
	Venus:	0.1
	Mars:	0.2

	<u> </u>	+0.0343 360		-011			
h	Su	<u> </u>			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°59.85 198°59.78	\$17°29.60 30.29	66° 40.15 81° 10.53	11.4' 11.4'	\$09°7.17 08°50.85	-16.3' -16.4'	59.4' 59.4'
2	213°59.71	30.98	95°40.93	11.4	08°34.46	-16.4	59.4'
3	228°59.64	• • 31.66	110°11.34	11.4'	08°18.02	-16.5'	59.5'
4	243°59.57	32.35	124°41.77	11.4'	$08^{\circ}1.51$	-16.6'	59.5'
5	258°59.49	33.03	139° 12.20	11.4'	07°44.95	-16.6'	59.5'
6 7	273°59.42 288°59.35	\$17°33.71 34.40	153° 42.65 168° 13.10	11.5' 11.5'	\$07°28.33 07°11.66	-16.7' -16.7'	59.5' 59.6'
8	303°59.27	35.08	182°43.56	11.5'	06°54.93	-16.8'	59.6'
9	318°59.20	• • 35.76	197° 14.03	11.5'	06°38.15	-16.8'	59.6'
10	333°59.13	36.44	211°44.50	11.5'	06°21.32	-16.9'	59.7'
11	348°59.05 3°58.98	37.12 \$17°37.80	226°14.98 240°45.46	11.5'	06°4.44	-16.9'	59.7' 59.7'
12 13	3°58.98 18°58.90	38.48	240° 45.46 255° 15.94	11.5' 11.5'	\$05°47.51 05°30.54	-17.0' -17.0'	59.7' 59.7'
14	33°58.83	39.16	269°46.41	11.5'	05°13.52	-17.1'	59.8'
15	48°58.75	• • 39.84	$284^{\circ}16.89$	11.5'	$04^{\circ}56.46$	-17.1'	59.8'
16	63°58.68	40.52	298°47.36	11.5'	04°39.36	-17.1'	59.8'
17 18	78°58.60 93°58.52	41.20 \$17°41.87	313° 17.83 327° 48.30	11.5' 11.5'	04°22.22 \$04°5.04	-17.2' -17.2'	59.8' 59.9'
19	95 56.52 108°58.44	42.55	342° 18.76	11.5	03°47.82	-17.2 -17.3'	59.9'
20	123°58.37	43.22	356°49.21	11.4'	03°30.56	-17.3	59.9'
21	138°58.29	• • 43.90	$11^{\circ}19.65$	11.4'	$03^{\circ}13.28$	-17.3'	59.9'
22	153°58.21	44.57	25°50.08	11.4'	02°55.96	-17.3'	60.0'
23	168°58.13	45.25	40°20.49	11.4'	02°38.61	-17.4'	60.0'
	SD = 16.1'	d = 0.7'		SI	D = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.05	S17°45.92	54°50.90	11.4'	S02°21.23	-17.4	60.0'
1	198°57.97	46.60	69°21.28	11.4'	02°3.82	-17.4'	60.0'
2	213°57.89	47.27	83°51.66	11.4'	01°46.39	-17.5'	60.1'
3 4	228°57.81 243°57.73	•• 47.94 48.61	98°22.01 112°52.35	11.3' 11.3'	01°28.94 01°11.46	-17.5' -17.5'	60.1' 60.1'
5	258° 57.65	49.28	127°22.66	11.3'	00°53.96	-17.5	60.1
6	273°57.57	S17°49.95	141°52.96	11.3'	S00°36.44	-17.5'	60.2'
7	288°57.49	50.62	156°23.23	11.2'	00°18.91	-17.6'	60.2'
8	303°57.41 318°57.32	51.29	170°53.48 185°23.70	11.2' 11.2'	\$00°1.36 N00°16.21	-17.6'	60.2'
9 10	318 57.32 333°57.24	· · 51.96 52.63	185 23.70 199°53.89	11.2'	00°33.79	17.6' 17.6'	60.2' 60.3'
11	348°57.16	53.30	214°24.06	11.1'	00°51.37	17.6'	60.3'
12	3°57.08	S17°53.97	228°54.20	11.1'	N01°8.97	17.6'	60.3'
13	18°56.99	54.63	243°24.30	11.1'	01°26.57	17.6'	60.3'
14 15	33°56.91 48°56.82	55.30 •• 55.97	257°54.37 272°24.41	11.0' 11.0'	01°44.18 02°1.79	17.6' 17.6'	60.3' 60.4'
16	63°56.74	56.63	286° 54.42	11.0'	02°1.79	17.6	60.4
17	78°56.65	57.30	301°24.38	10.9'	02°37.02	17.6'	60.4
18	93°56.57	S17°57.96	315°54.31	10.9'	N02°54.63	17.6'	60.4'
19	108°56.48 123°56.39	58.62	330°24.20 344°54.05		03°12.24	17.6'	60.4
20 21	123°56.39 138°56.31	59.29 17°59.95	344°54.05 359°23.86	10.8' 10.8'	03° 29.84 03° 47.43	17.6' 17.6'	60.4' 60.5'
22	153°56.22	18°0.61	13°53.62	10.7'	04°5.02	17.6	60.5'
23	168°56.13	1.27	28°23.34	10.7'	$04^{\circ}22.59$	17.6'	60.5'
	SD = 16.2'	d = 0.7'		SI	D = 16.4'		
Wed	GHA 183° 56.05	Dec \$18°1.93	GHA 42°53.01	u 10.6'	Dec N04° 40.15	d 17.5'	HP 60.5'
1	198°55.96	2.59	57°22.64	10.6'	04°57.70	17.5	60.5
2	213°55.87	3.25	71°52.21	10.5'	05° 15.22	17.5'	60.5'
3	228°55.78	• • 3.91	86°21.74	10.5'	05°32.73	17.5	60.6'
4 5	243°55.69 258°55.60	4.57 5.23	100°51.21 115°20.64	10.4' 10.4'	05°50.22 06°7.69	17.5' 17.4'	60.6' 60.6'
6	273°55.51	5.23 \$18°5.89	129° 50.00	10.4	N06°25.13	17.4	60.6
7	288°55.42	6.54	144° 19.32	10.3'	06° 42.55	17.4	60.6
8	303°55.33	7.20	158° 48.57	10.2'	06°59.93	17.4'	60.6'
9	318°55.24	• • 7.86	173° 17.77	10.1'	07° 17.29	17.3'	60.6'
10 11	333°55.15 348°55.06	8.51 9.17	187°46.91 202°15.99	10.1' 10.0'	07°34.61 07°51.90	17.3' 17.3'	60.7' 60.7'
12	3°54.96	\$18°9.82	202 15.99 216°45.01	10.0'	N08°9.15	17.3	60.7
13	18°54.87	10.47	231° 13.97	9.9'	$08^{\circ}26.37$	17.2'	60.7'
14	33°54.78	11.13	245° 42.86	9.8'	08° 43.54	17.1'	60.7'
15 16	48°54.69 63°54.59	· · 11.78 12.43	260°11.68 274°40.44	9.8' 9.7'	09°0.67 09°17.76	17.1' 17.0'	60.7' 60.7'
16 17	78°54.59	12.43	274°40.44 289°9.14	9.7	09°17.76	17.0° 17.0°	60.7'
18	93°54.40	\$18°13.73	303°37.76	9.6'	N09°51.79	16.9	60.7'
19	108°54.31	14.38	318°6.32	9.5'	10°8.73	16.9'	60.7'
20	123°54.21	15.03	332°34.80	9.4'	10°25.61	16.8'	60.8'
21 22	138°54.12 153°54.02	· · 15.68 16.33	347°3.21 1°31.55	9.3' 9.3'	10° 42.44 10° 59.22	16.8' 16.7'	60.8' 60.8'
23	168°53.93	16.55	1 51.55 15°59.81	9.3 9.2'	10 59.22 11°15.93	16.7'	60.8
	SD = 16.2'	d = 0.7'			D = 16.5'		
	5D = In / In						

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.
N 72°	06:50	08:22	10:27	13:00	15:05	16:37
N 70°	06:41	08:02	09:33	13:54	15:26	16:46
68°	06:33	07:45	09:01	14:26	15:42	16:54
66°	06:27	07:32	08:38	14:50	15:55	17:00
64°	06:21	07:21	08:19	15:08	16:07	17:06
62°	06:16	07:11	08:04	15:23	16:16	17:11
60°	06:12	07:03	07:51	15:36	16:24	17:16
N 58°	06:08	06:56	07:41	15:47	16:32	17:20
56°	06:04	06:49	07:31	15:57	16:38	17:24
54°	06:01	06:44	07:23	16:05	16:44	17:27
52°	05:57	06:38	07:15	16:12	16:50	17:30
50°	05:54	06:33	07:09	16:19	16:54	17:34
45°	05:47	06:23	06:54	16:34	17:05	17:41
N 40°	05:41	06:13	06:42	16:46	17:15	17:47
35°	05:35	06:05	06:32	16:56	17:23	17:53
30°	05:29	05:58	06:23	17:05	17:30	17:59
20°	05:18	05:44	06:07	17:21	17:44	18:11
N 10°	05:06	05:32	05:54	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:09	18:35
S 10°	04:39	05:05	05:28	18:01	18:23	18:49
20°	04:22	04:50	05:14	18:15	18:39	19:06
30°	04:00	04:31	04:57	18:32	18:57	19:29
35°	03:46	04:20	04:48	18:41	19:09	19:43
40°	03:29	04:07	04:37	18:52	19:22	20:00
45°	03:08	03:50	04:24	19:05	19:39	20:22
S 50°	02:39	03:30	04:08	19:21	20:00	20:51
52°	02:24	03:20	04:01	19:29	20:10	21:06
54°	02:07	03:08	03:53	19:37	20:22	21:24
56°	01:44	02:55	03:43	19:47	20:35	21:47
58°	01:13	02:40	03:33	19:57	20:51	22:20
S 60°	00:14	02:21	03:20	20:10	21:10	////

Lat.		Moonris	e		Moonset	;
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	15:07	14:28	13:47		02:01	04:31
N 70°	15:00	14:31	14:00		02:03	04:22
68°	14:54	14:32	14:10		02:06	04:15
66°	14:49	14:34	14:18	00:08	02:08	04:09
64°	14:45	14:35	14:25	00:16	02:09	04:04
62°	14:42	14:37	14:31	00:23	02:11	03:59
60°	14:39	14:38	14:37	00:29	02:12	03:56
N 58°	14:36	14:39	14:42	00:35	02:13	03:52
56°	14:33	14:39	14:46	00:40	02:14	03:50
54°	14:31	14:40	14:50	00:44	02:15	03:47
52°	14:29	14:41	14:53	00:48	02:15	03:45
50°	14:27	14:42	14:57	00:51	02:16	03:43
45°	14:23	14:43	15:04	00:59	02:17	03:38
N 40°	14:20	14:44	15:10	01:05	02:19	03:34
35°	14:17	14:45	15:15	01:10	02:20	03:31
30°	14:14	14:46	15:19	01:15	02:21	03:28
20°	14:09	14:48	15:27	01:23	02:22	03:23
N 10°	14:05	14:49	15:35	01:29	02:24	03:18
0°	14:02	14:51	15:41	01:36	02:25	03:14
S 10°	13:58	14:52	15:48	01:42	02:26	03:10
20°	13:54	14:54	15:56	01:49	02:27	03:06
30°	13:49	14:56	16:04	01:56	02:29	03:01
35°	13:46	14:57	16:09	02:01	02:29	02:58
40°	13:43	14:58	16:15	02:06	02:30	02:55
45°	13:40	14:59	16:21	02:11	02:31	02:51
S 50°	13:36	15:01	16:29	02:18	02:32	02:47
52°	13:34	15:02	16:33	02:21	02:33	02:45
54°	13:31	15:03	16:37	02:24	02:33	02:43
56°	13:29	15:04	16:41	02:28	02:34	02:40
58°	13:26	15:05	16:47	02:32	02:35	02:37
S 60°	13:23	15:06	16:52	02:37	02:36	02:34

		Sun		Moon			
Day	Eqn.of Time		Eqn.of Time Mer.		Mer.Pass.		
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	69-88%	
11	15:59	15:56	11:44	20:13	07:49		
12	15:52	15:48	11:44	21:02	08:38		
13	15:44	15:40	11:44	21:54	09:28		

November 14, 15, 16 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	53°35.27	140°38.37 \$25°37.66	287°52.17 N21°17.74	335°10.68 N22°18.01	68°43.57 \$08°44.38	
1	68° 37.73	155°37.54 37.66	302°53.93 17.68	350°13.44 17.99	83°46.04 44.37	Alpheratz 357°34.72 29°13.85
2	83°40.19	170°36.70 37.67	317°55.69 17.62	5°16.19 17.97	98°48.52 44.37	Ankaa 353°6.98 -42°10.37 Schedar 349°30.82 56°40.65
3	98°42.66	185°35.87 · · 37.67	332°57.45 · · 17.56	20°18.95 · · 17.95	113°50.99 · · 44.37	Diphda 348° 47.20 -17° 51.01
4	113°45.12	200°35.03 37.67	347°59.22 17.50	35°21.71 17.93	128°53.46 44.36	Achernar 335°19.74 -57°6.72
5	128° 47.59	215°34.20 37.67	3°0.98 17.45	50°24.47 17.91	143°55.94 44.36	Hamal 327°51.05 23°34.92
6 7	143° 50.05 158° 52.51	230°33.36	18° 2.75 N21° 17.39 33° 4.51 17.33	65°27.22 N22°17.89 80°29.98 17.87	158°58.41 \$08°44.35 174°0.88 44.35	Polaris 313°36.98 89°22.18
8	173° 54.98	260°31.70 37.66	48° 6.28 17.27	95°32.74 17.85	189°3.35 44.34	Acamar 315°11.45 -40°12.25
9	188° 57.44	275°30.86 · · 37.65	63°8.05 · · 17.21	110°35.50 · · 17.83	204°5.82 · · 44.34	Menkar 314°5.98 4°11.33 Mirfak 308°27.97 49°57.03
10	203°59.91	290°30.03 37.64	78° 9.82 17.16	125°38.26 17.81	219°8.30 44.34	Mirfak 308°27.97 49°57.03 Aldebaran 290°39.46 16°33.62
11	219°2.37	305°29.19 37.64	93°11.59 17.10	140°41.01 17.79	234° 10.77 44.33	Rigel 281°3.71 -8°10.24
12	234°4.84	320°28.36 \$25°37.63	108°13.36 N21°17.04	155°43.77 N22°17.77	249°13.24 \$08°44.33	Capella 280°21.68 46°1.33
13 14	249°7.30 264°9.76	335°27.53 37.61 350°26.69 37.60	123°15.14 16.99 138°16.91 16.93	170°46.53 17.75 185°49.29 17.74	264°15.71 44.32 279°18.18 44.32	Bellatrix 278°22.74 6°22.42
15	279° 12.23	5°25.86 · · 37.59	153°18.68 · · 16.87	200°52.05 · · 17.72	294°20.65 · · 44.31	Elnath 278°1.72 28°37.71
16	294°14.69	20°25.03 37.57	168°20.46 16.82	215°54.81 17.70	309°23.12 44.31	Alnilam 275°37.59 -1°11.05
17	$309^{\circ}17.16$	35°24.19 37.56	183°22.24 16.76	230°57.57 17.68	324°25.59 44.30	Betelgeuse 270°51.97 7°24.78 Canopus 263°52.05 -52°42.24
18	324° 19.62	50°23.36 S 25°37.54	198°24.01 N21°16.71	246°0.33 N22°17.66	339°28.06 S 08°44.30	Sirius 258°26.13 -16°44.83
19	339°22.08	65°22.53 37.52	213°25.79 16.65	261°3.09 17.64	354°30.53 44.29	Adhara 255°5.74 -29°0.10
20 21	354°24.55 9°27.01	80°21.69 37.50 95°20.86 · · 37.48	228°27.57 16.60 243°29.35 · · 16.54	276° 5.85 17.62 291° 8.62 · · 17.60	9°33.00 44.29 24°35.47 •• 44.28	Procyon 244°50.83 5°9.76
22	9 27.01 24°29.48	95 20.86 · · 37.48 110°20.03 37.46	258°31.13 16.49	306°11.38 17.58	39°37.94 44.28	Pollux 243°17.31 27°57.92
23	39°31.94	125°19.20 37.43	273°32.91 16.43	321°14.14 17.56	54° 40.41 44.27	Avior 234°14.60 -59°34.96
						Suhail 222°46.38 -43°31.63
Mer.	pass. 20:22	ν-0.8′ d0.0′ m-4.09	$\nu 1.8' \ d$ -0.1' m-0.16	ν2.8' d-0.0' m-2.76	ν2.5' d-0.0' m0.86	Miaplacidus 221°38.24 -69°48.74 Alphard 217°47.89 -8°45.82
						Regulus 207°34.65 11°50.78
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.41 61°36.80
0	54°34.40	140°18.37 \$25°37.41	288°34.70 N21°16.38	336°16.90 N22°17.54	69°42.88	Denebola 182°25.29 14°26.01
1 2	69°36.87 84°39.33	155°17.53 37.38 170°16.70 37.36	303°36.48 16.32 318°38.27 16.27	351°19.66 17.52 6°22.43 17.50	84°45.35 44.26 99°47.82 44.26	Gienah 175°43.98 -17°40.63
3	99°41.80	185°15.87 · · 37.33	333°40.05 · · 16.21	21°25.19 · · 17.48	114°50.29 · · 44.25	Acrux 173°0.81 -63°13.94
4	114° 44.26	200°15.04 37.30	348°41.84 16.16	36°27.95 17.46	129°52.76 44.25	Gacrux 171°52.27 -57°14.88
5	129°46.73	215°14.21 37.27	3°43.63 16.11	51°30.71 17.44	144°55.23 44.24	Alioth 166°13.52 55°49.35 Spica 158°22.75 -11°17.34
6	144°49.19	230°13.38 S 25°37.23	18°45.42 N21°16.06	66°33.48 N22°17.42	159°57.70 S 08°44.24	Alkaid 152°52.55 49°11.27
7	159°51.65	245°12.55 37.20	33°47.21 16.00	81°36.24 17.40	175°0.16 44.23	Hadar 148°36.88 -60°29.40
8 9	174° 54.12 189° 56.58	260°11.72 37.16	48°49.00 15.95	96°39.00 17.38 111°41.77 · 17.36	190°2.63 44.22	Menkent 147°58.20 -36°29.38
10	204°59.05	275°10.89 · · 37.13 290°10.06 37.09	63°50.79 · · 15.90 78°52.59	111°41.77 · · 17.36 126°44.53 17.34	205°5.10 · · 44.22 220°7.57 44.21	Arcturus 145°48.38 19°3.20
11	220°1.51	305°9.23 37.05	93°54.38 15.79	141°47.30 17.32	235°10.03 44.21	Rigil Kent. 139°41.21 -60°56.15
12	235°3.97	320°8.40 S25°37.01	108°56.18 N21°15.74	156°50.06 N22°17.30	250°12.50 S08°44.20	Kochab 137°20.92 74°3.09 Zuben'ubi 136°56.53 -16°8.61
13	250°6.44	335°7.57 36.97	123°57.97 15.69	171°52.83 17.28	265°14.97 44.19	Zuben'ubi 136°56.53 -16°8.61 Alphecca 126°4.24 26°37.90
14	265°8.90	350°6.74 36.93	138°59.77 15.64	186°55.59 17.26	280° 17.44 44.19	Antares 112° 16.39 -26° 29.19
15	280°11.37	5°5.91 · · 36.88	154° 1.57 · · 15.59	201°58.36 · · 17.24	295°19.90 · · 44.18	Atria 107°11.30 -69°4.37
16 17	295° 13.83 310° 16.30	20°5.08 36.84 35°4.25 36.79	169°3.37 15.54 184°5.17 15.49	217°1.12 17.22 232°3.89 17.20	310°22.37 44.17 325°24.84 44.17	Sabik 102°3.28 -15°45.31
18	325° 18.76	50°3.42 \$25°36.74	199°6.97 N21°15.44	247°6.66 N22°17.18	340°27.30 \$08°44.16	Shaula 96°10.95 -37°7.34
19	340°21.22	65°2.59 36.69	214°8.77 15.39	262°9.42 17.16	355°29.77 44.15	Rasalhague 95°58.99 12°32.59
20	355°23.69	80°1.76 36.64	229°10.58 15.34	277°12.19 17.14	10°32.23 44.15	Eltanin 90°42.70 51°29.26 Kaus Aust. 83°33.02 -34°22.43
21	$10^{\circ}26.15$	95°0.93 · · 36.59	244°12.38 · · 15.29	292°14.96 · · 17.12	25°34.70 · · 44.14	Vega 80°33.64 38°48.54
22	25°28.62	110°0.10 36.54	259°14.19 15.24	307°17.72 17.10	40°37.17 44.13	Nunki 75°48.20 -26°16.00
23	40°31.08	124°59.28 36.48	274°15.99 15.19	322°20.49 17.08	55°39.63 44.13	Altair 62°0.27 8°56.12
Mer.	pass. 20:18	ν -0.8′ d -0.0′ m-4.09	$ u 1.8' \ d ext{-}0.1' \ ext{m-}0.18$	ν 2.8′ d-0.0′ m-2.77	$ u 2.5' \ d$ -0.0 $' \ { m m} 0.87$	Peacock 53°6.15 -56°39.53
						Deneb 49°26.05 45°22.37
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.95 9°59.44
0	55° 33.54	139°58.45 \$25°36.43	289°17.80 N21°15.14	337°23.26 N22°17.06	70°42.10	Al Na'ir 27°33.03 -46°50.64 Fomalhaut 15°14.55 -29°29.54
1	70°36.01	154°57.62 36.37	304°19.61 15.09	352°26.02 17.04	85°44.56 44.11	Scheat 13°45.23 28°13.25
2	85°38.47	169°56.79 36.31	319°21.42 15.04	7°28.79 17.02	100° 47.03 44.11	Markab 13°29.94 15°20.48
3 4	100° 40.94 115° 43.40	184°55.97 · · 36.26 199°55.14 36.19	334°23.23 ·· 14.99 349°25.04 14.95	22°31.56 ·· 17.00 37°34.33 16.98	115°49.49 · · 44.10 130°51.96	Nov 14 Thu SHA Mer.pass
5	130°45.87	214°54.31 36.13	4°26.85 14.90	52°37.10 16.96	145°54.42 44.08	Venus 87°3.11 14:38
6	145° 48.33	229°53.49 \$25°36.07	19°28.67 N21°14.85	67°39.87 N22°16.94	160°56.89 S08°44.08	Mars 234°16.90 04:48
7	160° 50.79	244°52.66 36.01	34°30.48 14.80	82°42.64 16.91	175°59.35 44.07	Jupiter 281°35.42 01:39
8	175° 53.26	259°51.83 35.94	49°32.30 14.76	97°45.41 16.89	191°1.81 44.06	Saturn 15°8.30 19:22
9	190°55.72	274°51.01 · · 35.87	64°34.11 · · 14.71	112°48.18 · · 16.87	206°4.28 · · 44.05	Nov 15 Fri SHA Mer.pass
10	205°58.19	289°50.18 35.81	79°35.93 14.66	127°50.95 16.85	221°6.74 44.05	Venus 85°43.96 14:40
11 12	221°0.65 236°3.11	304°49.36 35.74 319°48.53 \$25°35.67	94°37.75 14.62 109°39.57 N21°14.57	142°53.72 16.83 157°56.49 N22°16.81	236°9.20 44.04 251°11.67 \$08°44.03	Mars 234°0.29 04:45
13	250 5.11 251°5.58	334°47.70 35.59	124°41.39 14.53	172°59.26 16.79	266°14.13 44.02	Jupiter 281°42.50 01:35
14	266°8.04	349°46.88 35.52	139°43.21 14.48	188°2.03 16.77	281°16.59 44.01	Saturn 15°8.48 19:18
15	$281^{\circ}10.51$	4°46.05 · · 35.45	154°45.03 · · 14.43	203°4.80 · · 16.75	296°19.06 · · 44.01	Nov 16 Sat SHA Mer.pass
16	296° 12.97	19°45.23 35.37	169°46.86 14.39	218°7.57 16.73	311°21.52 44.00	Venus 84°24.90 14:41
17	311° 15.44	34°44.41 35.29	184°48.68 14.34	233°10.34 16.71	326°23.98 43.99	Mars 233°44.26 04:42
18 19	326°17.90 341°20.36	49°43.58 S25°35.21 64°42.76 35.13	199°50.51 N21°14.30 214°52.34 14.26	248°13.11 N22°16.69 263°15.88 16.67	341°26.44 \$08°43.98 356°28.91 43.97	Jupiter 281°49.71 01:30
20	341 20.36 356°22.83	79°41.93 35.05	214 52.34 14.20 229°54.16 14.21	278°18.66 16.65	11°31.37 43.96	Saturn 15°8.55 19:14
21	11°25.29	94°41.11 · · 34.97	244°55.99 · · 14.17	293°21.43 · · 16.63	26°33.83 · · 43.96	Horizontal parallax
22	26°27.76	109°40.29 34.89	259°57.82 14.12	308°24.20 16.61	41°36.29 43.95	Venus: 0.1
23	41°30.22	124°39.46 34.80	274°59.65 14.08	323°26.97 16.58	56°38.75 43.94	Mars: 0.2
Mer.ı	pass. 20:14	ν-0.8' d-0.1' m-4.10	ν1.8' d-0.0' m-0.20	ν2.8' d-0.0' m-2.77	ν2.5' d-0.0' m0.87	

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.83	S18°17.63	30°28.00	9.1'	N11°32.59	16.6'	60.8'
1 2	198°53.73 213°53.64	18.27 18.92	44°56.11 59°24.15	9.0' 9.0'	11°49.18 12°5.70	16.5' 16.5'	60.8' 60.8'
3	228°53.54	. 19.57	73°52.11	8.9'	12°22.16	16.4	60.8'
4	243°53.44	20.21	88°19.98	8.8'	12° 38.55	16.3'	60.8'
5	258°53.34 273°53.24	20.86	102°47.78 117°15.50	8.7'	12°54.86 N13°11.11	16.2'	60.8'
6 7	273°53.24 288°53.14	\$18°21.50 22.14	117°15.50 131°43.14	8.6' 8.6'	13°27.27	16.2' 16.1'	60.8' 60.8'
8	303°53.05	22.79	146°10.69	8.5'	13°43.36	16.0'	60.8
9	318°52.95	• • 23.43	160°38.16	8.4'	13°59.36	15.9'	60.8'
10 11	333°52.85 348°52.75	24.07 24.71	175°5.54 189°32.84	8.3' 8.2'	14°15.29 14°31.13	15.8' 15.8'	60.8' 60.8'
12	3°52.64	\$18°25.35	204°0.06	8.1'	N14°46.88	15.7'	60.8
13	18°52.54	26.00	218°27.19	8.0'	$15^{\circ}2.54$	15.6'	60.8'
14	33°52.44 48°52.34	26.63	232°54.23 247°21.18	8.0'	15°18.11 15°33.59	15.5' 15.4'	60.8'
15 16	48 52.34 63°52.24	· · 27.27 27.91	247 21.18 261°48.05	7.9' 7.8'	15 33.59 15°48.97	15.4	60.8' 60.8'
17	78°52.13	28.55	276°14.82	7.7'	16°4.26	15.2'	60.8
18	93°52.03	S18°29.19	290°41.51	7.6'	N16° 19.44	15.1'	60.8'
19 20	108°51.93 123°51.82	29.83 30.46	305°8.11 319°34.62	7.5' 7.4'	16° 34.52 16° 49.50	15.0' 14.9'	60.8' 60.8'
21	138°51.72	31.10	334°1.03	7.3	10°49.30 17°4.37	14.8'	60.8
22	153°51.62	31.73	348°27.36	7.2'	$17^{\circ}19.14$	14.7'	60.8'
23	168°51.51	32.37	2°53.59	7.1'	17°33.79	14.5'	60.8'
	$SD = 16.2^{\prime}$	d = 0.6'		S	D = 16.6'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.41	\$18°33.00	$17^{\circ}19.73$	7.1'	$N17^{\circ}48.33$	14.4'	60.8
1	198°51.30	33.63	31°45.78	7.0'	18°2.75	14.3'	60.8'
2	213°51.19 228°51.09	34.27 •• 34.90	46°11.74 60°37.61	6.9' 6.8'	18° 17.06 18° 31.25	14.2' 14.1'	60.8' 60.7'
4	243°50.98	35.53	75°3.38	6.7'	18° 45.31	13.9'	60.7
5	258°50.87	36.16	89°29.06	6.6'	$18^{\circ}59.26$	13.8'	60.7'
6	273°50.77 288°50.66	\$18°36.79 37.42	103°54.65 118°20.15	6.5' 6.4'	N19°13.08 19°26.77	13.7'	60.7' 60.7'
7 8	288°50.66 303°50.55	37.42 38.05	118° 20.15 132° 45.55	6.3	19° 26.77 19° 40.33	13.6' 13.4'	60.7'
9	318°50.44	• • 38.68	147°10.87	6.2'	19°53.75	13.3'	60.7'
10	333°50.33	39.31	161°36.09	6.1'	20°7.05	13.2'	60.7'
11 12	348°50.22 3°50.12	39.94 \$18°40.57	176°1.21 190°26.25	6.0' 5.9'	20°20.21 N20°33.23	13.0' 12.9'	60.7' 60.7'
13	18°50.01	41.19	204°51.20	5.9'	20°46.11	12.7'	60.6
14	33°49.90	41.82	219°16.05	5.8'	20°58.85	12.6'	60.6'
15 16	48°49.78 63°49.67	· · 42.44 43.07	233°40.82 248°5.50	5.7' 5.6'	21°11.45 21°23.90	12.5' 12.3'	60.6' 60.6'
17	78°49.56	43.69	262°30.08	5.5'	21°36.20	12.2'	60.6
18	93°49.45	S18°44.32	276°54.58	5.4'	N21°48.35	12.0'	60.6'
19 20	108°49.34 123°49.23	44.94 45.56	291°18.99 305°43.32	5.3' 5.2'	22°0.36 22°12.20	11.8' 11.7'	60.6' 60.5'
21	138°49.11	. 46.19	320°7.55	5.2'	22° 23.90	11.7	60.5
22	153°49.00	46.81	334°31.71	5.1'	22°35.43	11.4'	60.5'
23	168°48.89	47.43	348°55.78	5.0'	22°46.81	11.2'	60.5'
	SD = 16.2'	d = 0.6'		S	D = 16.6'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°48.77	\$18°48.05	3°19.76	4.9'	N22°58.03	11.1'	60.5'
1 2	198°48.66 213°48.54	48.67 49.29	17°43.66 32°7.48	4.8' 4.7'	23°9.09 23°19.98	10.9' 10.7'	60.5' 60.4'
3	228°48.43	• • 49.91	46°31.23	4.7'	23°30.70	10.6'	60.4
4	243°48.31	50.52	60°54.89	4.6'	23°41.26	10.4'	60.4
5 6	258°48.20 273°48.08	51.14 \$18°51.76	75°18.47 89°41.98	4.5' 4.4'	23°51.65 N24°1.87	10.2' 10.0'	60.4' 60.4'
7	288°47.96	52.37	104°5.41	4.4'	24° 11.92	9.9'	60.3
8	303°47.85	52.99	118°28.77	4.3'	24°21.79	9.7'	60.3'
9 10	318°47.73 333°47.61	· · 53.61 54.22	132°52.06 147°15.28	4.2' 4.1'	24°31.49 24°41.01	9.5' 9.3'	60.3' 60.3'
11	348°47.49	54.83	147 15.28 161°38.43	4.1' 4.1'	24 41.01 24°50.35	9.3 9.2'	60.2
12	3°47.38	S 18°55.45	176°1.51	4.0'	N24°59.52	9.0'	60.2'
13 14	18°47.26 33°47.14	56.06 56.67	190°24.53 204°47.48	4.0' 3.9'	25°8.50 25°17.30	8.8' 8.6'	60.2' 60.2'
14 15	33°47.14 48°47.02	50.07	204 47.48 219° 10.37	3.8'	25° 17.30 25° 25.92	8.6 8.4	60.2 60.1
16	63°46.90	57.90	233°33.20	3.8'	25°34.35	8.2'	60.1'
17	78°46.78	58.51	247°55.98	3.7'	25°42.60	8.1'	60.1
18 19	93°46.66 108°46.54	\$18°59.12 18°59.73	262°18.70 276°41.36	3.7' 3.6'	N25°50.66 25°58.54	7.9' 7.7'	60.1' 60.0'
20	123°46.42	19°0.33	291°3.98	3.6'	26°6.22	7.5'	60.0'
21	138°46.30	• • 0.94	305°26.54	3.5'	26°13.71	7.3'	60.0'
22 23	153°46.17 168°46.05	1.55 2.16	319°49.06 334°11.53	3.5' 3.4'	26°21.02 26°28.13	7.1' 6.9'	60.0' 59.9'
23	SD = 16.2'	d = 0.6'			D = 16.5'	0.9	33.3
	JD — 10.2	u — 0.0		3	_ 10.5		

Lat. Naut. Civil Sunrise Sunset Civil N 72° 07:01 08:36 11:13 12:16 14:52 N 70° 06:51 08:13 09:53 13:36 15:15 68° 06:42 07:55 09:15 14:13 15:33 66° 06:35 07:41 08:49 14:40 15:47 64° 06:29 07:29 08:29 15:00 15:59 62° 06:23 07:19 08:13 15:16 16:10 60° 06:18 07:10 07:59 15:30 16:19 N 58° 06:13 07:02 07:47 15:41 16:27 56° 06:09 06:55 07:37 15:51 16:34 54° 06:05 06:49 07:29 16:00 16:40	Naut. 16:27 16:37 16:46 16:53 17:00 17:06 17:11 17:15 17:19
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16:37 16:46 16:53 17:00 17:06 17:11 17:15
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16:46 16:53 17:00 17:06 17:11 17:15
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	16:53 17:00 17:06 17:11 17:15
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	17:00 17:06 17:11 17:15
62° 06:23 07:19 08:13 15:16 16:10 60° 06:18 07:10 07:59 15:30 16:19 N 58° 06:13 07:02 07:47 15:41 16:27 56° 06:09 06:55 07:37 15:51 16:34	17:06 17:11 17:15
60° 06:18 07:10 07:59 15:30 16:19 N 58° 06:13 07:02 07:47 15:41 16:27 56° 06:09 06:55 07:37 15:51 16:34	17:11 17:15
N 58° 06:13 07:02 07:47 15:41 16:27 56° 06:09 06:55 07:37 15:51 16:34	17:15
56° 06:09 06:55 07:37 15:51 16:34	
	17:19
E40 06.0E 06.40 07.20 16.00 16.40	
	17:23
52° 06:02 06:43 07:21 16:08 16:46	17:27
50° 05:58 06:38 07:13 16:15 16:51	17:30
45° 05:51 06:26 06:58 16:31 17:03	17:38
N 40° 05:44 06:17 06:46 16:43 17:12	17:45
35° 05:37 06:08 06:35 16:54 17:21	17:52
30° 05:31 06:00 06:25 17:04 17:29	17:58
20° 05:19	18:10
N 10° 05:07 05:33 05:55 17:35 17:57	18:22
0° 04:54 05:19 05:41 17:48 18:10	18:35
S 10° 04:39 05:05 05:27 18:02 18:24	18:50
20° 04:21 04:49 05:13 18:17 18:40	19:08
30° 03:58 04:30 04:56 18:34 19:00	19:32
35° 03:44 04:18 04:46 18:44 19:12	19:46
40° 03:26 04:04 04:34 18:56 19:26	20:04
45° 03:04 03:47 04:21 19:09 19:44	20:27
S 50° 02:33 03:25 04:04 19:26 20:06	20:58
52° 02:17 03:14 03:56 19:34 20:16	21:14
54° 01:58 03:02 03:48 19:43 20:29	21:34
56° 01:33 02:48 03:38 19:53 20:43	22:00
58° 00:57 02:32 03:26 20:04 21:00	22:39
S 60° //// 02:11 03:13 20:18 21:21	////

Lat.		Moonris	e		Moonset		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat	
N 72°	12:48			07:22			
N 70°	13:18			06:54			
68°	13:41	12:48		06:34	09:25		
66°	13:59	13:29		06:17	08:44		
64°	14:14	13:58	13:26	06:04	08:17	10:54	
62°	14:26	14:20	14:13	05:53	07:56	10:08	
60°	14:37	14:38	14:44	05:44	07:39	09:38	
N 58°	14:46	14:54	15:07	05:36	07:24	09:15	
56°	14:54	15:07	15:26	05:29	07:12	08:57	
54°	15:02	15:18	15:42	05:23	07:02	08:41	
52°	15:08	15:28	15:56	05:17	06:52	08:28	
50°	15:14	15:37	16:08	05:12	06:44	08:16	
45°	15:27	15:56	16:34	05:01	06:26	07:52	
N 40°	15:38	16:12	16:54	04:52	06:12	07:33	
35°	15:48	16:26	17:11	04:44	06:00	07:17	
30°	15:56	16:37	17:25	04:37	05:49	07:03	
20°	16:10	16:58	17:51	04:26	05:31	06:40	
N 10°	16:23	17:15	18:12	04:16	05:16	06:19	
0°	16:35	17:32	18:33	04:06	05:01	06:00	
S 10°	16:47	17:49	18:53	03:57	04:47	05:42	
20°	17:00	18:07	19:16	03:47	04:32	05:22	
30°	17:15	18:28	19:41	03:35	04:14	04:59	
35°	17:24	18:40	19:57	03:29	04:04	04:45	
40°	17:34	18:55	20:15	03:22	03:52	04:30	
45°	17:46	19:12	20:36	03:13	03:39	04:11	
S 50°	18:00	19:33	21:04	03:03	03:23	03:49	
52°	18:07	19:43	21:17	02:58	03:15	03:38	
54°	18:15	19:55	21:33	02:53	03:06	03:26	
56°	18:23	20:08	21:51	02:47	02:57	03:12	
58°	18:33	20:24	22:14	02:41	02:46	02:55	
S 60°	18:44	20:42	22:43	02:34	02:34	02:36	

Sun				Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-100%
14	15:35	15:31	11:44	22:48	10:20	
15	15:26	15:20	11:45	23:46	11:17	
16	15:15	15:10	11:45	-:-	12:17	

November 17, 18, 19 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	56°32.69	139°38.64	290°1.49 N21°14.04	338°29.75 N22°16.56	71°41.21
1	71°35.15	154°37.82 34.63	305°3.32 13.99	353°32.52 16.54	86° 43.67 43.92
2	86°37.61	169°36.99 34.54	320° 5.15 13.95	8°35.29 16.52	101°46.13 43.91
3	101°40.08	184°36.17 · · 34.45	335°6.99 · · 13.91	23°38.07 · · 16.50	116° 48.60 · · 43.90
4	116° 42.54	199°35.35 34.36	350°8.83 13.87	38°40.84 16.48	131°51.06 43.89
5	131° 45.01	214°34.53 34.27	5°10.66 13.82	53°43.62 16.46	146°53.52 43.88
6	146° 47.47	229°33.71 S25°34.18	20°12.50 N21°13.78	68°46.39 N22°16.44	161°55.98
7	161°49.93	244°32.88 34.08	35°14.34 13.74	83°49.16 16.42	176° 58.44 43.87
8	176°52.40	259°32.06 33.99	50°16.18 13.70	98°51.94 16.40	192°0.90 43.86
9	191°54.86	274°31.24 · · 33.89	65°18.02 · · 13.66	113°54.71 · · 16.38	207°3.36 · · 43.85
10	206°57.33	289°30.42 33.79	80°19.86 13.62	128°57.49 16.35	222°5.82 43.84
11	221°59.79	304°29.60 33.69	95°21.71 13.58	144°0.26 16.33	237°8.27 43.83
12	237°2.26	319°28.78 \$25°33.59	110°23.55 N21°13.54	159°3.04 N22°16.31	252°10.73 S 08°43.82
13	252°4.72	334°27.96 33.49	125°25.40 13.50	174°5.82 16.29	267°13.19 43.81
14	267°7.18	349°27.14 33.38	140°27.24 13.46	189°8.59 16.27	282°15.65 43.80
15	282°9.65	4°26.32 · · 33.28	155°29.09 · · 13.42	204°11.37 · · 16.25	297°18.11 · · 43.79
16	297° 12.11	19°25.50 33.17	170°30.94 13.38	219°14.15 16.23	312°20.57 43.78
17	312°14.58	34°24.68 33.07	185°32.79 13.34	234°16.92 16.21	327°23.03 43.77
18	327°17.04	49°23.86 S 25°32.96	200°34.64 N21°13.30	249°19.70 N22°16.19	342°25.49 \$08°43.76
19	342° 19.51	64°23.04 32.85	215°36.49 13.26	264°22.48 16.16	357° 27.94 43.75
20	357°21.97	79°22.23 32.74	230°38.35 13.22	279°25.25 16.14	12°30.40 43.74
21	12°24.43	94°21.41 · · 32.62	245°40.20 · · 13.19	294°28.03 · · 16.12	27°32.86 · · 43.73
22	27°26.90	109°20.59 32.51	260°42.06 13.15	309°30.81 16.10	42°35.32 43.72
23	42°29.36	124°19.77 32.40	275°43.91 13.11	324°33.59 16.08	57°37.77 43.71
Mer.p	ass. 20:11	ν -0.8 $'$ d-0.1 $'$ m-4.11	$\nu 1.8' \ d$ -0.0' m-0.22	ν 2.8′ <i>d</i> -0.0′ m-2.77	ν2.5' d-0.0' m0.88
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Vion 0	GHA 57°31.83	139°18.95 \$25°32.28	290°45.77 N21°13.07	339°36.37 N22°16.06	72°40.23
1	72°34.29	139 18.95 S 25 32.28 154 18.14 32.16	290°45.77 N21°13.07 305°47.63 13.04	354°39.14 16.04	87°42.69 43.69
2	87° 36.76	169°17.32 32.04	320°49.49 13.00	9°41.92 16.02	102°45.14 43.68
3	102°39.22	184°16.50 · · 31.92	335°51.35 · · 12.96	24°44.70 · · 15.99	117° 47.60 · · 43.67
4	117°41.68	199° 15.69 31.80	350°53.21 12.93	39°47.48 15.97	132°50.06 43.65
5	132° 44.15	214°14.87 31.68	5°55.07 12.89	54°50.26 15.95	147°52.51 43.64
6	147° 46.61	229°14.06 S25°31.56	20°56.93 N21°12.85	69°53.04 N22°15.93	162°54.97 S08°43.63
7	162°49.08	244°13.24 31.43	35°58.80 12.82	84°55.82 15.91	177° 57.43 43.62
8	177°51.54	259° 12.42 31.30	51° 0.66 12.78	99°58.60 15.89	192°59.88 43.61
9	192°54.01	274°11.61 · · 31.18	66° 2.53 · · 12.75	115°1.38 · · 15.87	208°2.34 · · 43.60
10	207°56.47	289°10.79 31.05	81°4.40 12.71	130°4.16 15.84	223°4.79 43.59
11	222°58.93	304°9.98 30.92	96° 6.27 12.68	145°6.94 15.82	238°7.25 43.58
12	238°1.40	319°9.16 \$25°30.79	111°8.14 N21°12.64	160°9.72 N22°15.80	253°9.70 S08°43.57
13	253°3.86	334°8.35 30.65	126° 10.01 12.61	175°12.50 15.78	268°12.16 43.55
14	268°6.33	349°7.54 30.52	141°11.88 12.58	190°15.28 15.76	283°14.61 43.54
15	283°8.79	4°6.72 · · 30.39	156°13.75 · · 12.54	205°18.06 · · 15.74	298°17.07 · · 43.53
16	$298^{\circ}11.25$	19°5.91 30.25	171°15.63 12.51	220°20.85 15.71	313°19.52 43.52
17	313° 13.72	34°5.10 30.11	186°17.50 12.48	235°23.63 15.69	328°21.98 43.51
18	$328^{\circ}16.18$	49°4.28 S 25°29.97	201°19.38 N21°12.44	250°26.41 N22°15.67	343°24.43 S 08°43.50
19	343° 18.65	64°3.47 29.83	216°21.26 12.41	265°29.19 15.65	358°26.88 43.49
20	358°21.11	79°2.66 29.69	231°23.14 12.38	280°31.98 15.63	13°29.34 43.47
21	13°23.58	94°1.85 · · 29.55	246°25.02 · · 12.35	295°34.76 · · 15.61	28°31.79 · · 43.46
22	28°26.04	109°1.04 29.41	261°26.90 12.32	310°37.54 15.58	43°34.24 43.45
23	43°28.50	124°0.22 29.26	276°28.78 12.28	325°40.32 15.56	58°36.70 43.44
Mer.p	ass. 20:07	ν -0.8′ d-0.1′ m-4.11	$\nu 1.9' \ d$ -0.0' m-0.23	ν 2.8′ <i>d</i> -0.0′ m-2.78	ν2.5' d-0.0' m0.88
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Tue 0	GHA 58°30.97	138°59.41 \$25°29.11	291°30.66 N21°12.25	340°43.11 N22°15.54	73°39.15 \$08°43.42
1	73°33.43	153°58.60 28.97	306°32.54 12.22	355°45.89 15.52	88°41.60 43.41
2	88° 35.90	168° 57.79 28.82	321°34.43 12.19	10°48.67 15.50	103° 44.06 43.40
3	103°38.36	183°56.98 · · 28.67	336°36.32 · · 12.16	25°51.46 · · 15.47	118° 46.51 · · · 43.39
4	118° 40.83	198°56.17 28.52	351°38.20 12.13	40°54.24 15.45	133°48.96 43.38
5	133° 43.29	213°55.36 28.36	6°40.09 12.10	55°57.03 15.43	148°51.41 43.36
6	148° 45.75	228°54.55 \$25°28.21	21°41.98 N21°12.07	70°59.81 N22°15.41	163°53.86 S08°43.35
7	163°48.22	243°53.74 28.05	36°43.87 12.04	86°2.60 15.39	178° 56.32 43.34
8	178°50.68	258°52.93 27.90	51°45.76 12.01	101°5.38 15.36	193°58.77 43.33
9	$193^{\circ}53.15$	273°52.12 · · 27.74	66°47.65 · · 11.98	116°8.17 · · 15.34	209°1.22 · · 43.31
10	$208^{\circ}55.61$	288°51.32 27.58	81°49.55 11.96	131°10.95 15.32	224°3.67 43.30
11	223°58.07	303°50.51 27.42	96°51.44 11.93	146°13.74 15.30	239°6.12 43.29
12	239°0.54	318°49.70 \$25°27.26	111°53.34 N21°11.90	161°16.52 N22°15.28	254°8.57 \$08°43.27
13	254°3.00	333°48.89 27.10	126°55.24 11.87	176°19.31 15.25	269°11.02 43.26
14	269°5.47	348°48.09 26.93	141°57.13 11.84	191°22.10 15.23	284°13.47 43.25
15	284°7.93	3°47.28 · · 26.77	156°59.03 · · 11.82	206°24.88 · · 15.21	299°15.92 · · 43.23
16	299° 10.40	18°46.47 26.60	172°0.93 11.79	221°27.67 15.19	314°18.37 43.22
17	314°12.86	33°45.67 26.43	187°2.83 11.76	236°30.46 15.17	329° 20.82 43.21
18	329° 15.32	48°44.86 S25°26.27	202°4.74 N21°11.74	251°33.24 N22°15.14	344°23.27 \$08°43.19
19	344°17.79	63°44.05 26.10	217° 6.64 11.71	266°36.03 15.12	359°25.72 43.18
20	359°20.25	78°43.25 25.92	232°8.54 11.68	281°38.82 15.10	14°28.17 43.17
21	14°22.72	93°42.44 · · 25.75	247°10.45 · · 11.66	296°41.60 · · 15.08	29°30.62 · · 43.15
22	29°25.18 44°27.65	108°41.64 25.58 123°40.83 25.40	262°12.36 11.63	311°44.39 15.05	44°33.07 43.14 59°35.52 43.13
23	44 27.05		277°14.26 11.61	326°47.18 15.03	
Mer.p	ass. 20:03	ν -0.8′ d -0.1′ m-4.12	$\nu 1.9' \ d$ -0.0' m-0.25	ν 2.8′ <i>d</i> -0.0′ m-2.78	ν 2.5′ <i>d</i> -0.0′ m0.89

	Stars	
	SHA	Dec
Alpheratz	357°34.72	29°13.85
Ankaa Schedar	353°6.99 349°30.82	-42°10.37 56°40.67
Diphda	349° 30.62 348° 47.20	-17°51.02
Achernar	$335^{\circ}19.76$	-57°6.74
Hamal	327°51.04	23°34.93
Polaris Acamar	313°36.57 315°11.44	89°22.20 -40°12.27
Menkar	314°5.97	4°11.33
Mirfak	308°27.95	49°57.04
Aldebaran Rigel	290°39.44 281°3.69	16°33.62 -8°10.25
Capella	280°21.65	46°1.34
Bellatrix	278°22.72	6°22.41
Elnath Alnilam	278°1.70 275°37.57	28°37.71 -1°11.06
Betelgeuse	270°51.95	7°24.78
Canopus	$263^{\circ}52.02$	-52°42.25
Sirius	258°26.11	-16°44.84
Adhara Procyon	255°5.72 244°50.80	-29°0.12 5°9.75
Pollux	243° 17.28	27°57.91
Avior	234°14.56	-59°34.98
Suhail Miaplacidus	222°46.34 221°38.18	-43°31.65 -69°48.75
Alphard	221° 38.18 217° 47.86	-69°48.75 -8°45.83
Regulus	$207^{\circ}34.62$	11°50.77
Dubhe	193°41.37 182°25.26	61°36.78
Denebola Gienah	182°25.26 175°43.95	14°26.00 -17°40.63
Acrux	173°0.77	-63°13.93
Gacrux	171°52.23	-57°14.88
Alioth Spica	166° 13.49 158° 22.73	55°49.33 -11°17.35
Alkaid	150 22.73 152°52.54	-11 17.35 49°11.25
Hadar	148°36.85	-60°29.39
Menkent	147°58.17	-36°29.38
Arcturus Rigil Kent.	145°48.36 139°41.18	19°3.19 -60°56.14
Kochab	137°20.92	74°3.07
Zuben'ubi	136°56.52	-16°8.61
Alphecca Antares	126°4.23 112°16.38	26°37.88 -26°29.19
Antares	107°11.29	-69°4.36
Sabik	$102^{\circ}3.28$	-15°45.31
Shaula Rasalhague	96° 10.94 95° 58.99	-37°7.33 12°32.58
Eltanin	90°42.71	51°29.25
Kaus Aust.	$83^{\circ}33.02$	-34°22.42
Vega	80°33.65	38°48.54
Nunki Altair	75°48.20 62°0.27	-26°16.00 8°56.12
Peacock	$53^{\circ}6.16$	-56°39.53
Deneb	49°26.06	45°22.37
Enif Al Na'ir	33°38.95 27°33.04	9°59.44 -46°50.64
Fomalhaut	15° 14.56	-40 50.04 -29°29.54
Scheat	$13^{\circ}45.24$	28°13.26
Markab	13°29.94	15°20.48
Nov 17 Sun	SHA	Mer.pass
Venus Mars	83°5.95 233°28.80	14:42 04:39
Jupiter	281°57.06	01:26
Saturn	15°8.53	19:10
Nov 18 Mon	SHA	Mer.pass
Venus	81°47.13	14:44
Mars Jupiter	233°13.94 282°4.54	04:36 01:21
Saturn	15°8.40	19:06
Nov 19 Tue	SHA	Mer.pass
Venus	80°28.44	14:45
Mars	232°59.69	04:33
Jupiter Saturn	282°12.14 15°8.18	01:17 19:02
		19:02
Horizon	tal parallax Venus:	0.1
	Mars:	0.1

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.93	S19°2.76	348°33.96	3.4'	N26°35.04	6.7'	59.9'
1	198°45.81	3.37	2°56.35	3.4'	26°41.77	6.5'	59.9'
2	213° 45.68	3.97	17°18.70	3.3'	26°48.30	6.3'	59.9'
3 4	228° 45.56 243° 45.43	· · 4.58 5.18	31°41.01 46°3.30	3.3' 3.3'	26°54.63 27°0.77	6.1' 5.9'	59.8' 59.8'
5	258° 45.31	5.16 5.79	60°25.55	3.2'	27° 6.71	5.9 5.7'	59.8'
6	273°45.18	S19°6.39	74°47.77	3.2'	N27°12.45	5.5'	59.7'
7	288°45.06	6.99	89° 9.97	3.2'	$27^{\circ}18.00$	5.3'	59.7'
8	303°44.93	7.59	103°32.15	3.2'	27°23.34	5.1'	59.7'
9 10	318° 44.81 333° 44.68	· · 8.19 8.79	117°54.30 132°16.44	3.1' 3.1'	27°28.49 27°33.44	4.9' 4.7'	59.6' 59.6'
11	348° 44.56	9.39	146°38.57	3.1	27°38.19	4.7	59.6'
12	3°44.43	S19° 9.99	161°0.68	3.1'	N27°42.74	4.3'	59.5'
13	18°44.30	10.59	175°22.78	3.1'	27°47.09	4.1'	59.5'
14	33°44.17	11.19	189°44.88	3.1'	27°51.23	3.9'	59.5'
15 16	48° 44.04 63° 43.92	· · 11.79 12.39	204° 6.98 218° 29.07	3.1' 3.1'	27°55.18 27°58.93	3.7' 3.5'	59.4' 59.4'
17	78° 43.79	12.98	232°51.16	3.1'	28°2.47	3.3'	59.4
18	93°43.66	S19°13.58	247°13.26	3.1'	N28°5.81	3.1'	59.3'
19	108°43.53	14.17	261°35.37	3.1'	28°8.96	2.9'	59.3'
20	123° 43.40	14.77	275°57.49	3.1'	28°11.90	2.7'	59.3'
21 22	138° 43.27 153° 43.14	· · 15.36 15.95	290°19.62 304°41.76	3.1' 3.2'	28°14.64 28°17.18	2.5' 2.3'	59.2' 59.2'
23	168° 43.01	16.55	319°3.93	3.2'	28°19.52	2.1'	59.2'
	SD = 16.2'	d = 0.6'			O = 16.3'		
	JD — 10.2	u — 0.0		اد			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183° 42.88 198° 42.74	\$19°17.14 17.73	333°26.12 347°48.33	3.2' 3.2'	N28°21.66 28°23.59	1.9' 1.7'	59.1' 59.1'
2	213° 42.74	18.32	2°10.57	3.3'	26 25.39 28°25.33	1.5'	59.1'
3	228° 42.48	. 18.91	16°32.84	3.3'	28°26.87	1.3'	59.0'
4	243°42.35	19.50	$30^{\circ}55.14$	3.3'	$28^{\circ}28.21$	1.1'	59.0'
5	258° 42.21	20.09	45°17.48	3.4'	28°29.36	0.9'	59.0'
6	273° 42.08 288° 41.95	\$19°20.68 21.27	59°39.86 74°2.28	3.4' 3.5'	N28°30.30 28°31.05	0.7' 0.6'	58.9'
7 8	288°41.95 303°41.81	21.27	74° 2.28 88° 24.74	3.5'	28°31.05 28°31.60	0.6	58.9' 58.9'
9	318° 41.68	• • 22.44	102°47.26	3.6'	28°31.96	0.4	58.8'
10	333°41.54	23.03	$117^{\circ}9.82$	3.6'	28°32.12	-0.0'	58.8'
11	348°41.41	23.61	131°32.43	3.7'	28°32.08	-0.2'	58.7'
12	3°41.27	\$19°24.20	145°55.10	3.7'	N28°31.85 28°31.43	-0.4'	58.7'
13 14	18° 41.13 33° 41.00	24.78 25.37	160°17.82 174°40.60	3.8' 3.8'	28°31.43 28°30.82	-0.6' -0.8'	58.7' 58.6'
15	48° 40.86	. 25.95	189° 3.45	3.9'	28°30.01	-1.0'	58.6'
16	63°40.72	26.53	203°26.36	4.0'	$28^{\circ}29.02$	-1.2'	58.6'
17	78° 40.59	27.11	217°49.34	4.0'	28°27.83	-1.4'	58.5'
18 19	93°40.45 108°40.31	\$19°27.70 28.28	232°12.39 246°35.52	4.1' 4.2'	N28°26.46 28°24.90	-1.6' -1.7'	58.5' 58.4'
20	108 40.31 123° 40.17	28.86	260°58.71	4.3'	28°23.16	-1.7	58.4
21	138° 40.03	29.44	275°21.99	4.4'	28°21.22	-2.1'	58.4
22	153°39.89	30.02	289°45.34	4.4'	$28^{\circ}19.11$	-2.3'	58.3'
23	168°39.75	30.59	304°8.77	4.5'	28°16.81	-2.5'	58.3'
	SD = 16.2'	d = 0.6'		SI	O = 16.1'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	183°39.61	S 19°31.17	$318^{\circ}32.29$	4.6'	N28°14.33	-2.7'	58.3'
1	198° 39.47	31.75	332°55.89	4.7'	28°11.68	-2.8'	58.2'
2	213°39.33 228°39.19	32.33 · · 32.90	347°19.58 1°43.36	4.8' 4.9'	28°8.84 28°5.82	-3.0' -3.2'	58.2' 58.1'
4	243°39.05	33.48	1 43.30 16°7.24	4.9 5.0'	28°2.63	-3.2 -3.4'	58.1
5	258°38.91	34.05	30°31.20	5.1'	27°59.26	-3.5'	58.1'
6	273°38.76	S19°34.63	44°55.26	5.2'	N27°55.72	-3.7'	58.0'
7	288°38.62	35.20	59°19.42	5.3'	27°52.01	-3.9'	58.0'
8 9	303°38.48 318°38.34	35.77 •• 36.34	73°43.68 88°8.04	5.4' 5.5'	27°48.13 27°44.07	-4.1' -4.2'	57.9' 57.9'
10	333°38.19	36.92	102°32.50	5.6'	27°39.85	-4.4'	57.9'
11	348°38.05	37.49	116°57.06	5.7'	27°35.47	-4.6'	57.8'
12	3°37.90	S19°38.06	131°21.73	5.8'	N27°30.91	-4.7'	57.8'
13 14	18° 37.76 33° 37.61	38.63 39.20	145°46.50 160°11.38	5.9' 6.0'	27°26.20 27°21.32	-4.9' -5.0'	57.8' 57.7'
14 15	48° 37.47	39.20	174°36.38	6.1'	27 21.32 27°16.28	-5.0 -5.2'	57.7'
16	63°37.32	40.33	189°1.48	6.2'	27°11.09	-5.4	57.6'
17	78°37.18	40.90	203°26.69	6.3'	27°5.73	-5.5'	57.6'
18	93°37.03	\$19°41.47	217°52.02	6.4'	N27°0.22	-5.7'	57.6'
19 20	108° 36.88 123° 36.74	42.03 42.60	232°17.46 246°43.02	6.6' 6.7'	26°54.56 26°48.74	-5.8' -6.0'	57.5' 57.5'
21	138° 36.59	43.16	240 43.02 261°8.69	6.8'	26°42.78	-6.1'	57.5'
22	153°36.44	43.73	275°34.48	6.9'	26°36.66	-6.3	57.4'
23	168°36.29	44.29	290°0.39	7.0'	26°30.39	-6.4'	57.4'
	SD = 16.2'	d = 0.6'		SI	D = 15.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	07:12	08:51			14:39	16:18
N 70°	07:00	08:25	10:14	13:16	15:05	16:29
68°	06:51	08:05	09:29	14:00	15:24	16:39
66°	06:42	07:50	09:00	14:29	15:40	16:47
64°	06:35	07:37	08:38	14:51	15:53	16:54
62°	06:29	07:26	08:21	15:09	16:04	17:00
60°	06:24	07:16	08:06	15:23	16:14	17:06
N 58°	06:19	07:08	07:54	15:36	16:22	17:11
56°	06:14	07:01	07:43	15:46	16:29	17:16
54°	06:10	06:54	07:34	15:56	16:36	17:20
52°	06:06	06:48	07:26	16:04	16:42	17:24
50°	06:03	06:42	07:18	16:12	16:48	17:27
45°	05:54	06:30	07:02	16:28	17:00	17:36
N 40°	05:47	06:20	06:49	16:41	17:10	17:43
35°	05:40	06:11	06:38	16:52	17:20	17:50
30°	05:33	06:02	06:28	17:02	17:28	17:57
20°	05:21	05:47	06:11	17:20	17:43	18:10
N 10°	05:08	05:34	05:56	17:35	17:57	18:22
0°	04:54	05:20	05:42	17:49	18:11	18:36
S 10°	04:39	05:05	05:27	18:03	18:26	18:52
20°	04:20	04:48	05:12	18:19	18:42	19:11
30°	03:56	04:28	04:54	18:37	19:03	19:35
35°	03:41	04:16	04:44	18:47	19:15	19:50
40°	03:23	04:01	04:32	18:59	19:30	20:08
45°	02:59	03:43	04:18	19:13	19:48	20:32
S 50°	02:27	03:21	04:00	19:31	20:11	21:05
52°	02:10	03:09	03:52	19:39	20:22	21:22
54°	01:49	02:57	03:43	19:49	20:35	21:44
56°	01:21	02:42	03:32	19:59	20:51	22:13
58°	00:36	02:24	03:21	20:11	21:09	23:03
S 60°	////	02:02	03:07	20:26	21:32	////

Lat.		Moonris	e		Moonset	;
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°						
64°						
62°	13:57		16:31	12:35		14:20
60°	15:01	15:49	17:20	11:33	12:56	13:31
N 58°	15:35	16:29	17:51	10:59	12:16	13:00
56°	16:00	16:57	18:15	10:34	11:49	12:36
54°	16:20	17:18	18:34	10:14	11:27	12:17
52° 50°	16:37 16:52	17:36 17:51	18:49 19:03	09:57 09:42	11:09 10:54	12:01 11:46
45°	10:52	18:22	19:03	09:42	10:54	11:46
						-
N 40°	17:45	18:46	19:53	08:50	09:59	10:55
30°	18:04 18:21	19:06 19:23	20:11 20:27	08:32 08:15	09:39 09:22	10:36 10:20
20°	18:49	19:23	20:27	07:48	09:22	09:53
N 10°	19:13	20:16	21:16	07:46	08:29	09:33
0°	19:36	20:38	21:37	07:03	08:06	09:07
S 10°	19:59	21:01	21:59	06:41	07:43	08:45
20°	20:23	21:26	22:21	06:18	07:18	08:21
30°	20:51	21:54	22:47	05:51	06:49	07:53
35°	21:08	22:11	23:03	05:35	06:32	07:37
40°	21:28	22:31	23:20	05:16	06:12	07:17
45°	21:52	22:54	23:42	04:54	05:48	06:54
S 50°	22:23	23:25		04:25	05:17	06:23
52°	22:39	23:40		04:12	05:01	06:08
54°	22:57	23:58		03:56	04:43	05:51
56°	23:19		00:19	03:37	04:21	05:30
58°	23:47		00:47	03:14	03:53	05:03
S 60°		00:29	01:25	02:44	03:11	04:24

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-87%	
17	15:04	14:58	11:45	00:48	13:19		
18	14:52	14:45	11:45	01:51	14:22		
19	14:38	14:32	11:45	02:53	15:22		ı

November 20, 21, 22 UT (Wed., Thu., Fri.)

h	Aries	Venu	ıs	М	ars	Jup	oiter	Sat	urn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	59°30.11		25°25.23	292°16.17	N21°11.58	341°49.97	N22° 15.01	74°37.97	S08°43.11	
1	74°32.57	153°39.23	25.05	307°18.08	11.56	356°52.76	14.99	89°40.42	43.10	Alpheratz
2	89°35.04	168°38.42	24.87	322°19.99	11.53	11°55.54	14.97	104°42.87	43.08	Ankaa
3	104°37.50	183°37.62	• • 24.69	337°21.91	• • 11.51	26°58.33	• • 14.94	119°45.32	• • 43.07	Schedar Diphda
4	119°39.97	198°36.82	24.51	352°23.82	11.49	42°1.12	14.92	134°47.76	43.06	Achernar
5	134°42.43	213°36.01	24.32	7°25.73	11.46	57°3.91	14.90	149°50.21	43.04	Hamal
6	149° 44.89		25°24.14	22°27.65	N21°11.44	72°6.70	N22° 14.88	164°52.66	S08°43.03	Polaris
7	164°47.36	243°34.41	23.96	37°29.57	11.42	87°9.49	14.85	179°55.11	43.01	Acamar
8	179°49.82	258°33.61	23.77	52°31.48	11.39	102°12.28	14.83	194°57.56	43.00	Menkar
9 10	194° 52.29 209° 54.75	273°32.81 288°32.00	· · 23.58 23.39	67°33.40 82°35.32	· · 11.37 11.35	117°15.07 132°17.86	· · 14.81 14.79	210°0.00 225°2.45	· · 42.98 42.97	Mirfak
11	224° 57.22	303°31.20	23.20	97°37.24	11.33	147°20.65	14.79	240°4.90	42.95	Aldebaran
12	239°59.68		25°23.01	112°39.17	N21°11.31	162°23.44	N22°14.74	255°7.34	S08°42.94	Rigel
13	255°2.14	333°29.60	22.82	127°41.09	11.29	177°26.23	14.72	270°9.79	42.93	Capella
14	270°4.61	348°28.80	22.63	142°43.01	11.26	192°29.02	14.70	285°12.24	42.91	Bellatrix
15	285°7.07	3°28.00	• • 22.43	157°44.94	• • 11.24	207°31.81	• • 14.67	300°14.68	• • 42.90	Elnath Alnilam
16	300°9.54	18°27.20	22.23	172°46.87	11.22	222°34.61	14.65	315° 17.13	42.88	Betelgeuse
17	315° 12.00	33°26.41	22.04	187°48.79	11.20	237°37.40	14.63	330° 19.58	42.87	Canopus
18	330° 14.47		25°21.84	202°50.72	N21°11.18	252°40.19	N22°14.60	345°22.02	S08°42.85	Sirius
19	345° 16.93	63°24.81	21.64	217°52.65	11.16	267°42.98	14.58	0°24.47	42.83	Adhara
20	0° 19.39 15° 21.86	78°24.01 93°23.21	21.44	232°54.58 247°56.52	11.14	282°45.77 297°48.56	14.56	15°26.91 30°29.36	42.82	Procyon
21 22	30°24.32	93 23.21 108°22.42	21.03	247 50.52 262°58.45	· · 11.13 11.11	312°51.36	· · 14.54 14.51	30 29.30 45°31.80	· · 42.80 42.79	Pollux
23	45° 26.79	100° 22.42 123° 21.62	20.82	278° 0.38	11.11	312 51.30 327°54.15	14.51	60°34.25	42.79	Avior
							_			Suhail
_Mer.p	pass. 19:59	ν -0.8′ d-0.2	′ m-4.12	ν 1.9′ d-0	.0′ m-0.27	$\nu^{2.8'} d-0$.0′ m-2.78	$\nu^{2.4'} d-0$.0′ m0.89	Miaplacidus
										Alphard
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus
0	$60^{\circ}29.25$	138°20.82	25°20.62	293°2.32	N21°11.07	342°56.94	N22° 14.47	75°36.69	S08°42.76	Dubhe Denebola
1	75°31.71	153°20.03	20.41	308°4.26	11.05	357°59.74	14.45	90°39.14	42.74	Gienah
2	90°34.18	168° 19.23	20.20	323°6.20	11.03	13°2.53	14.42	105°41.58	42.73	Acrux
3	105°36.64	183° 18.44	• • 19.99	338°8.13	• • 11.02	28°5.32	• • 14.40	120°44.03	• • 42.71	Gacrux
4	120°39.11	198°17.64	19.78	353°10.07	11.00	43°8.12	14.38	135°46.47	42.69	Alioth
5	135°41.57	213°16.85	19.57	8°12.02	10.98	58°10.91	14.35	150°48.91	42.68	Spica
6 7	150° 44.04 165° 46.50	228°16.05 243°15.26	25°19.35 19.14	23°13.96 38°15.90	N21°10.97	73°13.70 88°16.50	N22°14.33 14.31	165°51.36 180°53.80	\$08°42.66 42.65	Alkaid
8	180°48.96	258° 14.46	18.92	58 15.90 53°17.85	10.95 10.93	103°19.29	14.31	195° 56.25	42.63	Hadar
9	195°51.43	273° 13.67	18.71	68°19.79	. 10.93	118°22.09	. 14.26	210° 58.69	• 42.61	Menkent
10	210°53.89	288°12.88	18.49	83°21.74	10.90	133°24.88	14.24	226°1.13	42.60	Arcturus
11	225°56.36	303°12.08	18.27	98°23.69	10.89	148°27.68	14.22	241°3.57	42.58	Rigil Kent.
12	240°58.82	318°11.29	25°18.05	113°25.64	N21°10.87	163°30.47	N22° 14.19	256°6.02	S08°42.57	Kochab Zuben'ubi
13	$256^{\circ}1.28$	333°10.50	17.82	128°27.59	10.86	178°33.27	14.17	271°8.46	42.55	Alphecca
14	271°3.75	348°9.71	17.60	143°29.54	10.84	193°36.06	14.15	286° 10.90	42.53	Antares
15	286°6.21	3°8.92	• • 17.37	158°31.49	• • 10.83	208°38.86	• • 14.12	301°13.34	• • 42.52	Atria
16	301°8.68	18°8.12	17.15	173°33.44	10.82	223°41.65	14.10	316° 15.79	42.50	Sabik
17 18	316° 11.14 331° 13.60	33°7.33 48°6.54	16.92 25°16.69	188°35.40 203°37.36	10.80 N21°10.79	238°44.45 253°47.24	14.08 N22°14.05	331°18.23 346°20.67	42.48 \$08°42.47	Shaula
19	346° 16.07	63°5.75	16.46	203 37.30 218°39.31	10.79	268°50.04	14.03	1°23.11	42.45	Rasalhague
20	1° 18.53	78°4.96	16.23	233°41.27	10.76	283°52.84	14.01	16°25.55	42.43	Eltanin
21	16°21.00	93°4.17	• • 16.00	248°43.23	. 10.75	298°55.63	• • 13.98	31°27.99	• • 42.41	Kaus Aust.
22	31°23.46	108°3.39	15.77	263°45.19	10.74	313°58.43	13.96	46°30.44	42.40	Vega Nunki
23	46°25.93	123°2.60	15.53	278°47.15	10.73	329°1.23	13.94	61°32.88	42.38	Altair
Merr	pass. 19:55	ν-0.8' d-0.2	/ m_/ 13	11 0' d-0	.0′ m-0.29	1/2 8/ d-0	.0′ m-2.79	υ2 Λ' d-0	.0′ m0.90	Peacock
		ν 0.0 d 0.2		- V1.5 U 0	.0 111 0.23			- VZ.+ U 0	.0 1110.30	Deneb
			_		_		_		_	Enif
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir
0	61°28.39	138°1.81 S 153°1.02	25°15.29	293°49.12 308°51.08	N21°10.72	344°4.02 359°6.82	N22° 13.91	76°35.32 91°37.76	\$08°42.36	Fomalhaut
1 2	76° 30.85 91° 33.32	168° 0.23	15.06 14.82	308 51.08 323 53.04	10.71 10.69	359°6.82 14°9.62	13.89 13.87	91°37.76 106°40.20	42.35 42.33	Scheat
3	106°35.78	182°59.45	• • 14.58	338°55.01	. 10.68	29°12.42	• • 13.84	100 40.20 121°42.64	• • 42.31	Markab
4	121°38.25	197°58.66	14.34	353°56.98	10.67	44°15.22	13.82	136° 45.08	42.29	Nov 20 Wed
5	136°40.71	212°57.87	14.10	8°58.95	10.66	59°18.01	13.80	151°47.52	42.28	Venus
6	151°43.17		25°13.85	24° 0.92	N21°10.65	74°20.81	N22° 13.77	166°49.96	S08°42.26	Mars
7	$166^{\circ}45.64$	242°56.30	13.61	39°2.89	10.64	89°23.61	13.75	181°52.40	42.24	Jupiter
8	181°48.10	257°55.52	13.36	54° 4.86	10.64	104°26.41	13.73	196° 54.84	42.22	Saturn
9	196° 50.57		• • 13.11	69°6.83	• • 10.63	119°29.21	• • 13.70	211°57.28	• • 42.20	Nov 21 Thu
10	211°53.03	287°53.95	12.87	84°8.81	10.62	134°32.01	13.68	226°59.71	42.19	Venus
11	226° 55.50	302°53.16	12.62	99°10.78	10.61	149°34.81	13.66	242°2.15	42.17	Mars
12	241°57.96		25°12.37	114°12.76	N21°10.60	164°37.60	N22° 13.63	257°4.59	S08°42.15	Jupiter
13 14	257°0.42 272°2.89	332°51.60 347°50.81	12.11 11.86	129°14.74 144°16.72	10.59 10.59	179°40.40 194°43.20	13.61 13.59	272°7.03 287°9.47	42.13 42.11	Saturn
15	272 2.69 287°5.35	2°50.03	11.60	159° 18.70	10.59	209°46.00	13.59	302°11.91	• • 42.11	Nov 22 Fri
16	302°7.82	17°49.25	11.35	174°20.68	10.57	224°48.80	13.54	317°14.34	42.10	Venus
17	317° 10.28	32°48.47	11.09	189°22.66	10.57	239°51.60	13.51	332°16.78	42.06	Mars
18	332° 12.74		25°10.83	204°24.64	N21°10.56	254°54.40	N22° 13.49	347° 19.22	S08°42.04	Jupiter
19	$347^{\circ}15.21$	$62^{\circ}46.91$	10.57	219°26.63	10.55	269°57.20	13.47	2°21.66	42.02	Saturn
20	2° 17.67	77°46.12	10.31	234°28.62	10.55	285°0.00	13.44	17°24.09	42.00	
21	17°20.14	92°45.34	• • 10.05	249°30.60	• • 10.54	300°2.81	• • 13.42	32°26.53	• • 41.98	Horizon
22	32°22.60	107° 44.56	9.79	264°32.59	10.54	315°5.61	13.40	47°28.97	41.97	
23	47°25.06	122°43.78	9.52	279°34.58	10.53	330°8.41	13.37	62°31.41	41.95	
Mer.	oass. 19:51	ν -0.8′ d-0.2	′ m-4.14	ν 2.0′ d-0	.0′ m-0.31	ν 2.8′ d-0	.0′ m-2.79	ν 2.4′ d-0	.0′ m0.90	

Stars SHA

 $357^{\circ}34.72$

349°30.83

348°47.20

 $335^{\circ}19.76$

 $327^{\circ}51.03$

313°36.45

 $315^{\circ}11.44$

290°39.42

281°3.67

 $280^{\circ}21.62$

 $278^{\circ}22.70$

 $278^{\circ}1.68$

275°37.55

 $314^{\circ}5.96$ 308°27.94

353°6.99

Dec 29°13.86

-42°10.38

56°40 68

-17°51.02

 $-57^{\circ}6.75$

23°34.93

89°22.22

40°12.28

4°11.33

49°57.05

16°33.62

-8°10.26

 $46^{\circ}1.35$

 $6^{\circ}22.41$

28°37.71

 $-1^{\circ}11.06$

 $7^{\circ}24.77$ -52°42.27

-16°44.85

-29°0.13

 $27^{\circ}57.91$

-59°34.99

-43°31.66

-69°48.76

-8°45.84

11°50.75

61°36.77

 $14^{\circ}25.98$

-17°40.64

-63°13.93

-57°14.88

55°49.32

-11°17.36

49°11.23

-60°29.39

-36°29.38

 $19^{\circ}3.17$

60°56.13

 $74^{\circ}3.05$

-16°8.62

26°37.87

-26°29.19

-69°4.35

 $-37^{\circ}7.33$

12°32.57

51°29.23

-34°22.42

38°48.53

-26°16.00

8°56.12

-56°39.52

45°22.37

9°59.44

-46°50.64

-29°29.54

28°13.26

15°20.48

Mer.pass

14:46

04:30

01:12

18:58

14:47

04:27

01:08

18:54

14:49

04:24

01:04

18:51

0.1

0.2

Mer.pass

Mer.pass

62°0.28

 $53^{\circ}6.17$

SHA

79°9.92

 $15^{\circ}7.86$

15°7.44

 $15^{\circ}6.93$

Venus:

Mars

SHA

SHA

-15°45.31

5°9.74

	011-010 =	+0.0322 360		-011		. 555	
h	Su	<u> </u>			Moon		
Wed	GHA	Dec \$19°44.85	GHA	ν 7.1'	Dec	d c.c.	HP
0 1	183°36.14 198°35.99	45.42	304°26.42 318°52.56	7.1' 7.3'	N26°23.98 26°17.43	-6.6' -6.7'	57.3' 57.3'
2	213°35.84	45.98	333°18.83	7.4	26°10.73	-6.8'	57.3'
3	228°35.69	• • 46.54	347°45.22	7.5'	26°3.89	-7.0'	57.2'
4	243°35.54	47.10	2°11.73	7.6'	$25^{\circ}56.92$	-7.1'	57.2'
5	258°35.39	47.66	16°38.36	7.8'	25°49.80	-7.3'	57.1'
6 7	273°35.24 288°35.09	\$19°48.22 48.78	31°5.11 45°31.98	7.9' 8.0'	N25°42.55 25°35.16	-7.4' -7.5'	57.1' 57.1'
8	303°34.94	49.33	45 51.96 59°58.98	8.1	25° 27.64	-7.5'	57.1°
9	318°34.79	• • 49.89	74°26.11	8.2'	25°19.99	-7.8'	57.0'
10	333°34.64	50.45	88°53.35	8.4'	25°12.21	-7.9'	57.0'
11	348°34.48	51.01	103°20.72	8.5'	25°4.30	-8.0'	56.9'
12 13	3°34.33 18°34.18	\$19°51.56 52.12	117°48.22 132°15.84	8.6' 8.7'	N24°56.27 24°48.11	-8.2' -8.3'	56.9' 56.8'
14	33°34.02	52.67	146°43.58	8.9'	24° 39.83	-8.4'	56.8'
15	48°33.87	• • 53.22	161°11.45	9.0'	24°31.43	-8.5'	56.8'
16	63°33.71	53.78	175°39.44	9.1'	$24^{\circ}22.90$	-8.6'	56.7'
17	78°33.56	54.33	190°7.56	9.2'	24°14.26	-8.8'	56.7'
18 19	93°33.40 108°33.25	\$19°54.88 55.43	204°35.80 219°4.17	9.4' 9.5'	N24°5.51 23°56.64	-8.9' -9.0'	56.7' 56.6'
20	106 33.25 123°33.09	55.45 55.98	219 4.17 233°32.66	9.5 9.6'	23°47.65	-9.0 -9.1'	56.6
21	138°32.94	56.53	248°1.27	9.7'	23°38.55	-9.2'	56.6'
22	153°32.78	57.08	$262^{\circ}30.01$	9.9'	23°29.35	-9.3'	56.5'
23	168°32.62	57.63	276°58.87	10.0'	23°20.03	-9.4'	56.5'
	SD = 16.2'	d = 0.6'		SI	D = 15.6'		
Thu 0	GHA 183°32.46	Dec \$19°58.18	GHA 291°27.85	u 10.1'	Dec N23°10.61	d -9.5'	HP 56.4'
1	198°32.31	58.73	305°56.96	10.1	23°1.08	-9.6'	56.4
2	213°32.15	59.27	320°26.19	10.4'	22°51.45	-9.7'	56.4'
3	228°31.99	19°59.82	334°55.54	10.5'	22°41.72	-9.8'	56.3'
4	243°31.83	20°0.36	349°25.01	10.6'	22°31.88	-9.9'	56.3'
5 6	258°31.67 273°31.51	0.91 \$20°1.45	3°54.60 18°24.32	10.7' 10.8'	22°21.95 N22°11.92	-10.0' -10.1'	56.3' 56.2'
7	288°31.35	2.00	32°54.15	11.0'	22°1.79	-10.1 -10.2'	56.2'
8	303°31.19	2.54	47°24.10	11.1'	21°51.57	-10.3	56.2'
9	318°31.03	• • 3.08	61°54.17	11.2'	21°41.26	-10.4'	56.1'
10	333°30.87	3.62	76°24.36	11.3'	21°30.85	-10.5'	56.1'
11	348°30.71 3°30.55	4.16 \$20°4.70	90°54.66 105°25.09	11.4' 11.5'	21°20.36 N21°9.77	-10.6'	56.1'
12 13	18°30.55	5.24	105°25.09 119°55.62	11.5	N21 9.77 20°59.10	-10.7' -10.8'	56.0' 56.0'
14	33°30.23	5.78	134°26.27	11.8'	20°48.34	-10.8'	56.0'
15	48°30.06	6.32	148°57.04	11.9'	$20^{\circ}37.50$	-10.9'	55.9'
16	63°29.90	6.86	163°27.92	12.0'	20°26.57	-11.0'	55.9'
17 18	78°29.74 93°29.57	7.40 \$20°7.93	177°58.91 192°30.02	12.1' 12.2'	20°15.56 N20°4.47	-11.1' -11.2'	55.9' 55.8'
19	93 29.57 108°29.41	320 7.93 8.47	207°1.23		19°53.31		55.8'
20	123°29.24	9.00	221°32.56	12.4'	19°42.06	-11.3'	55.8'
21	138°29.08	• • 9.54	236°3.99	12.5'	19°30.74	-11.4'	55.8'
22	153°28.91	10.07	250°35.53	12.6'	19°19.35	-11.5'	55.7'
23	168°28.75	10.61	265°7.18	12.8'	19°7.88	-11.5'	55.7'
	SD = 16.2'	d = 0.5'		SI	D = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°28.58	\$20°11.14	279°38.93	12.9'	N18°56.34	-11.6'	55.7'
1	198°28.42	11.67	294°10.79	13.0'	18°44.72	-11.7'	55.6'
2	213°28.25	12.20	308°42.76 323°14.82	13.1'	18°33.04	-11.8'	55.6'
3 4	228°28.08 243°27.92	· · 12.73 13.26	323°14.82 337°46.99	13.2' 13.3'	18°21.29 18°9.47	-11.8' -11.9'	55.6' 55.5'
5	243 27.92 258°27.75	13.79	352°19.26	13.4	16 9.47 17°57.59	-11.9' -11.9'	55.5'
6	273°27.58	S20°14.32	6°51.63	13.5'	N17°45.64	-12.0'	55.5'
7	288°27.41	14.85	21°24.10	13.6'	17°33.62	-12.1'	55.5'
8	303°27.24	15.38	35°56.67	13.7'	17°21.55	-12.1'	55.4'
9 10	318°27.07 333°26.91	· · 15.91 16.43	50°29.33 65°2.09	13.8' 13.9'	17°9.41 16°57.21	-12.2' -12.3'	55.4' 55.4'
11	348°26.74	16.43	79°34.94	13.9'	16° 44.96	-12.3'	55.3'
12	3°26.57	S20°17.48	94°7.89	14.0'	N16°32.64	-12.4'	55.3'
13	18°26.40	18.01	108°40.93	14.1'	16°20.27	-12.4'	55.3'
14	33°26.22	18.53	123°14.06	14.2'	16°7.85	-12.5'	55.3'
15 16	48°26.05 63°25.88	· · 19.05 19.58	137°47.28 152°20.59	14.3' 14.4'	15°55.37 15°42.83	-12.5' -12.6'	55.2' 55.2'
10 17	78°25.71	20.10	152 20.59 166°53.99	14.4	15 42.83 15°30.25	-12.6'	55.2'
18	93°25.54	S20°20.62	181°27.47	14.6'	N15°17.61	-12.7'	55.2'
19	108°25.37	21.14	196°1.04	14.7'	15°4.92	-12.7'	55.1'
20	123°25.19	21.66	210°34.69	14.7'	14°52.18	-12.8'	55.1'
21 22	138°25.02 153°24.85	· · 22.18 22.70	225°8.42 239°42.24	14.8' 14.9'	14°39.40 14°26.56	-12.8' -12.9'	55.1' 55.1'
22	168°24.67	23.22	254°16.14	14.9 15.0'	14 20.50 14°13.69	-12.9'	55.0'
	SD = 16.2'	d = 0.5'			D = 15.2'		
	JD — 10.2	u — 0.5		31	_ 13.2		

Lat.	Twilight		Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.	
N 72°	07:22	09:05			14:26	16:09	
N 70°	07:09	08:36	10:40	12:51	14:55	16:22	
68°	06:59	08:15	09:44	13:47	15:16	16:32	
66°	06:50	07:58	09:12	14:19	15:33	16:41	
64°	06:42	07:44	08:48	14:43	15:47	16:49	
62°	06:35	07:33	08:29	15:02	15:59	16:56	
60°	06:29	07:23	08:14	15:18	16:09	17:02	
N 58°	06:24	07:14	08:01	15:31	16:18	17:07	
56°	06:19	07:06	07:49	15:42	16:26	17:12	
54°	06:15	06:59	07:40	15:52	16:33	17:17	
52°	06:11	06:52	07:31	16:01	16:39	17:21	
50°	06:07	06:47	07:23	16:09	16:45	17:25	
45°	05:58	06:34	07:06	16:25	16:58	17:34	
N 40°	05:50	06:23	06:52	16:39	17:09	17:42	
35°	05:42	06:13	06:41	16:51	17:18	17:49	
30°	05:36	06:05	06:30	17:01	17:27	17:56	
20°	05:22	05:49	06:13	17:19	17:43	18:09	
N 10°	05:09	05:35	05:57	17:35	17:57	18:23	
0°	04:55	05:20	05:42	17:50	18:12	18:37	
S 10°	04:39	05:05	05:28	18:04	18:27	18:53	
20°	04:20	04:48	05:12	18:21	18:44	19:13	
30°	03:55	04:27	04:53	18:39	19:06	19:38	
35°	03:39	04:14	04:42	18:50	19:19	19:53	
40°	03:20	03:59	04:30	19:03	19:34	20:13	
45°	02:56	03:40	04:15	19:18	19:53	20:37	
S 50°	02:22	03:16	03:57	19:36	20:17	21:12	
52°	02:04	03:05	03:48	19:45	20:28	21:30	
54°	01:41	02:51	03:39	19:54	20:42	21:54	
56°	01:09	02:36	03:28	20:06	20:58	22:27	
58°	////	02:16	03:15	20:18	21:18	////	
S 60°	////	01:52	03:00	20:33	21:43	////	

Lat.		Moonrise			Moonset		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri	
N 72°			20:23			15:49	
N 70°			20:57			15:13	
68°		19:00	21:21		15:34	14:47	
66°		19:40	21:40		14:53	14:27	
64°	17:59	20:07	21:54	14:49	14:25	14:11	
62°	18:37	20:28	22:07	14:10	14:03	13:58	
60°	19:05	20:44	22:17	13:42	13:46	13:46	
N 58°	19:26	20:58	22:26	13:20	13:31	13:36	
56°	19:43	21:11	22:34	13:03	13:18	13:28	
54°	19:57	21:21	22:41	12:48	13:07	13:20	
52°	20:10	21:30	22:47	12:34	12:57	13:13	
50°	20:21	21:39	22:53	12:23	12:48	13:06	
45°	20:44	21:56	23:05	11:59	12:29	12:53	
N 40°	21:03	22:10	23:15	11:39	12:14	12:41	
35°	21:18	22:22	23:23	11:23	12:01	12:32	
30°	21:31	22:33	23:31	11:09	11:49	12:23	
20°	21:54	22:51	23:44	10:45	11:29	12:08	
N 10°	22:13	23:06	23:55	10:24	11:12	11:55	
0°	22:32	23:21		10:04	10:56	11:43	
S 10°	22:50	23:35		09:44	10:39	11:30	
20°	23:09	23:50		09:23	10:22	11:17	
30°	23:31		80:00	08:58	10:01	11:01	
35°	23:44		00:18	08:43	09:49	10:52	
40°	23:59		00:30	08:26	09:35	10:42	
45°	•• ••	00:17	00:43	08:06	09:19	10:30	
S 50°	00:09	00:38	00:59	07:40	08:58	10:15	
52°	00:22	00:49	01:07	07:27	08:48	10:08	
54°	00:37	01:00	01:16	07:12	08:37	10:00	
56°	00:54	01:14	01:25	06:55	08:25	09:51	
58°	01:15	01:29	01:36	06:35	08:10	09:41	
S 60°	01:42	01:47	01:48	06:08	07:52	09:30	

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
- ",	00 ^h	12 ^h	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-61%
20	14:25	14:17	11:46	03:51	16:18	
21	14:10	14:02	11:46	04:44	17:08	
22	13:54	13:46	11:46	05:32	17:54	

November 23, 24, 25 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn _
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	62°27.53	137°43.01 \$25°9.26	294°36.57 N21°10.53	345°11.21 N22°13.35	77°33.84 \$08°41.93
1	77° 29.99	152°42.23 8.99	309°38.56 10.53	0°14.01 13.32	92°36.28 41.91
2	92°32.46	167°41.45 8.72	324°40.56 10.52	15°16.81 13.30	107°38.71 41.89
3	107° 34.92	182°40.67 · · 8.45	339°42.55 · · 10.52	30°19.61 · · 13.28	122°41.15 · · 41.87
4	122° 37.38	197°39.89 8.18	354°44.55 10.51	45°22.42 13.25	137°43.59 41.85
5	137° 39.85	212°39.12 7.91	9°46.54 10.51	60°25.22 13.23	152°46.02 41.83
6	152° 42.31	227°38.34	24°48.54 N21°10.51	75°28.02 N22°13.20	167°48.46
7	167°44.78	242°37.56 7.37	39°50.54 10.51	90°30.82 13.18	182°50.89 41.79
8	182°47.24	257°36.79 7.09	54°52.54 10.50	105°33.63 13.16	197°53.33 41.77
9	$197^{\circ}49.71$	272°36.01 · · 6.81	69°54.54 · · 10.50	120°36.43 · · 13.13	212°55.76 · · 41.75
10	$212^{\circ}52.17$	287°35.24 6.54	84°56.54 10.50	135°39.23 13.11	227°58.20 41.73
11	227°54.63	302°34.46 6.26	99°58.55 10.50	150°42.03 13.08	243°0.63 41.72
12	242°57.10	317°33.69 \$25°5.98	115°0.55 N21°10.50	165°44.84 N22°13.06	258°3.07 S08°41.70
13	257° 59.56	332°32.91 5.69	130°2.56 10.50	180°47.64 13.04	273°5.50 41.68
14	273°2.03	347°32.14 5.41	145° 4.56 10.50	195°50.45 13.01	288°7.94 41.66
15	288°4.49	2°31.37 · · 5.13	160°6.57 ·· 10.50	210°53.25 · · 12.99	303°10.37 · · 41.64
16	$303^{\circ}6.95$	17°30.59 4.84	175°8.58 10.50	225°56.05 12.96	318°12.80 41.62
17	318°9.42	32°29.82 4.56	190°10.59 10.50	240°58.86 12.94	333°15.24 41.60
18	333° 11.88	47°29.05 \$25°4.27	205°12.60 N21°10.50	256°1.66 N22°12.92	348°17.67 S 08°41.58
19	348° 14.35	62°28.28 3.98	220°14.62 10.50	271°4.47 12.89	3°20.10 41.55
20	3° 16.81	77°27.51 3.69	235°16.63 10.50	286°7.27 12.87	18° 22.54 41.53
21	18° 19.27	92°26.74 · · 3.40	250°18.65 · · 10.51	301°10.08 · · 12.84	33°24.97 · · 41.51
22	33°21.74	107°25.97 3.11	265°20.66 10.51	316°12.88 12.82	48°27.40 41.49
23	48°24.20	122°25.20 2.81	280°22.68 10.51	331°15.68 12.79	63°29.84 41.47
Mer.p	pass. 19:47	ν-0.8' d-0.3' m-4.14	ν2.0' d-0.0' m-0.33	ν2.8' d-0.0' m-2.79	ν2.4' d-0.0' m0.91
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	63°26.67	137°24.43	295°24.70 N21°10.51	346°18.49 N22°12.77	78°32.27 \$08°41.45
1	78° 29.13	157 24.45 323 2.32 152°23.66 2.22	310°26.72 10.52	1°21.30 12.75	93°34.70 41.43
2	93°31.59	167°22.89 1.92	325°28.74 10.52	16°24.10 12.72	108° 37.13 41.41
3	108° 34.06	182°22.12 · · 1.63	340°30.77 · · 10.52	31°26.91 · · 12.70	123°39.56 · · 41.39
4	123° 36.52	197°21.36 1.33	355°32.79 10.53	46°29.71 12.67	138° 42.00 41.37
5	138° 38.99	212°20.59 1.02	10°34.81 10.53	61°32.52 12.65	153°44.43 41.35
6	153°41.45	227°19.82 \$25°0.72	25°36.84 N21°10.54	76°35.32 N22°12.62	168°46.86 S08°41.33
7	168° 43.92	242°19.06 0.42	40°38.87 10.54	91°38.13 12.60	183°49.29 41.31
8	183°46.38	257°18.29 25°0.11	55°40.90 10.55	106°40.94 12.58	198°51.72 41.28
9	198° 48.84	272°17.52 24°59.81	70°42.93 · · 10.55	121°43.74 · · 12.55	213°54.15 · · 41.26
10	213°51.31	287°16.76 59.50	85°44.96 10.56	136°46.55 12.53	228° 56.58 41.24
11	228° 53.77	302°15.99 59.19	100°46.99 10.56	151°49.36 12.50	243°59.01 41.22
12	243°56.24	317°15.23 S 24°58.88	115°49.02 N21°10.57	166°52.16 N22°12.48	259°1.44
13	258° 58.70	332°14.47 58.57	130°51.06 10.58	181°54.97 12.45	274°3.87 41.18
14	$274^{\circ}1.16$	347°13.70 58.26	145°53.09 10.58	196°57.78 12.43	289°6.30 41.16
15	289°3.63	2°12.94 · · 57.95	160°55.13 · · 10.59	212°0.59 · · 12.40	304°8.73 · · 41.13
16	304°6.09	17°12.18 57.63	175°57.17 10.60	227°3.39 12.38	319°11.16 41.11
17	$319^{\circ}8.56$	32°11.42 57.32	190°59.21 10.61	242°6.20 12.35	334°13.59 41.09
18	334°11.02	47°10.65 S 24°57.00	206°1.25 N21°10.62	257°9.01 N22°12.33	349°16.02 S 08°41.07
19	$349^{\circ}13.48$	62°9.89 56.68	221°3.29 10.62	272°11.82 12.30	4°18.45 41.05
20	$4^{\circ}15.95$	77°9.13 56.36	236° 5.33 10.63	287°14.63 12.28	19°20.88 41.02
21	$19^{\circ}18.41$	92°8.37 · · 56.04	251°7.38 · · 10.64	302°17.44 · · 12.26	34°23.31 · · 41.00
22	$34^{\circ}20.88$	107°7.61 55.72	266° 9.42 10.65	317°20.24 12.23	49°25.74 40.98
23	49°23.34	122°6.85 55.40	281°11.47 10.66	332°23.05 12.21	64°28.17 40.96
Mer.r	pass. 19:43	ν-0.8' d-0.3' m-4.15	$\nu 2.0' \ d0.0' \ \text{m-}0.35$	ν2.8' d-0.0' m-2.80	ν2.4' d-0.0' m0.91
N4	CIIA	CHA D	CHA De-	CHA De-	GHA Dec
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	
0 1	64° 25.80 79° 28.27	137°6.09 S24°55.07 152°5.34 54.75	296°13.52 N21°10.67 311°15.57 10.68	347°25.86 N22°12.18 2°28.67 12.16	79°30.60
	79°28.27 94°30.73	152°5.34 54.75 167°4.58 54.42	326°17.62 10.69	2°28.67 12.16 17°31.48 12.13	94°33.02 40.91 109°35.45 40.89
2	94°30.73 109°33.20	182°3.82 · · 54.09	341°19.67 · · 10.70	32°34.29 · · 12.11	109°35.45 40.89 124°37.88 · · 40.87
3 4	109° 33.20 124° 35.66	182°3.82 · · 54.09 197°3.06 53.77	356°21.72 10.72	47°37.10 12.08	139°40.31 40.85
4 5	124 35.00 139°38.12	212°2.31 53.44	11°23.78 10.73	47 37.10 12.08 62°39.91 12.06	154°42.73 40.82
6	154° 40.59	212 2.31 53.44 227°1.55 S 24°53.10	26°25.83 N21°10.74	77°42.72 N22°12.03	169° 45.16 S08° 40.80
7	169°43.05	242°0.79 52.77	41°27.89 10.75	92°45.53 12.01	184° 47.59 40.78
8	169 43.05 184° 45.52	257°0.04 52.44	56°29.95 10.77	107°48.34 11.98	184 47.59 40.78 199°50.02 40.75
9	199° 47.98	271°59.28 · · 52.10	71°32.00 · · 10.78	122°51.15 · · 11.96	214°52.44 · · 40.73
10	214° 50.45	286°58.53 51.77	86°34.06 10.79	137°53.96 11.93	214 52.44
11	214 50.45 229°52.91	301°57.78 51.43	101°36.13 10.81	152°56.77 11.91	244°57.30 40.69
12	244° 55.37	316°57.02 \$24°51.09	116°38.19 N21°10.82	167°59.58 N22°11.88	259°59.72 S08°40.66
13	259° 57.84	331°56.27 50.75	131°40.25 10.83	183°2.39 11.86	275°2.15 40.64
14	275°0.30	346°55.52 50.41	146°42.32 10.85	198°5.20 11.83	290°4.57 40.62
15	290°2.77	1°54.77 · · 50.07	161°44.38 · · 10.86	213°8.01 · · 11.81	305°7.00 · · 40.59
16	305°5.23	16°54.01 49.73	176°46.45 10.88	228°10.82 11.78	320°9.43 40.57
17	305° 5.23 320° 7.69	31°53.26 49.38	191°48.52 10.89	243°13.63 11.76	335°11.85 40.55
18	335° 10.16	46°52.51 S24°49.04	206°50.59 N21°10.91	258°16.45 N22°11.73	350°14.28 S08°40.52
19	350° 12.62	61°51.76 48.69	221°52.66 10.93	273°19.26 11.71	5° 16.70 40.50
20	5° 15.09	76°51.01 48.34	236°54.73 10.94	288°22.07 11.68	20°19.13 40.47
21	20° 17.55	91°50.26 · · 47.99	251°56.81 · · 10.96	303°24.88 · · 11.66	35°21.55 · · 40.45
22	35° 20.01	106°49.51 47.64	266°58.88 10.98	318°27.69 11.63	50°23.98 40.43
23	50°22.48	121° 48.77 47.29	282°0.96 10.99	333°30.50 11.61	65°26.40 40.40
Mer.p	pass. 19:39	ν-0.8′ d-0.3′ m-4.16	ν2.0′ d0.0′ m-0.37	ν2.8' d-0.0' m-2.80	ν2.4' d-0.0' m0.92
	_				

	Stars	
	SHA	Dec
Alpheratz	357° 34.73	29°13.86
Ankaa	353°7.00 349°30.85	-42°10.39 56°40.69
Schedar Diphda	349° 30.85 348° 47.20	-17°51.03
Achernar	$335^{\circ}19.77$	-57°6.76
Hamal	327°51.03	23°34.94
Polaris Acamar	313°36.67 315°11.44	89°22.24 -40°12.29
Menkar	$314^{\circ}5.96$	4°11.32
Mirfak	308°27.93	49°57.07
Aldebaran Rigel	290°39.41 281°3.66	16°33.62 -8°10.26
Capella	280°21.61	46°1.36
Bellatrix	278°22.69	6°22.41
Elnath Alnilam	278°1.66 275°37.54	28°37.72 -1°11.07
Betelgeuse	270°51.91	7°24.77
Canopus	263°51.98	-52°42.28
Sirius Adhara	258° 26.07 255° 5.67	-16°44.86 -29°0.14
Procyon	244°50.75	5°9.73
Pollux	243°17.22	27°57.91
Avior Suhail	234°14.49 222°46.28	-59°35.00 -43°31.66
Sunaii Miaplacidus	222°46.28 221°38.08	-43°31.66 -69°48.76
Alphard	217°47.81	-8°45.85
Regulus	207°34.56 193°41.27	11°50.75 61°36.76
Dubhe Denebola	193°41.27 182°25.21	14°25.97
Gienah	175°43.90	-17°40.65
Acrux	173°0.69	-63°13.93
Gacrux Alioth	171°52.17 166°13.43	-57°14.87 55°49.30
Spica	158°22.69	-11°17.37
Alkaid	152°52.49	49°11.21
Hadar Menkent	148° 36.79 147° 58.14	-60°29.38 -36°29.38
Arcturus	145°48.33	19°3.16
Rigil Kent.	139°41.13	-60°56.12
Kochab Zuben'ubi	137° 20.89 136° 56.49	74°3.02 -16°8.62
Alphecca	126°4.21	26°37.85
Antares	112° 16.37	-26°29.19
Atria Sabik	107°11.27 102°3.27	-69°4.34 -15°45.32
Shaula	96° 10.94	-37°7.33
Rasalhague	95°58.99	12°32.56
Eltanin Kaus Aust.	90°42.73 83°33.02	51°29.21 -34°22.42
Vega	80°33.67	38°48.51
Nunki	75°48.20	-26°16.00
Altair	62°0.28	8°56.11
Peacock Deneb	53°6.19 49°26.10	-56°39.52 45°22.36
Enif	33°38.97	9°59.44
Al Na'ir	27°33.07	-46°50.65
Fomalhaut Scheat	15° 14.57 13° 45.26	-29°29.55 28°13.26
Markab	13° 29.95	15°20.48
Nov 23 Sat	SHA	Mer.pass
Venus	75° 15.48	14:50
Mars Jupiter	232°9.04 282°43.68	04:21 00:59
Saturn	15°6.31	18:47
Nov 24 Sun	SHA	Mer.pass
Venus	73°57.76	14:51
Mars	231°58.03	04:18
Jupiter Saturn	282°51.82 15°5.60	00:55 18:43
Nov 25 Mon	SHA	Mer.pass
Venus	72°40.29	14:52
Mars	231°47.71	04:15
Jupiter Saturn	283°0.06 15°4.79	00:50 18:39
		10.39
Horizon	tal parallax Venus:	0.1
	Mars:	0.2

h	Sui	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°24.50	S20°23.73	$268^{\circ}50.11$	15.1'	$N14^{\circ}0.76$	-13.0'	55.0'
1	198°24.32	24.25	283°24.17	15.1'	13° 47.79	-13.0'	55.0'
2	213°24.15 228°23.97	24.76 •• 25.28	297°58.30 312°32.51	15.2' 15.3'	13°34.78 13°21.73	-13.1' -13.1'	55.0' 54.9'
4	243°23.80	25.79	327°6.79	15.4'	13°8.64	-13.1	54.9'
5	258°23.62	26.31	341°41.14	15.4'	$12^{\circ}55.50$	-13.2'	54.9'
6	273°23.45	\$20°26.82	356° 15.57	15.5'	N12°42.33	-13.2'	54.9'
7 8	288°23.27 303°23.09	27.33 27.85	10°50.07 25°24.63	15.6' 15.6'	12°29.12 12°15.87	-13.2' -13.3'	54.9' 54.8'
9	318°22.92	• • 28.36	39°59.27	15.7'	12°2.58	-13.3'	54.8'
10	333°22.74	28.87	54°33.97	15.8'	$11^{\circ}49.26$	-13.4'	54.8'
11	348°22.56 3°22.38	29.38 \$20°29.89	69°8.74 83°43.57	15.8'	11°35.90 N11°22.51	-13.4	54.8'
12 13	3°22.38 18°22.20	30.40	98° 18.47	15.9' 16.0'	11°9.09	-13.4' -13.5'	54.7' 54.7'
14	33°22.02	30.91	112°53.43	16.0'	10°55.63	-13.5'	54.7'
15	48°21.84	•• 31.41	127°28.44	16.1'	10°42.14	-13.5'	54.7'
16	63°21.66 78°21.48	31.92	142°3.52 156°38.66	16.1' 16.2'	10°28.62 10°15.08	-13.5'	54.7'
17 18	93°21.30	32.43 \$20°32.93	150 38.00 171°13.85	16.2	N10°1.50	-13.6' -13.6'	54.7' 54.6'
19	108°21.12	33.44	185°49.10	16.3'	09°47.89	-13.6'	54.6'
20	123°20.94	33.94	200°24.41	16.4'	09°34.26	-13.7'	54.6'
21	138°20.76 153°20.58	• • 34.44	214°59.76 229°35.17	16.4'	09°20.60 09°6.92	-13.7'	54.6' 54.6'
22 23	168°20.40	34.95 35.45	244° 10.63	16.5' 16.5'	09 6.92 08°53.21	-13.7' -13.7'	54.5'
	SD = 16.2'	d = 0.5'			O = 15.0'		5
	JD = 10.2′	u = 0.5		51	J — 15.0°		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.21	S20°35.95	258°46.15	16.6'	N08°39.48	-13.8'	54.5'
1 2	198°20.03 213°19.85	36.45 36.95	273°21.70 287°57.31	16.6' 16.7'	08°25.72 08°11.94	-13.8' -13.8'	54.5' 54.5'
3	228°19.67	• • 37.45	302°32.96	16.7	07°58.14	-13.8'	54.5'
4	243°19.48	37.95	317°8.66	16.7'	$07^{\circ}44.32$	-13.8'	54.5'
5	258°19.30	38.45	331°44.40	16.8'	07°30.48	-13.9'	54.4'
6 7	273°19.11 288°18.93	\$20°38.94 39.44	346°20.18 0°56.00	16.8' 16.9'	N07°16.61 07°2.73	-13.9' -13.9'	54.4' 54.4'
8	303°18.74	39.94	15°31.87	16.9'	06°48.83	-13.9'	54.4'
9	318°18.56	• • 40.43	30°7.77	16.9'	$06^{\circ}34.92$	-13.9'	54.4'
10	333°18.37 348°18.19	40.93	44° 43.71 59° 19.68	17.0'	06°20.99 06°7.04	-13.9'	54.4'
11 12	3°18.00	41.42 5 20°41.92	73°55.69	17.0' 17.0'	N05°53.07	-14.0' -14.0'	54.4' 54.3'
13	18°17.81	42.41	88°31.74	17.1'	05°39.09	-14.0'	54.3'
14	33°17.63	42.90	103°7.81	17.1'	05°25.10	-14.0'	54.3'
15 16	48°17.44 63°17.25	· · 43.39 43.88	117°43.92 132°20.06	17.1' 17.2'	05°11.10 04°57.08	-14.0' -14.0'	54.3' 54.3'
17	78°17.06	43.00 44.37	132 20.00 146°56.23	17.2'	04 57.06 04°43.05	-14.0'	54.3'
18	93°16.87	S20°44.86	161°32.42	17.2'	N04°29.01	-14.1'	54.3'
19	108°16.68	45.35	176°8.64	17.2'	04°14.96	-14.1'	54.3'
20 21	123°16.50 138°16.31	45.84 •• 46.33	190° 44.89 205° 21.16	17.3' 17.3'	04°0.90 03°46.83	-14.1' -14.1'	54.2' 54.2'
22	153°16.12	46.81	219° 57.45	17.3	03°32.75	-14.1'	54.2'
23	168°15.93	47.30	234°33.76	17.3'	03°18.66	-14.1'	54.2'
	SD = 16.2'	d = 0.5'		SI	D = 14.9'		
Mon	GHA 183°15.74	Dec \$20°47.79	GHA 249° 10.10	u 17.4'	Dec N03°4.57	d -14.1'	HP 54.2'
0 1	183°15.74 198°15.54	\$20°47.79 48.27	249° 10.10 263° 46.45	17.4° 17.4'	N03°4.57 02°50.47	-14.1' -14.1'	54.2' 54.2'
2	213°15.35	48.75	278°22.82	17.4'	02°36.37	-14.1'	54.2'
3	228°15.16	• • 49.24	292°59.21	17.4	02°22.26	-14.1'	54.2'
4 5	243°14.97 258°14.78	49.72 50.20	307°35.61 322°12.03	17.4' 17.4'	02°8.15 01°54.03	-14.1' -14.1'	54.2' 54.2'
6	273°14.59	\$20°50.68	336°48.46	17.4	N01°39.91	-14.1	54.2'
7	288°14.39	51.17	$351^{\circ}24.91$	17.5'	$01^{\circ}25.78$	-14.1'	54.1'
8	303°14.20	51.65	6°1.36	17.5'	01°11.66	-14.1'	54.1'
9 10	318°14.01 333°13.81	52.12 52.60	20°37.83 35°14.30	17.5' 17.5'	00°57.53 00°43.41	-14.1' -14.1'	54.1' 54.1'
11	348°13.62	53.08	49° 50.78	17.5'	00°43.41 00°29.28	-14.1	54.1
12	3°13.42	S20°53.56	64°27.27	17.5'	N00° 15.16	-14.1'	54.1'
13	18°13.23 33°13.03	54.04 54.51	79°3.76 93°40.25	17.5'	N00°1.03 S00°13.09	-14.1'	54.1'
14 15	33°13.03 48°12.84	54.51 •• 54.99	93° 40.25 108° 16.75	17.5' 17.5'	00° 27.21	14.1' 14.1'	54.1' 54.1'
16	63°12.64	55.46	122°53.25	17.5'	$00^{\circ}41.32$	14.1'	54.1'
17	78°12.45	55.94	137°29.75	17.5'	00°55.43	14.1'	54.1'
18 19	93°12.25 108°12.05	\$20°56.41 56.88	152°6.25 166°42.74	17.5' 17.5'	\$01°9.54 01°23.64	14.1' 14.1'	54.1' 54.1'
20	108°12.05 123°11.86	56.88 57.35	181° 19.24	17.5'	01°23.64 01°37.73	14.1' 14.1'	54.1' 54.1'
21	138°11.66	•• 57.83	195°55.73	17.5'	$01^{\circ}51.82$	14.1'	54.1'
22	153°11.46	58.30	210°32.21	17.5	02°5.90	14.1'	54.1'
23	168°11.26	58.77	225°8.69	17.5'	02°19.97	14.1'	54.1'
	SD = 16.2'	d = 0.5'		SI	D = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:32	09:19			14:13	16:01
N 70°	07:18	08:48	11:19	12:14	14:45	16:15
68°	07:06	08:25	10:00	13:33	15:08	16:26
66°	06:57	08:06	09:23	14:10	15:26	16:36
64°	06:48	07:52	08:57	14:36	15:41	16:44
62°	06:41	07:39	08:37	14:56	15:54	16:52
60°	06:35	07:29	08:21	15:12	16:04	16:58
N 58°	06:29	07:19	08:07	15:26	16:14	17:04
56°	06:24	07:11	07:55	15:38	16:22	17:09
54°	06:19	07:04	07:45	15:48	16:30	17:14
52°	06:15	06:57	07:36	15:57	16:36	17:18
50°	06:11	06:51	07:27	16:06	16:42	17:23
45°	06:01	06:37	07:10	16:23	16:56	17:32
N 40°	05:53	06:26	06:56	16:38	17:07	17:41
35°	05:45	06:16	06:43	16:50	17:17	17:48
30°	05:38	06:07	06:33	17:01	17:26	17:56
20°	05:24	05:51	06:14	17:19	17:43	18:10
N 10°	05:10	05:36	05:58	17:35	17:58	18:23
0°	04:55	05:21	05:43	17:50	18:13	18:38
S 10°	04:39	05:05	05:28	18:06	18:28	18:55
20°	04:19	04:47	05:11	18:22	18:46	19:15
30°	03:54	04:26	04:52	18:42	19:08	19:40
35°	03:37	04:12	04:41	18:53	19:22	19:57
40°	03:18	03:57	04:28	19:06	19:37	20:17
45°	02:52	03:37	04:13	19:21	19:57	20:43
S 50°	02:16	03:13	03:54	19:41	20:22	21:19
52°	01:57	03:01	03:45	19:50	20:34	21:38
54°	01:32	02:46	03:35	20:00	20:49	22:04
56°	00:56	02:30	03:23	20:11	21:06	22:42
58°	////	02:09	03:10	20:25	21:26	////
S 60°	////	01:43	02:54	20:41	21:54	////

Lat.		Moonris	e		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	22:49		00:50	14:51	14:14	13:42
N 70°	23:03		00:54	14:34	14:07	13:42
68°	23:14		00:57	14:21	14:01	13:42
66°	23:24		01:00	14:10	13:56	13:43
64°	23:31		01:03	14:01	13:52	13:43
62°	23:38		01:04	13:53	13:48	13:43
60°	23:44	•• ••	01:06	13:46	13:45	13:43
N 58°	23:49		01:08	13:40	13:42	13:43
56°	23:53		01:09	13:34	13:39	13:43
54°	23:57		01:10	13:29	13:37	13:43
52°		00:01	01:11	13:25	13:35	13:44
50°		00:04	01:12	13:21	13:33	13:44
45°		00:11	01:15	13:12	13:28	13:44
N 40°		00:17	01:16	13:04	13:25	13:44
35°		00:22	01:18	12:58	13:22	13:44
30°		00:26	01:19	12:52	13:19	13:44
20°		00:34	01:22	12:42	13:14	13:44
N 10°		00:40	01:24	12:34	13:10	13:44
0°	00:05	00:47	01:26	12:25	13:06	13:45
S 10°	00:16	00:53	01:28	12:17	13:02	13:45
20°	00:27	00:59	01:30	12:08	12:57	13:45
30°	00:39	01:07	01:32	11:58	12:52	13:45
35°	00:46	01:11	01:34	11:52	12:49	13:45
40°	00:54	01:16	01:35	11:45	12:46	13:45
45°	01:04	01:21	01:37	11:37	12:42	13:45
S 50°	01:15	01:28	01:39	11:27	12:37	13:45
52°	01:21	01:31	01:40	11:23	12:35	13:45
54°	01:26	01:34	01:41	11:18	12:33	13:45
56°	01:33	01:38	01:43	11:12	12:30	13:45
58°	01:40	01:42	01:44	11:06	12:27	13:45
S 60°	01:48	01:47	01:45	10:59	12:24	13:45

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	51-32%	
23	13:38	13:30	11:47	06:15	18:36		
24	13:21	13:12	11:47	06:56	19:16		
25	13:03	12:54	11:47	07:35	19:55		

November 26, 27, 28 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	65°24.94	136°48.02	297°3.03 N21°11.01	348°33.32 N22°11.58	80°28.82 \$08°40.38
1	80°27.41	151°47.27 46.58	312°5.11 11.03	3°36.13 11.56	95°31.25 40.35
2	95° 29.87	166°46.52 46.23	327°7.19 11.05	18°38.94 11.53	110°33.67 40.33
3	110°32.33	181°45.78 · · 45.87	342° 9.27 · · 11.07	33°41.75 · · 11.50	125°36.10 · · 40.31
4	125° 34.80	196° 45.03 45.51	357°11.36 11.09	48°44.57 11.48	140°38.52 40.28
5	140°37.26	211°44.29 45.15	12°13.44 11.11	63°47.38 11.45	155° 40.94 40.26
6	155°39.73	226°43.54 S 24°44.79	27°15.52 N21°11.13	78°50.19 N22°11.43	170°43.37
7	170°42.19	241°42.80 44.43	42°17.61 11.15	93°53.01 11.40	185° 45.79 40.21
8	185°44.65	256° 42.05 44.07	57°19.70 11.17	108°55.82 11.38	200° 48.21 40.18
9	200°47.12	271°41.31 · · 43.71	72°21.79 · · 11.19	123°58.63 · · 11.35	215°50.64 · · 40.16
10	215°49.58	286° 40.57 43.34	87°23.88 11.21	139°1.45 11.33	230°53.06 40.13
11	230°52.05	301°39.83 42.98	102°25.97 11.23	154°4.26 11.30	245°55.48 40.11
12	245°54.51	316°39.08 S 24°42.61	117°28.06 N21°11.25	169°7.07 N22°11.28	260°57.90 \$08°40.08
13	$260^{\circ}56.98$	331°38.34 42.24	132°30.15 11.27	184°9.89 11.25	276°0.32 40.06
14	275°59.44	346°37.60 41.87	147°32.25 11.30	199°12.70 11.23	291°2.75 40.03
15	$291^{\circ}1.90$	1°36.86 · · 41.50	162°34.34 · · 11.32	214°15.52 · · 11.20	306°5.17 · · 40.01
16	306°4.37	16°36.12 41.13	177°36.44 11.34	229°18.33 11.17	321°7.59 39.98
17	321°6.83	31°35.38 40.75	192°38.54 11.36	244°21.15 11.15	336°10.01 39.96
18	336°9.30	46°34.64 S 24°40.38	207°40.64 N21°11.39	259°23.96 N22°11.12	351°12.43 \$08°39.93
19	351° 11.76	61°33.90 40.00	222°42.74 11.41	274°26.77 11.10	6°14.85 39.91
20	6° 14.22	76°33.17 39.63	237°44.84 11.44	289°29.59 11.07	21°17.27 39.88
21	21° 16.69	91°32.43 · · 39.25	252°46.95 · · 11.46	304°32.40 · · 11.05	36°19.69 · · 39.86
22	36° 19.15	106°31.69 38.87	267°49.05 11.49	319°35.22 11.02	51°22.11 39.83
23	51°21.62	121°30.95 38.49	282°51.16 11.51	334°38.03 10.99	66° 24.54 39.81
Mer.	pass. 19:35	ν -0.7' d-0.4' m-4.16	$\nu 2.1' \ d0.0' \ \text{m-}0.39$	ν2.8' d-0.0' m-2.80	ν2.4' d-0.0' m0.92
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	66°24.08	136°30.22	297°53.26 N21°11.54	349°40.85 N22°10.97	81°26.96
1	81°26.54	151°29.48 37.73	312°55.37 11.56	4°43.67 10.94	96°29.38 39.75
2	96° 29.01	166°28.75 37.34	327°57.48 11.59	19°46.48 10.92	111°31.80 39.73
3	111°31.47	181°28.01 · · 36.96	342°59.59 · · 11.62	34°49.30 · · 10.89	126°34.21 · · 39.70
4	126° 33.94	196°27.28 36.57	358°1.71 11.64	49°52.11 10.87	141°36.63 39.68
5	141°36.40	211°26.55 36.18	13°3.82 11.67	64°54.93 10.84	156°39.05 39.65
6	156° 38.86	226°25.81 \$24°35.80	28°5.93 N21°11.70	79°57.74 N22°10.81	171°41.47 \$08°39.62
7	171°41.33	241°25.08 35.41	43°8.05 11.72	95°0.56 10.79	186°43.89 39.60
8	186° 43.79	256°24.35 35.01	58°10.17 11.75	110°3.38 10.76	201°46.31 39.57
9	201°46.26	271°23.62 · · 34.62	73°12.29 · · 11.78	125°6.19 · · 10.74	216°48.73 · · 39.55
10	216°48.72	286°22.89 34.23 301°22.16 33.83	88°14.41 11.81	140°9.01 10.71 155°11.83 10.69	231°51.15 39.52
11	231°51.19 246°53.65	301°22.16 33.83 316°21.43 \$24°33.44	103°16.53 11.84 118°18.65 N21°11.87	155°11.83 10.69 170°14.64 N22°10.66	246° 53.57 39.49 261° 55.98 \$08° 39.47
12	240 53.05 261°56.11	331°20.70 33.04	118 18.05 N21 11.87 133°20.77 11.90	185°17.46 10.63	276°58.40 39.44
13 14	276° 58.58	331 20.70 33.04 346°19.97 32.64	148°22.90 11.93	200°20.28 10.61	270 58.40 39.44 292°0.82 39.41
15	292°1.04	1°19.24 · · 32.25	163°25.03 · · 11.96	215°23.09 · · 10.58	307°3.24 · · 39.39
16	307°3.51	16°18.51 31.85	178°27.15 11.99	230°25.91 10.56	322°5.65 39.36
17	307 5.51 322°5.97	31°17.78 31.44	193°29.28 12.02	245°28.73 10.53	322 5.05 39.30 337°8.07 39.33
18	337°8.43	46°17.06 S24°31.04	208°31.41 N21°12.05	260°31.55 N22°10.50	352°10.49 \$08°39.31
19	352° 10.90	61°16.33 30.64	223°33.54 12.09	275°34.36 10.48	7°12.91 39.28
20	7° 13.36	76°15.61 30.23	238°35.68 12.12	290°37.18 10.45	22°15.32 39.25
21	22° 15.83	91°14.88 · · 29.83	253°37.81 · · 12.15	305°40.00 · · 10.43	37°17.74 · · 39.22
22	37° 18.29	106°14.16 29.42	268°39.94 12.18	320°42.82 10.40	52° 20.16 39.20
23	52°20.75	121°13.43 29.01	283°42.08 12.22	335°45.64 10.37	67° 22.57 39.17
Mer.p	pass. 19:31	ν-0.7' d-0.4' m-4.17	ν2.1' d0.0' m-0.42	ν2.8′ d-0.0′ m-2.80	ν2.4' d-0.0' m0.92
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	67° 23.22	136°12.71	298°44.22 N21°12.25	350°48.45 N22°10.35	82°24.99 \$08°39.14
1	82°25.68	151°11.98 28.19	313°46.36 12.28	5°51.27 10.32	97°27.40 39.11
2	97°28.15	166°11.26 27.78	328°48.50 12.32	20°54.09 10.30	112°29.82 39.09
3	112°30.61	181°10.54 · · 27.36	343°50.64 · · 12.35	35°56.91 · · 10.27	127°32.23 · · 39.06
4	$127^{\circ}33.07$	$196^{\circ}9.82$ 26.95	358°52.78 12.39	50°59.73 10.24	142°34.65 39.03
5	$142^{\circ}35.54$	211°9.10 26.53	13°54.93 12.42	66°2.55 10.22	157°37.07 39.00
6	157°38.00	226°8.38 S 24°26.12	28°57.07 N21°12.46	81°5.37 N22°10.19	172°39.48 \$08°38.98
7	172°40.47	241°7.66 25.70	43°59.22 12.49	96°8.18 10.16	187°41.90 38.95
8	187° 42.93	256°6.94 25.28	59° 1.37 12.53	111°11.00 10.14	202°44.31 38.92
9	202°45.40	271°6.22 · · 24.86	74°3.52 · · 12.57	126°13.82 · · 10.11	217°46.72 · · 38.89
10	217°47.86	286°5.50 24.44	89°5.67 12.60	141°16.64 10.09	232°49.14 38.86
11	232°50.32	301°4.78 24.02	104°7.82 12.64	156°19.46 10.06	247°51.55 38.84
12	247°52.79	316°4.07 S 24°23.59	119°9.97 N21°12.68	171°22.28 N22°10.03	262°53.97 S08°38.81
13	262°55.25	331°3.35 23.17	134°12.13 12.72	186°25.10 10.01	277°56.38 38.78
14	277°57.72	346°2.63 22.74	149°14.28 12.76	201°27.92 9.98	292°58.79 38.75
15	293°0.18	1°1.92 · · 22.31	164°16.44 · · 12.79	216°30.74 · · 9.95	308°1.21 · · · 38.72
16	308°2.64	16°1.20 21.89	179°18.60 12.83	231°33.56 9.93	323°3.62 38.69
17	323°5.11	31°0.49 21.46	194°20.76 12.87	246°36.38 9.90	338° 6.03 38.66
18	338°7.57	45°59.77 \$24°21.03	209°22.92 N21°12.91	261°39.20 N22°9.87	353°8.45 \$08°38.64
19	353°10.04	60°59.06 20.59	224°25.08 12.95	276°42.02 9.85	8° 10.86 38.61
20	8°12.50	75°58.35 20.16	239°27.24 12.99	291°44.84 9.82	23°13.27 38.58
21	23°14.96	90°57.64 · · 19.73	254°29.41 · · 13.03	306°47.66 · · 9.80	38° 15.69 · · · 38.55
22	38° 17.43	105°56.92 19.29	269°31.58 13.07	321°50.48 9.77	53° 18.10 38.52
23	53° 19.89	120°56.21 18.86	284°33.74 13.11	336°53.30 9.74	68° 20.51 38.49
Mer.	pass. 19:27	ν-0.7' d-0.4' m-4.18	ν2.1' d0.0' m-0.44	ν2.8' d-0.0' m-2.81	ν2.4' d-0.0' m0.93

SHA		Stars	
Ankaa 353°7.02 -42°10.40 Schedar 349°30.87 56°40.69 Diphda 348°47.21 -17°51.04 Achernar 335°19.79 -57°6.77 Hamal 327°51.04 23°34.94 Polaris 313°36.93 89°22.26 Acamar 315°11.44 -40°12.30 Menkar 314°5.96 4°11.32 Mirfak 308°27.93 49°57.07 Aldebaran 290°39.41 16°33.62 Rigel 281°3.65 -8°10.27 Capella 280°21.59 46°1.36 Bellatrix 278°1.65 28°37.72 Alnilam 275°37.53 -1°11.07 Betelgeuse 270°51.90 7°24.77 Canopus 263°51.96 -52°42.30 Sirius 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 Procyon 244°50.73 5°9.73 Pollux 233°14.46 -59°35.01 Avior 234°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 211°38.03 -69°48.77 Alphard 217°47.79 8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°3.28 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -56°39.52 Deneb 49°26.12 26°37.84 Al Na'ir 27°33.09 -46°5.06 Fomalhaut 15°14.59 -29°2.955 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 28 Thu SHA Mer.pass Nov 29 Weus SHA Mer.pass Nov 28 Thu SHA Mer.pass Nov 28 T			Dec
Schedar Diphda 348° 47.21 -17°51.04 Achernar 348° 47.21 -17°51.04 Achernar 338° 47.21 -17°51.04 Polaris 313° 36.93 89° 22.26 Acamar 315° 11.44 -40° 12.30 Menkar 314°5.96 4°11.32 Mirfak 308° 27.93 49° 57.07 Aldebaran 290° 39.41 16° 33.62 Rigel 281° 3.65 -8° 10.27 Capella 280° 21.59 46° 1.36 Bellatrix 278° 2.68 6° 22.40 Elnath 278° 1.65 28° 37.72 Alnilam 275° 37.53 -1° 11.07 Betelgeuse 270° 51.90 7° 24.77 Canopus 258° 26.05 -16° 44.87 Adhara 255° 5.66 -29° 0.15 Procyon 244° 50.73 5° 9.73 Pollux 234° 17.21 27° 57.91 Avior 234° 14.46 -59° 35.01 Suhail 222° 46.26 -43° 31.67 Miaplacidus 221° 38.03 -69° 48.77 Alphard 217° 47.79 8° 45.85 Poenbol 182° 25.19 14° 25.99 Gienah 175° 43.88 -17° 40.65 Acrux 173° 0.66 -63° 13.92 Gacrux 171° 52.14 -57° 14.87 Alioth 166° 13.41 55° 49.28 Spica 158° 22.68 -11° 17.37 Alkaid 152° 52.48 49° 11.19 Hadar 148° 36.77 -60° 29.37 Menkent 147° 58.12 -36° 29.38 Arcturus 148° 36.77 -60° 29.37 Menkent 147° 58.12 -36° 29.38 Arcturus 145° 48.32 19° 31.4 Rigil Kent. 139° 41.11 -60° 56.11 Kochab 137° 20.87 74° 3.01 Zuben'ubi 136° 56.48 -16° 8.63 Alphecca 126° 4.21 26° 37.84 Antares 112° 16.37 -26° 29.19 Atria 107° 11.28 -69° 43.2 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Rasalhague 95° 58.99 12° 32.55 Eltanin 90° 42.74 51° 29.20 Kaus Aust. 83° 33.03 -34° 22.42 Vega 80° 33.68 38° 48.50 Nunki 75° 48.21 -26° 16.00 Altair 62° 0.30 8° 56.10 Peacock 53° 6.21 -56° 39.52 Deneb 49° 26.12 45° 22.35 Enif 33° 38.98 9° 59.43 Al Na'ir 70° 6.14 14:55 Scheat 13° 45.27 28° 13.26 Markab 13° 29.97 15° 20.48 Mars 231° 21.00 04:04 Mars 231° 21.00 04:04 Mars 231° 21.00 14:04 Mars 231° 21.00 04:04			
Diphda 348° 47.21 -17° 51.04 Achernar 335° 19.79 -57° 6.77 Hamal 327° 51.04 23° 34.94 Polaris 313° 36.93 89° 22.26 Acamar 314° 5.96 4° 11.32 Mirfak 308° 27.93 49° 57.07 Aldebaran 290° 39.41 16° 33.62 Rigel 281° 3.65 -8° 10.27 Capella 280° 21.59 46° 1.36 Bellatrix 278° 22.68 6° 22.40 Elnath 278° 1.65 28° 37.72 Alnilam 275° 37.53 -1° 11.07 Betelgeuse 270° 51.90 7° 24.77 Canopus 263° 51.96 -52° 42.30 Sirius 258° 26.05 -16° 44.87 Adhara 255° 5.66 -29° 0.15 Procyon 244° 50.73 5° 97.3 Pollux 243° 17.21 27° 57.91 Avior 234° 14.46 -59° 35.01 Suhail 222° 46.26 -43° 31.67 Miaplacidus 221° 38.3 -69° 48.77 Alphard 217° 47.79 -8° 45.85 Regulus 207° 34.54 11° 50.74 Dubhe 193° 41.24 61° 36.75 Denebola 182° 25.19 14° 25.96 Gienah 175° 43.88 -17° 40.65 Acrux 173° 0.66 -63° 13.92 Gacrux 171° 52.14 -57° 14.87 Alioth 166° 13.41 55° 49.28 Spica 158° 22.68 -11° 17.37 Alkaid 152° 52.48 49° 11.19 Hadar 148° 36.77 -60° 29.37 Menkent 147° 58.12 -36° 29.38 Arcturus 145° 48.32 19° 3.14 Rigil Kent 139° 41.11 -60° 56.11 Kochab 31° 20.87 74° 3.01 Zuben'ubi 316° 56.48 -16° 8.63 Alphecca 126° 4.21 26° 37.84 Antares 112° 16.37 -26° 29.19 Atria 107° 11.28 -69° 4.32 Sabik 102° 3.27 -15° 45.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Eltanin 90° 42.74 51° 29.20 Kaus Aust 83° 3.30 -34° 22.42 Vega 80° 33.68 38° 48.50 Nunki 75° 48.21 -26° 16.00 Altair 62° 0.30 8° 56.10 Peacock 53° 6.21 -56° 39.52 Eltanin 90° 42.74 51° 29.20 Kaus Aust 83° 3.30 -46° 50.65 Fomalhaut 15° 14.59 -29° 29.55 Scheat 13° 45.27 -28° 13.26 Mars 231° 23.09 -46° 50.65 Fomalhaut 15° 14.59 -29° 29.55 Scheat 13° 45.27 -28° 13.26			
Achernar 335°19.79 -57°6.77 Hamal 327°51.04 23°34.94 Polaris 313°36.39 89°22.26 Acamar 315°11.44 -40°12.30 Menkar 314°5.96 4°11.32 Mirfak 308°27.93 49°57.07 Aldebaran 290°39.41 16°33.62 Rigel 281°3.65 -8°10.27 Capella 280°21.59 46°1.36 Bellatrix 278°22.68 6°22.40 Elnath 278°1.65 28°37.72 Alnilam 275°37.53 -1°11.07 Betelgeuse 270°51.90 7°24.77 Canopus 263°51.96 -52°42.30 Sirius 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 Procyon 244°50.73 5°9.73 Pollux 243°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 211°38.03 -69°48.77 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 316°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.7 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -56°39.52 Deneb 49°26.12 45°22.35 Enifi 33°3.89 95.94.3 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 5°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 28 Thu SHA Mer.p			
Polaris 313° 36.93 89° 22.26 Acamar 314° 5.96 4° 11.32 Menkar 314° 5.96 4° 11.32 Mirfak 308° 27.93 49° 57.07 Aldebaran 290° 39.41 16° 33.62 Rigel 281° 3.65 -8° 10.27 Capella 280° 21.59 46° 1.36 Bellatrix 278° 1.65 28° 37.72 Alnilam 275° 37.53 -1° 11.07 Betelgeuse 270° 51.90 7° 24.77 Canopus 263° 51.96 -52° 42.30 Sirius 258° 26.05 -16° 44.87 Adhara 255° 5.66 -29° 0.15 Procyon 244° 50.73 5° 97.3 Pollux 243° 17.21 27° 57.91 Avior 234° 14.46 -59° 35.01 Suhail 222° 46.26 -43° 31.67 Alphard 217° 47.79 -8° 45.85 11° 50.74 Alphard 217° 47.79 -8° 45.85 11° 50.74 Alphard 217° 47.9 -8° 45.85 11° 50.74 Alphard 217° 47.9 -8° 45.85 11° 50.74 Alphard 175° 43.88 -17° 40.65 Acrux 173° 0.66 -63° 13.92 Gacrux 171° 52.14 -57° 14.87 Alioth 166° 13.41 55° 49.28 Spica 158° 22.68 -11° 17.37 Alkaid 152° 52.48 49° 11.19 Hadar 148° 36.77 -60° 29.37 Menkent 147° 58.12 -36° 29.38 Arcturus 145° 48.32 19° 3.14 Rigil Kent 139° 41.11 -60° 56.11 Kochab 137° 20.87 74° 3.01 Zuben'ubi 136° 56.48 -16° 8.63 Alphecca 126° 4.21 26° 37.84 Antares 112° 16.37 -26° 29.19 Atria 107° 11.28 -69° 4.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16° 60.94 -16°			
Acamar 315° 11.44	Hamal		
Menkar 314°5.96 4°11.32 Mirfak 308°27.93 49°57.07 Aldebaran 290°9.41 16°33.62 Rigel 281°3.65 -8°10.27 Capella 280°21.59 46°1.36 Bellatrix 278°1.65 28°37.72 Alnilam 270°51.90 7°24.77 Canopus 263°51.96 -52°42.30 Sirius 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 Procyon 244°50.73 5°9.73 Pollux 234°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 221°38.03 -69°48.77 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 17°40.65 Acrux 173°0.66 -63°13.92 <		313°36.93	
Mirfak 308°27.93 49°57.07 Aldebaran 290°39.41 16°33.62 Rigel 281°3.65 8°10.27 Capella 280°21.59 46°1.36 Bellatrix 278°2.68 6°22.40 Elnath 278°1.65 28°37.72 Alnilam 275°37.53 -1°11.07 Betelgeuse 270°51.90 7°24.77 Canopus 263°51.90 -52°42.30 Sirius 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 Procyon 244°50.73 5°9.73 Pollux 243°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 221°38.03 -69°48.77 Alphard 217°47.79 -8°45.85 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alkaid 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -56°49.28 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 55°3.89 12°32.55 Scheat 13°45.27 28°313.60 Mars 231°38.09 04:11 Jupiter 283°3.77 00:46 Saturn 15°3.88 18:35 Nov 27 Wed Venus 70°6.14 14:55 Altair 15°3.89 14:54 Mars 231°3.09 -46°50.65 Fomalhaut 55°3.89 14:54 Mars 231°3.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°313.60 Mer.pass 70°6.14 14:55 Altair 15°3.88 18:35 Nov 28 Thu Venus 40°4.94 14:55 Altair 15°3.88 18:35 Nov 28 Thu Venus 40°6.14 14:55 Altair 15°3.88 18:35 Nov 28 Thu Venus 50°6.14 14:55 Altair 15°3.88 18:35 Nov 28 Thu Venus 50°6.14 14:55 Altair 15°3.89 14:54 Altair 27°3.09 -46°50.65 Fomalhaut 55°1.459 -29°29.55 Scheat 13°45.27 28°3.32 Altair 15°3.88 18:35 Nov 28 Thu Venus 50°6.14 14:55 Altair 15°3.88 18:35 Nov 28 Thu Venus 50°6.14 14:55 Altair 15°3.89 14:54 Altair 15°3.89 14:54 Altair 15°3.89 14:54 Altair 15°3.89 14:54 Alta			
Rigel 281° 3.65 -8° 10.27 Capella 280° 21.59 46° 1.36 Bellatrix 278° 22.68 6° 22.40 Elnath 278° 1.65 28° 37.72 Alnilam 275° 37.53 -1° 11.07 Betelgeuse 270° 51.90 7° 24.77 Canopus 263° 51.96 -52° 42.30 Sirius 255° 5.66 -29° 0.15 Procyon 244° 50.73 5° 9.73 Pollux 243° 17.21 27° 57.91 Avior 234° 14.46 -59° 35.01 Suhail 222° 46.26 -43° 31.67 Miaplacidus 221° 38.03 -69° 48.77 Alphard 217° 47.79 -8° 45.85 Regulus 207° 34.54 11° 50.74 Dubhe 193° 41.24 61° 36.75 Denebola 182° 25.19 14° 25.96 Gienah 175° 43.88 -17° 40.65 Acrux 173° 0.66 -63° 13.92 Gacrux 173° 0.66 -63° 13.92 Gacrux 171° 52.14 <t< td=""><td></td><td></td><td></td></t<>			
Capella 280° 21.59 46° 1.36 Bellatrix 278° 22.68 6° 22.40 Elnath 278° 1.65 28° 37.72 Alnilam 270° 51.90 7° 24.77 Canopus 263° 51.96 -52° 42.30 Sirius 258° 26.05 -16° 44.87 Adhara 255° 5.66 -29° 0.15 Procyon 244° 50.73 5° 9.73 Pollux 243° 17.21 27° 57.91 Avior 234° 14.46 -59° 35.01 Suhail 222° 46.26 -43° 31.67 Miaplacidus 221° 38.03 -69° 48.77 Alphard 217° 47.79 -8° 45.85 Regulus 207° 34.54 11° 50.74 Dubhe 193° 41.24 61° 36.75 Denebola 182° 25.19 14° 25.96 Gienah 175° 43.88 -17° 40.65 Acrux 173° 0.66 -63° 13.92 Gacrux 171° 52.14 -57° 14.87 Alloith 166° 13.41 55° 49.28 Spica 158° 22.68 <t< td=""><td>Aldebaran</td><td>290°39.41</td><td>16°33.62</td></t<>	Aldebaran	290°39.41	16°33.62
Bellatrix 278°22.68 6°22.40 Elnath 278°1.65 28°37.72 Alnilam 275°37.53 -1°11.07 7°24.77 24.77 258°26.05 -52°42.30 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 25°3.60 -29°0.15 24°30.73 5°9.73 Pollux 243°17.21 27°57.91 Avior 234°14.46 -59°35.01 222°46.26 -43°31.67 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 55°2.48 49°11.19 Hadar 148°36.77 -60°29.37 Alphacra 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 12°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Deneb 49°4.21 -26°61.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 -56°39.52 Deneb 49°26.13 -50°39.52 Deneb 49°26.12 -56°39.52 Deneb 49°26.12 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39.52 -56°39			
Elnath			
Alnilam 275°37.53 -1°11.07 Betelgeuse 270°51.90 7°24.77 Canopus 263°51.96 -52°42.30 Sirius 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 Procyon 244°50.73 5°9.73 Pollux 243°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 221°38.03 -69°48.77 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 147°58.12 -36°29.38			
Canopus Sirius 258° 26.05 -16° 44.87 Adhara 255° 5.66 -29° 0.15 Procyon 244° 50.73 Pollux 243° 17.21 27° 57.91 Avior 234° 14.46 -59° 35.01 Suhail 222° 46.26 -43° 31.67 Alphard 217° 47.79 -8° 45.85 Pollub 193° 41.24 Pollub 193° 41.11 Pollub 193°			
Sirius 258°26.05 -16°44.87 Adhara 255°5.66 -29°0.15 Procyon 244°50.73 5°9.73 Pollux 234°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 221°38.03 -69°48.77 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84	_		
Adhara Procyon Procyon Pollux P			
Procyon 244°50.73 5°9.73 Pollux 243°17.21 27°57.91 Avior 234°14.46 -59°35.01 Suhail 222°46.26 -43°31.67 Miaplacidus 217°47.79 -8°45.85 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 173°0.66 -63°13.92 Gacrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84			
Avior Suhail 222°46.26 -43°31.67 Miaplacidus 221°38.03 -69°48.77 Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 -56°39.52 Deneb 49°26.12 -56°39.52 Deneb 49°26.12 -56°39.52 Deneb 49°26.12 -56°39.52 Enif 33°3.89 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 28 Thu SHA Mer.pass Nov 27 Wed SHA Mer.pass Nov 28 Thu SHA Mer.pass Nov 28 Thu SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:35 Nov 28 Thu SHA Mer.pass Nov 28 Thu SHA Mer.pass Nov 28 Thu SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:35			
Suhail 222° 46.26 -43° 31.67 Miaplacidus 221° 38.03 -69° 48.77 Alphard 217° 47.79 -8° 45.85 Regulus 207° 34.54 11° 50.74 Dubhe 193° 41.24 61° 36.75 Denebola 182° 25.19 14° 25.96 Gienah 175° 43.88 -17° 40.65 Acrux 173° 0.66 -63° 13.92 Gacrux 171° 52.14 -57° 14.87 Alioth 166° 13.41 55° 49.28 Spica 158° 22.68 -11° 17.37 Alkaid 148° 36.77 -60° 29.37 Menkent 147° 58.12 -36° 29.38 Arcturus 145° 48.32 19° 3.14 Rigil Kent. 139° 41.11 -60° 56.11 Kochab 137° 20.87 74° 3.01 Zuben'ubi 136° 56.48 -16° 8.63 Alphecca 126° 4.21 26° 37.84 Antares 112° 16.37 -26° 29.19 Atria 107° 11.28 -69° 4.32 Sabik 102° 3.27	Pollux	243°17.21	27°57.91
Miaplacidus			
Alphard 217°47.79 -8°45.85 Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55			
Regulus 207°34.54 11°50.74 Dubhe 193°41.24 61°36.75 Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°3.2 Rasalhague 95°58.99 12°32.55			
Denebola 182°25.19 14°25.96 Gienah 175°43.88 -17°40.65 Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Shaula 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°29.18 04:08 Jupiter 283°3.7 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:55 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27	•	$207^{\circ}34.54$	11°50.74
Gienah Acrux 173°0.66 -63°13.92 Gacrux 171°52.14 -57°14.87 Alioth 166°13.41 55°49.28 Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Kigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Entif 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue Venus 71°23.08 14:54 Mars 231°29.97 15°20.48 Nov 27 Wed Venus 70°6.14 14:55 Naturn 15°2.88 18:35 Nov 28 Thu Venus 68°49.49 14:56 Mars 231°29.18 04:04 Jupiter 283°16.77 00:41 5°2.88 Naturn 15°2.88 18:31 Nov 28 Thu Venus 68°49.49 14:56 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 5°2.88 18:31 Nov 28 Thu Venus 68°49.49 14:56 Mars 231°29.18 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus 0.1			
Acrux			
Gacrux			
Spica 158°22.68 -11°17.37 Alkaid 152°52.48 49°11.19 Hadar 148°36.77 -60°29.37 Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 100°3.27 -15°45.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°3.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 <td< td=""><td></td><td></td><td></td></td<>			
Alkaid Hadar	Alioth		
Hadar			
Menkent 147°58.12 -36°29.38 Arcturus 145°48.32 19°3.14 Rigil Kent. 139°41.11 -60°56.11 Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 <			
Arcturus 145° 48.32 19° 3.14 Rigil Kent. 139° 41.11 -60° 56.11 Kochab 137° 20.87 74° 3.01 Zuben'ubi 136° 56.48 -16° 8.63 Alphecca 126° 4.21 26° 37.84 Antares 112° 16.37 -26° 29.19 Atria 107° 11.28 -69° 4.32 Sabik 102° 3.27 -15° 45.32 Shaula 96° 10.94 -37° 7.32 Rasalhague 95° 58.99 12° 32.55 Eltanin 90° 42.74 51° 29.20 Kaus Aust. 83° 33.03 -34° 22.42 Vega 80° 33.68 38° 48.50 Nunki 75° 48.21 -26° 16.00 Altair 62° 0.30 8° 56.10 Peacock 53° 6.21 -56° 39.52 Deneb 49° 26.12 45° 22.35 Enif 33° 38.98 9° 59.43 Al Na'ir 27° 33.09 -46° 50.65 Fomalhaut 15° 14.59 -29° 29.55 Scheat 13° 45.27 28°			
Kochab 137°20.87 74°3.01 Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°49.27 28°13.26 Markab 231°38.99 04:11 Jupiter <td></td> <td></td> <td>19°3.14</td>			19°3.14
Zuben'ubi 136°56.48 -16°8.63 Alphecca 126°4.21 26°37.84 Antares 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Saturn	_		
Alphecca			
Antares Atria 112°16.37 -26°29.19 Atria 107°11.28 -69°4.32 Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed Yenus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27			
Sabik 102°3.27 -15°45.32 Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°3.80 9'4:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus <td< td=""><td>'</td><td></td><td></td></td<>	'		
Shaula 96°10.94 -37°7.32 Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 231°3.80 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77			
Rasalhague 95°58.99 12°32.55 Eltanin 90°42.74 51°29.20 Kaus Aust. 83°33.03 -34°22.42 Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77			
Eltanin			
Vega 80°33.68 38°48.50 Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56	_		
Nunki 75°48.21 -26°16.00 Altair 62°0.30 8°56.10 Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 283°1°29.18 04:08 Jupiter 283°1°29.8 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37<			
Altair			
Peacock 53°6.21 -56°39.52 Deneb 49°26.12 45°22.35 Enif 33°38.98 9°59.43 Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27			
Rinif			
Al Na'ir 27°33.09 -46°50.65 Fomalhaut 15°14.59 -29°29.55 Scheat 13°45.27 28°13.26 Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1	Deneb		
Fomalhaut Scheat 15°14.59 -29°29.55 Scheat Markab 13°45.27 28°13.26 Nov 26 Tue Venus Mars SHA Venus P1°23.08 14:54 Mars 231°38.09 04:11 Jupiter Saturn 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed Venus SHA 70°6.14 Mer.pass Jupiter Saturn 231°29.18 04:08 Jupiter Saturn 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu Venus SHA 68°49.49 Mer.pass Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: Venus: 0.1			
Scheat Markab 13°45.27 15°20.48 Nov 26 Tue Venus Venus Aupiter Saturn SHA Saturn Mer.pass 14:54 14:54 14:55 Nov 27 Wed Venus Aupiter Saturn SHA Sham Sham Sham Sham Sham Sham Sham Sham			
Markab 13°29.97 15°20.48 Nov 26 Tue SHA Mer.pass Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Venus 71°23.08 14:54 Mars 231°38.09 04:11 Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1	Nov 26 Tue	SHA	Mer.pass
Jupiter 283°8.37 00:46 Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1		$71^{\circ}23.08$	
Saturn 15°3.88 18:35 Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Nov 27 Wed SHA Mer.pass Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Venus 70°6.14 14:55 Mars 231°29.18 04:08 Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			18:35
Mars Jupiter Saturn 231°29.18 283°16.77 15°2.88 04:08 00:41 18:31 Nov 28 Thu Venus SHA 68°49.49 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn Mer.pass 14:56 00:37 15°1.77 Horizontal parallax Venus: 0.1			-
Jupiter 283°16.77 00:41 Saturn 15°2.88 18:31 Nov 28 Thu			
Saturn 15°2.88 18:31 Nov 28 Thu SHA Mer.pass Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Venus 68°49.49 14:56 Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Mars 231°21.00 04:04 Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			-
Jupiter 283°25.24 00:37 Saturn 15°1.77 18:27 Horizontal parallax Venus: 0.1			
Horizontal parallax Venus: 0.1		283°25.24	
Venus: 0.1	Saturn	15° 1.77	18:27
	Horizon		
			*:=

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°11.06	\$20°59.23	$239^{\circ}45.16$	17.5'	S 02°34.03	14.1'	54.1'
1	198°10.86	20°59.70	254°21.62	17.5'	02°48.09	14.0'	54.1'
2	213°10.67 228°10.47	21°0.17 •• 0.64	268°58.07 283°34.51	17.4' 17.4'	03°2.13 03°16.16	14.0' 14.0'	54.0' 54.0'
4	243°10.27	1.11	298° 10.94	17.4	03°30.18	14.0'	54.0'
5	258°10.07	1.57	$312^{\circ}47.35$	17.4'	03°44.19	14.0'	54.0'
6	273° 9.87	S21°2.04	327°23.75	17.4	S03°58.19	14.0'	54.0'
7 8	288° 9.67 303° 9.46	2.50 2.96	342°0.14 356°36.50	17.4' 17.3'	04° 12.17 04° 26.14	14.0' 14.0'	54.0' 54.0'
9	318° 9.26	• • 3.43	11°12.85	17.3	04° 40.10	13.9'	54.0'
10	333° 9.06	3.89	$25^{\circ}49.18$	17.3'	$04^{\circ}54.04$	13.9'	54.0'
11	348°8.86	4.35	40°25.49	17.3'	05°7.96	13.9'	54.0'
12 13	3°8.66 18°8.45	\$21°4.81 5.27	55°1.78 69°38.05	17.3' 17.2'	\$05°21.86 05°35.75	13.9' 13.9'	54.0' 54.0'
14	33° 8.25	5.73	84° 14.29	17.2'	05°49.62	13.9	54.0'
15	48° 8.05	. 6.19	98°50.51	17.2'	06°3.47	13.8'	54.0'
16	63°7.84	6.65	113°26.70	17.2'	06°17.30	13.8'	54.0'
17	78° 7.64 93° 7.44	7.11 \$21°7.56	128°2.87	17.1'	06°31.12 \$06°44.91	13.8'	54.0'
18 19	93° 7.44 108° 7.23	8.02	142°39.01 157°15.12	17.1' 17.1'	06°58.67	13.8' 13.7'	54.0' 54.0'
20	123°7.03	8.48	171°51.20	17.0'	00° 30.07 07° 12.42	13.7	54.0'
21	138° 6.82	• • 8.93	186°27.24	17.0'	07°26.14	13.7'	54.0'
22	153° 6.62	9.39	201°3.26	17.0'	07°39.84	13.7'	54.0'
23	168° 6.41	9.84	215°39.24	16.9'	07°53.51	13.6'	54.1'
	SD = 16.2'	d = 0.5'		SE	0 = 14.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°6.20	S21°10.29	230° 15.19	16.9'	S08°7.16	13.6'	54.1'
1	198°6.00	10.74	244°51.10	16.9'	08°20.78	13.6'	54.1'
2	213°5.79	11.19	259°26.98	16.8'	08°34.38	13.6'	54.1'
3 4	228° 5.58 243° 5.38	· · 11.65 12.10	274°2.82 288°38.61	16.8' 16.8'	08°47.95 09°1.49	13.5' 13.5'	54.1' 54.1'
5	258° 5.17	12.54	303°14.37	16.7'	09°15.00	13.5'	54.1
6	273° 4.96	S21°12.99	317°50.09	16.7'	S09°28.48	13.4'	54.1'
7	288° 4.75	13.44	332°25.77	16.6'	09°41.93	13.4'	54.1'
8 9	303° 4.54 318° 4.33	13.89 •• 14.34	347°1.40 1°37.00	16.6'	09°55.35 10°8.73	13.4'	54.1'
10	318 4.33 333°4.12	14.78	1 37.00 16°12.54	16.5' 16.5'	10 8.73 10°22.08	13.4' 13.3'	54.1' 54.1'
11	348° 3.91	15.23	30°48.04	16.5'	10° 35.40	13.3'	54.1'
12	3°3.70	S21°15.67	45°23.49	16.4'	S 10°48.69	13.2'	54.1'
13	18° 3.49	16.11	59°58.90	16.4'	11°1.93	13.2'	54.1'
14 15	33°3.28 48°3.07	16.56 •• 17.00	74°34.25 89°9.56	16.3' 16.3'	11°15.15 11°28.32	13.2' 13.1'	54.1' 54.1'
16	63° 2.86	17.44	103°44.81	16.2'	11°41.46	13.1	54.1'
17	78° 2.65	17.88	$118^{\circ}20.01$	16.1'	$11^{\circ}54.56$	13.1'	54.1'
18	93°2.44	S21°18.32	132°55.16	16.1'	\$12°7.62	13.0'	54.1'
19 20	108° 2.23 123° 2.01	18.76 19.20	147°30.26 162°5.30	16.0' 16.0'	12°20.63 12°33.61	13.0' 12.9'	54.1' 54.2'
21	123 2.01 138°1.80	19.20	162 5.30 176°40.28	16.0 15.9'	12 33.01 12°46.55	12.9'	54.2'
22	153° 1.59	20.08	191°15.20	15.9'	12°59.44	12.8'	54.2'
23	168°1.37	20.51	205°50.07	15.8'	13° 12.28	12.8'	54.2'
	SD = 16.2'	d = 0.5'		SE	0 = 14.7'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°1.16	S21°20.95	220°24.88	15.7'	S13°25.09	12.8'	54.2'
1	198° 0.95	21.39	234°59.63	15.7'	13°37.84	12.7'	54.2'
2	213° 0.73 228° 0.52	21.82 •• 22.25	249°34.32 264°8.95	15.6' 15.6'	13°50.55 14°3.22	12.7' 12.6'	54.2' 54.2'
4	243° 0.30	22.69	278°43.51	15.5'	14° 15.83	12.6'	54.2'
5	258° 0.09	23.12	293°18.01	15.4'	14°28.40	12.5'	54.2'
6	272°59.87	S21°23.55	307°52.45	15.4'	\$14°40.91	12.5'	54.2'
7 8	287°59.66 302°59.44	23.98 24.41	322°26.82 337°1.12	15.3' 15.2'	14°53.38 15°5.79	12.4' 12.4'	54.2' 54.3'
9	302 59.44 317°59.22	. 24.41	351° 35.36	15.2'	15 5.79 15° 18.14	12.4	54.3'
10	332°59.01	25.27	6°9.53	15.1'	$15^{\circ}30.45$	12.2'	54.3'
11	347°58.79	25.70	20°43.63	15.0'	15°42.70	12.2'	54.3'
12 13	2°58.57 17°58.35	S21°26.13 26.55	35°17.66 49°51.62	15.0' 14.9'	\$15°54.89 16°7.03	12.1' 12.1'	54.3' 54.3'
13 14	17°58.35 32°58.14	26.55 26.98	49°51.62 64°25.51	14.9' 14.8'	16° 7.03 16° 19.11	12.1	54.3'
15	47°57.92	27.41	78° 59.33	14.7'	16°31.13	12.0'	54.3'
16	62°57.70	27.83	93°33.07	14.7'	16°43.09	11.9'	54.3'
17	77°57.48	28.26	108°6.74	14.6'	16°54.98	11.8'	54.3'
18 19	92°57.26 107°57.04	\$21°28.68 29.10	122°40.33 137°13.85	14.5' 14.4'	\$17°6.82 17°18.60	11.8' 11.7'	54.4' 54.4'
20	107 57.04 122°56.82	29.10 29.52	151° 47.29	14.4' 14.4'	17 18.60 17°30.30	11.7 11.6'	54.4' 54.4'
21	137°56.60	• • 29.95	166°20.66	14.3'	$17^{\circ}41.95$	11.6'	54.4'
22	152°56.38	30.37	180°53.95	14.2'	17°53.53	11.5'	54.4'
23	167°56.16	30.79	195°27.16	14.1'	18°5.04	11.4'	54.4'
	SD = 16.2'	d = 0.4'		SE	0 = 14.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	07:41	09:34		_	14:01	15:54
N 70°	07:26	08:59			14:36	16:09
68°	07:14	08:34	10:16	13:19	15:01	16:21
66°	07:03	08:14	09:34	14:01	15:21	16:31
64°	06:55	07:59	09:06	14:29	15:36	16:40
62°	06:47	07:46	08:45	14:50	15:49	16:48
60°	06:40	07:34	08:27	15:08	16:01	16:55
N 58°	06:34	07:25	08:13	15:22	16:10	17:01
56°	06:28	07:16	08:01	15:34	16:19	17:07
54°	06:23	07:08	07:50	15:45	16:27	17:12
52°	06:19	07:01	07:40	15:55	16:34	17:16
50°	06:14	06:55	07:32	16:03	16:40	17:21
45°	06:04	06:41	07:14	16:22	16:54	17:31
N 40°	05:56	06:29	06:59	16:36	17:06	17:40
35°	05:48	06:19	06:46	16:49	17:17	17:48
30°	05:40	06:09	06:35	17:00	17:26	17:55
20°	05:26	05:53	06:16	17:19	17:43	18:10
N 10°	05:11	05:37	06:00	17:36	17:58	18:24
0°	04:56	05:22	05:44	17:51	18:14	18:39
S 10°	04:39	05:06	05:28	18:07	18:30	18:57
20°	04:19	04:47	05:11	18:24	18:48	19:17
30°	03:53	04:25	04:52	18:44	19:11	19:43
35°	03:36	04:11	04:40	18:56	19:25	20:00
40°	03:15	03:55	04:27	19:09	19:41	20:21
45°	02:49	03:35	04:11	19:25	20:01	20:48
S 50°	02:12	03:10	03:51	19:45	20:27	21:25
52°	01:51	02:57	03:42	19:54	20:40	21:46
54°	01:24	02:42	03:31	20:05	20:55	22:14
56°	00:41	02:24	03:19	20:17	21:13	23:00
58°	////	02:02	03:05	20:31	21:35	////
S 60°	////	01:33	02:49	20:48	22:05	////

Lat.		Moonris	е		Moonset	:
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	02:46	04:48	07:13	13:10	12:32	11:33
N 70°	02:42	04:32	06:38	13:18	12:50	12:10
68°	02:38	04:20	06:12	13:24	13:04	12:37
66°	02:34	04:11	05:53	13:29	13:15	12:58
64°	02:32	04:02	05:38	13:34	13:25	13:14
62°	02:29	03:55	05:25	13:38	13:33	13:28
60°	02:27	03:49	05:15	13:42	13:40	13:40
N 58°	02:26	03:44	05:05	13:45	13:47	13:50
56°	02:24	03:40	04:57	13:48	13:52	13:59
54°	02:23	03:35	04:50	13:50	13:57	14:07
52°	02:21	03:32	04:44	13:52	14:02	14:14
50°	02:20	03:28	04:38	13:55	14:06	14:20
45°	02:18	03:21	04:26	13:59	14:15	14:34
N 40°	02:15	03:15	04:16	14:03	14:23	14:46
35°	02:14	03:09	04:07	14:06	14:30	14:56
30°	02:12	03:05	03:59	14:09	14:36	15:04
20°	02:09	02:57	03:46	14:14	14:46	15:19
N 10°	02:07	02:50	03:35	14:19	14:55	15:33
0°	02:05	02:44	03:24	14:23	15:03	15:45
S 10°	02:02	02:37	03:14	14:28	15:12	15:57
20°	02:00	02:31	03:03	14:32	15:21	16:11
30°	01:57	02:23	02:50	14:37	15:31	16:26
35°	01:56	02:19	02:43	14:41	15:37	16:35
40°	01:54	02:14	02:35	14:44	15:44	16:46
45°	01:52	02:08	02:26	14:48	15:52	16:58
S 50°	01:50	02:01	02:14	14:53	16:02	17:13
52°	01:49	01:58	02:09	14:55	16:06	17:19
54°	01:48	01:55	02:03	14:58	16:11	17:27
56°	01:47	01:51	01:57	15:00	16:17	17:36
58°	01:45	01:47	01:50	15:03	16:23	17:46
S 60°	01:44	01:42	01:41	15:07	16:30	17:57

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	24-10%	
26	12:44	12:35	11:47	08:14	20:33		
27	12:25	12:15	11:48	08:53	21:14		
28	12:05	11:54	11:48	09:35	21:56		

November 29, 30, 01 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	68°22.36	135°55.50 \$24°18.42	299°35.91 N21°13.16	351°56.12 N22°9.72	83°22.92 S 08°38.46	
1	83°24.82	150°54.79 17.98	314°38.08 13.20	6°58.94 9.69	98°25.33 38.43	Alpheratz 357°34.75 29°13.86 Ankaa 353°7.04 -42°10.41
2	98°27.29	165°54.08 17.54	329°40.25 13.24	22°1.76 9.66	113°27.75 38.40	Ankaa 353°7.04 -42°10.41 Schedar 349°30.88 56°40.70
3	113° 29.75	180°53.37 · · 17.10	344° 42.43 · · 13.28	37°4.59 · · 9.64	128°30.16 · · 38.37	Diphda 348°47.22 -17°51.05
4	128° 32.21	195°52.67 16.66	359°44.60 13.33	52°7.41 9.61	143°32.57 38.34	Achernar 335°19.81 -57°6.79
5 6	143°34.68 158°37.14	210°51.96 16.21 225°51.25 \$24°15.77	14°46.77 13.37 29°48.95 N21°13.41	67°10.23 9.58 82°13.05 N22°9.56	158°34.98 38.32 173°37.39 \$08°38.29	Hamal 327°51.04 23°34.94
7	173° 39.61	240°50.54 15.32	44°51.13 13.46	97°15.87 9.53	188°39.80 38.26	Polaris 313°37.04 89°22.27
8	188°42.07	255°49.84 14.87	59°53.31 13.50	112°18.69 9.50	203°42.21 38.23	Acamar 315°11.45 -40°12.32
9	203°44.53	270°49.13 · · 14.43	74°55.49 · · 13.55	127°21.51 · · 9.48	218°44.62 · · 38.20	Menkar 314°5.96 4°11.31 Mirfak 308°27.93 49°57.08
10	218°47.00	285°48.43 13.98	89°57.67 13.59	142°24.34 9.45	233°47.03 38.17	Aldebaran 290°39.40 16°33.62
11	233°49.46	300°47.72 13.53	104°59.85 13.64	157°27.16 9.42	248°49.44 38.14	Rigel 281°3.64 -8°10.29
12	248°51.93	315°47.02 \$24°13.08	120°2.04 N21°13.68	172°29.98 N22°9.40	263°51.85 \$08°38.11 278°54.26 38.08	Capella 280°21.58 46°1.37
13 14	263° 54.39 278° 56.86	330°46.32 12.62 345°45.61 12.17	135° 4.22 13.73 150° 6.41 13.78	187°32.80 9.37 202°35.62 9.34	278°54.26 38.08 293°56.67 38.05	Bellatrix 278°22.67 6°22.40
15	293° 59.32	0°44.91 · · 11.71	165° 8.60 · · 13.82	217°38.45 · · 9.32	308°59.08 · · 38.02	Elnath 278°1.64 28°37.72
16	309°1.78	15°44.21 11.26	180°10.79 13.87	232°41.27 9.29	324°1.49 37.99	Alnilam 275°37.52 -1°11.08
17	324°4.25	30°43.51 10.80	195°12.98 13.92	247°44.09 9.26	339°3.90 37.96	Betelgeuse 270°51.89 7°24.76 Canopus 263°51.94 -52°42.31
18	$339^{\circ}6.71$	45°42.81 S 24°10.34	210°15.17 N21°13.97	262°46.91 N22°9.24	354°6.31 S 08°37.93	Sirius 258°26.04 -16°44.88
19	354°9.18	60° 42.11 9.88	225°17.37 14.01	277°49.74 9.21	9°8.72 37.90	Adhara 255°5.64 -29°0.17
20	9°11.64	75°41.41 9.42	240°19.56 14.06	292°52.56 9.18	24°11.13 37.86	Procyon 244°50.71 5°9.72
21 22	24° 14.10 39° 16.57	90°40.71 · · 8.96 105°40.01 8.50	255°21.76 ·· 14.11 270°23.95 14.16	307°55.38 · · 9.16 322°58.20 9.13	39°13.53 · · 37.83 54°15.94 37.80	Pollux 243°17.18 27°57.90
23	54° 19.03	120°39.31 8.03	285°26.15 14.21	338°1.03 9.10	69°18.35 37.77	Avior 234°14.43 -59°35.02
		-				Suhail 222°46.23 -43°31.68
Wer.	pass. 19:23	ν-0.7' d-0.4' m-4.18	ν2.2' d0.0' m-0.46	ν2.8′ d-0.0′ m-2.81	ν2.4' d-0.0' m0.93	Miaplacidus 221°37.98 -69°48.78 Alphard 217°47.77 -8°45.87
						Regulus 207°34.52 11°50.73
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°41.20 61°36.74
0	69°21.50	135°38.62 \$24°7.57	300°28.35 N21°14.26	353°3.85 N22°9.07	84°20.76	Denebola 182°25.17 14°25.95
1	84° 23.96	150°37.92 7.10	315°30.56 14.31	8°6.67 9.05	99°23.17 37.71	Gienah 175°43.86 -17°40.66
2 3	99° 26.43 114° 28.89	165°37.23 6.63 180°36.53 · · 6.17	330°32.76 14.36 345°34.96 •• 14.41	23°9.50 9.02 38°12.32 • 8.99	114°25.57 37.68 129°27.98 · · 37.65	Acrux 173°0.61 -63°13.92
4	129° 31.35	195°35.84 5.70	0°37.17 14.46	53°15.14 8.97	144°30.39 37.62	Gacrux 171°52.10 -57°14.87
5	144°33.82	210°35.14 5.23	15°39.37 14.52	68°17.97 8.94	159°32.79 37.59	Alioth 166°13.38 55°49.27
6	159°36.28	225°34.45 \$24°4.75	30°41.58 N21°14.57	83°20.79 N22°8.91	174°35.20 \$08°37.56	Spica 158°22.66 -11°17.38 Alkaid 152°52.46 49°11.18
7	$174^{\circ}38.75$	240° 33.75 4.28	45°43.79 14.62	98°23.61 8.89	189° 37.61 37.52	Hadar 148°36.74 -60°29.36
8	189°41.21	255°33.06 3.81	60°46.00 14.67	113°26.44 8.86	204°40.01 37.49	Menkent 147°58.10 -36°29.38
9	204° 43.67	270°32.37 · · 3.33	75°48.22 · · 14.73	128°29.26 · · 8.83	219°42.42 · · 37.46	Arcturus 145°48.31 19°3.13
10 11	219° 46.14 234° 48.60	285°31.68 2.85 300°30.99 2.38	90°50.43 14.78 105°52.64 14.83	143°32.08 8.80 158°34.91 8.78	234°44.83 37.43 249°47.23 37.40	Rigil Kent. 139°41.08 -60°56.10
12	249°51.07	315°30.30 \$24°1.90	120°54.86 N21°14.89	173°37.73 N22°8.75	264°49.64 S08°37.37	Kochab 137°20.85 74°2.99
13	264°53.53	330°29.61 1.42	135°57.08 14.94	188°40.56 8.72	279°52.04 37.33	Zuben'ubi 136°56.46 -16°8.63
14	279°56.00	345°28.92 0.94	150°59.30 15.00	203°43.38 8.70	294°54.45 37.30	Alphecca 126°4.20 26°37.82 Antares 112°16.36 -26°29.19
15	294°58.46	0°28.23 · · 0.45	166°1.52 · · 15.05	218°46.20 · · 8.67	309°56.86 · · 37.27	Atria 107°11.27 -69°4.31
16	310°0.92	15°27.55 23°59.97	181°3.74 15.11	233°49.03 8.64	324°59.26 37.24	Sabik 102°3.26 -15°45.32
17	325°3.39	30°26.86 23°59.49	196° 5.96 15.16	248°51.85 8.62	340°1.67 37.21	Shaula 96°10.94 -37°7.32
18 19	340°5.85 355°8.32	45°26.17 \$23°59.00 60°25.49 58.51	211°8.18 N21°15.22 226°10.41 15.28	263°54.68 N22°8.59 278°57.50 8.56	355° 4.07 S08° 37.18 10° 6.47 37.14	Rasalhague 95°58.99 12°32.55
20	10° 10.78	75°24.80 58.03	241°12.64 15.33	294°0.33 8.53	25°8.88 37.11	Eltanin 90°42.75 51°29.19
21	25° 13.24	90°24.12 · · 57.54	256°14.87 · · 15.39	309°3.15 · · 8.51	40°11.28 · · 37.08	Kaus Aust. 83°33.03 -34°22.41 Vega 80°33.68 38°48.49
22	$40^{\circ}15.71$	105°23.43 57.05	271°17.09 15.45	324°5.98 8.48	55°13.69 37.05	Vega 80°33.68 38°48.49 Nunki 75°48.21 -26°15.99
23	55° 18.17	120°22.75 56.55	286°19.33 15.51	339°8.80 8.45	70°16.09 37.01	Altair 62°0.30 8°56.10
Mer.	pass. 19:19	ν-0.7' d-0.5' m-4.19	ν2.2' d0.1' m-0.48	ν2.8' d-0.0' m-2.81	ν2.4' d-0.0' m0.94	Peacock 53°6.23 -56°39.51
	P					Deneb 49°26.13 45°22.35
S	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.99 9°59.43
Sun 0	70° 20.64	GHA Dec 135°22.07 S 23°56.06	GHA Dec 301°21.56 N 21°15.56	GHA Dec 354°11.63 N22°8.42	GHA Dec 85°18.50 \$08°36.98	Al Na'ir 27°33.11 -46°50.65 Fomalhaut 15°14.60 -29°29.56
1	85° 23.10	150°21.38 55.57	316°23.79 15.62	9°14.45 8.40	100°20.90 36.95	Fomalhaut 15°14.60 -29°29.56 Scheat 13°45.28 28°13.26
2	$100^{\circ}25.57$	165°20.70 55.07	331°26.03 15.68	24°17.28 8.37	115°23.30 36.92	Markab 13°29.98 15°20.47
3	115°28.03	180°20.02 · · 54.58	346°28.26 · · 15.74	39°20.10 · · 8.34	130°25.71 · · 36.88	
4	130°30.49	195°19.34 54.08	1°30.50 15.80	54°22.93 8.32	145°28.11 36.85	Nov 29 Fri SHA Mer.pass Venus 67°33.15 14:57
5 6	145°32.96 160°35.42	210°18.66 53.58 225°17.98 \$23°53.08	16°32.74 15.86 31°34.98 N21°15.92	69°25.75 8.29 84°28.58 N22°8.26	160°30.51 36.82 175°32.92 \$08°36.78	Venus 67-33.15 14:57 Mars 231°13.55 04:01
7	175° 37.89	240°17.30 52.58	46°37.22 15.98	99°31.40 8.23	190°35.32 36.75	Jupiter 283°33.77 00:32
8	190° 40.35	255°16.63 52.08	61°39.46 16.04	114°34.23 8.21	205°37.72 36.72	Saturn 15°0.56 18:24
9	205°42.81	270°15.95 · · 51.58	76°41.71 · · 16.11	129°37.05 · · 8.18	220°40.12 · · 36.69	
10	220° 45.28	285°15.27 51.08	91°43.95 16.17	144°39.88 8.15	235°42.52 36.65	Nov 30 Sat SHA Mer.pass Venus 66°17.12 14:58
11	235° 47.74	300°14.60 50.57	106°46.20 16.23	159°42.71 8.12	250°44.93 36.62	Mars 231°6.86 03:58
12 13	250° 50.21 265° 52.67	315°13.92 \$23°50.07 330°13.25 49.56	121°48.45 N21°16.29 136°50.70 16.36	174°45.53 N22°8.10 189°48.36 8.07	265°47.33 \$08°36.59 280°49.73 36.55	Jupiter 283°42.35 00:28
13 14	265°52.67 280°55.14	330°13.25 49.56 345°12.57 49.05	151°52.95 16.42	204°51.18 8.04	280°49.73 36.55 295°52.13 36.52	Saturn 14°59.26 18:20
15	295° 57.60	0°11.90 · · 48.54	166°55.20 · · 16.48	219°54.01 · · 8.01	310°54.53 · · 36.49	Dec 01 Sun SHA Mer.pass
16	311°0.06	15°11.23 48.03	181°57.46 16.55	234°56.84 7.99	325°56.93 36.45	Venus 65°1.43 14:59
17	326°2.53	30°10.55 47.52	196°59.71 16.61	249°59.66 7.96	340°59.33 36.42	Mars 231°0.92 03:54
18	341°4.99	45°9.88 S 23°47.01	212°1.97 N21°16.68	265°2.49 N22°7.93	356°1.74 S 08°36.38	Jupiter 283°50.99 00:23
19	356°7.46	60°9.21 46.49	227°4.23 16.74	280°5.32 7.90	11° 4.14 36.35	Saturn 14°57.86 18:16
20 21	11°9.92 26°12.39	75°8.54 45.98 90°7.87 · · 45.46	242°6.48 16.81 257°8.75 •• 16.87	295°8.14 7.88 310°10.97 · · 7.85	26°6.54 36.32 41°8.94 · · 36.28	Horizontal parallax
22	20 12.39 41°14.85	105°7.20 44.95	257°8.75 ·· 16.87 272°11.01 16.94	310°10.97 · · 7.85 325°13.79 7.82	56°11.34 36.25	Venus: 0.2
23	56° 17.31	120°6.53 44.43	287°13.27 17.01	340°16.62 7.79	71°13.74 36.21	Mars: 0.2
	pass. 19:15	ν-0.7' d-0.5' m-4.20	ν2.2' d0.1' m-0.50	ν2.8' d-0.0' m-2.81	ν2.4' d-0.0' m0.94	
ivier.	hass. 13:13	ν-υ.ι u-υ.ɔ III-4.2U	ν∠.∠ αυ.1 m-υ.5υ	ν2.0 u-0.0 III-2.01	ν2. 4 α-0.0 πο.94	

h	Su	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°55.94	S21°31.20	210° 0.29	14.1'	\$18°16.48	11.4'	54.4'
1 2	197°55.72 212°55.50	31.62 32.04	224°33.34 239°6.31	14.0' 13.9'	18°27.86 18°39.16	11.3' 11.2'	54.4' 54.5'
3	227° 55.27	• • 32.46	253°39.20	13.8'	18°50.40	11.2'	54.5
4	242°55.05	32.87	268°12.01	13.7'	19°1.56	11.1'	54.5'
5 6	257°54.83 272°54.61	33.29 S 21°33.70	282°44.74 297°17.38	13.6' 13.6'	19°12.64 \$19°23.65	11.0' 10.9'	54.5' 54.5'
7	287° 54.38	34.12	311°49.94	13.5'	19°34.59	10.9	54.5
8	$302^{\circ}54.16$	34.53	326°22.41	13.4'	19°45.45	10.8'	54.5'
9	317°53.94 332°53.71	· · 34.95 35.36	340°54.81 355°27.11	13.3'	19°56.23 20°6.94	10.7'	54.5'
10 11	332 53.71 347°53.49	35.30 35.77	9°59.33	13.2' 13.1'	20 6.94 20°17.56	10.6' 10.5'	54.6' 54.6'
12	2°53.26	S21°36.18	24°31.47	13.0'	S20°28.10	10.5'	54.6'
13	17°53.04	36.59	39°3.51	13.0'	20°38.56 20°48.94	10.4	54.6'
14 15	32°52.81 47°52.59	37.00 · · 37.41	53°35.47 68°7.35	12.9' 12.8'	20°48.94 20°59.23	10.3' 10.2'	54.6' 54.6'
16	62°52.36	37.81	82°39.13	12.7'	21°9.43	10.1'	54.6'
17	77°52.14	38.22 \$21°38.63	97°10.83	12.6'	21°19.55	10.0'	54.7'
18 19	92°51.91 107°51.68	39.03	111°42.44 126°13.96	12.5' 12.4'	\$21°29.58 21°39.52	9.9' 9.9'	54.7' 54.7'
20	122°51.46	39.44	140°45.39	12.3'	21°49.37	9.8'	54.7'
21	137°51.23	• • 39.84	155°16.73	12.3'	21°59.13	9.7'	54.7'
22 23	152°51.00 167°50.77	40.25 40.65	169°47.98 184°19.14	12.2' 12.1'	22°8.80 22°18.37	9.6' 9.5'	54.7' 54.7'
23			104 19.14			9.5	J4.1
	SD = 16.2'	d = 0.4'		SL	0 = 14.8'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°50.54 197°50.32	\$21°41.05 41.45	198°50.22 213°21.20	12.0' 11.9'	\$22°27.85 22°37.23	9.4' 9.3'	54.8' 54.8'
2	212° 50.09	41.45	213 21.20 227°52.09	11.8'	22°46.51	9.3 9.2'	54.8'
3	227°49.86	• • 42.25	242°22.89	11.7'	22°55.70	9.1'	54.8'
4	242°49.63	42.65	256°53.60	11.6'	23°4.78	9.0'	54.8'
5 6	257°49.40 272°49.17	43.05 \$21°43.45	271°24.22 285°54.74	11.5' 11.4'	23°13.77 \$23°22.65	8.9' 8.8'	54.8' 54.9'
7	287° 48.94	43.84	300°25.18	11.3'	23°31.43	8.7'	54.9'
8	302°48.71	44.24	314°55.53	11.3'	23°40.10	8.6'	54.9'
9 10	317° 48.48 332° 48.25	· · 44.64 45.03	329°25.78 343°55.95	11.2' 11.1'	23°48.67 23°57.13	8.5' 8.4'	54.9' 54.9'
11	347° 48.02	45.43	358°26.02	11.1	23 57.13 24°5.48	8.2	54.9
12	2°47.78	S21°45.82	12°56.01	10.9'	S24°13.73	8.1'	54.9'
13 14	17° 47.55 32° 47.32	46.21 46.60	27°25.90 41°55.71	10.8' 10.7'	24°21.86 24°29.88	8.0' 7.9'	55.0' 55.0'
15	47°47.09	• • 46.99	56°25.42	10.6'	24° 29.00 24° 37.79	7.8'	55.0'
16	62°46.86	47.39	70°55.05	10.5'	24°45.59	7.7'	55.0'
17 18	77°46.62 92°46.39	47.78 \$21°48.16	85°24.58 99°54.03	10.4' 10.4'	24°53.27 \$25°0.83	7.6' 7.4'	55.0' 55.0'
19	107°46.16	48.55	114°23.39	10.4	25°8.28	7.4	55.1'
20	122° 45.92	48.94	128°52.66	10.2	25°15.60	7.2'	55.1'
21 22	137°45.69 152°45.45	· · 49.33 49.71	143°21.84 157°50.94	10.1' 10.0'	25°22.81 25°29.90	7.1' 7.0'	55.1' 55.1'
23	167° 45.22	50.10	172°19.95	9.9'	25°36.86	6.8	55.1
	SD = 16.2'	d = 0.4'		SE	0 = 14.9'		
C	GHA	D	GHA	ν	Dec	d	HP
Sun 0	182° 44.98	Dec S21°50.48	186°48.87	ν 9.8'	\$25°43.70	6.7'	55.2'
1	197° 44.75	50.87	201°17.71	9.8'	25°50.42	6.6'	55.2'
2	212°44.51 227°44.28	51.25 •• 51.63	215°46.46 230°15.13	9.7' 9.6'	25°57.01 26°3.48	6.5' 6.3'	55.2' 55.2'
3 4	242° 44.04	52.01	244°43.71	9.0 9.5'	26° 9.82	6.2	55.2'
5	257° 43.80	52.40	259°12.22	9.4'	$26^{\circ}16.02$	6.1'	55.2'
6	272°43.57 287°43.33	\$21°52.78 53.16	273°40.64 288°8.98	9.3' 9.3'	\$26°22.10 26°28.05	5.9' 5.8'	55.3'
7 8	287°43.33 302°43.09	53.16	288°8.98 302°37.24	9.3'	26° 28.05 26° 33.86	5.8° 5.7'	55.3' 55.3'
9	317°42.86	• • 53.91	$317^{\circ}5.42$	9.1'	26°39.55	5.5'	55.3'
10 11	332°42.62 347°42.38	54.29 54.67	331°33.52 346°1.54	9.0' 8.9'	26°45.09 26°50.51	5.4' 5.3'	55.3' 55.3'
11	347°42.38 2°42.14	54.67 \$21°55.04	0°29.49	8.9'	\$26°55.78	5.3	55.4'
13	17°41.90	55.42	14°57.36	8.8'	27°0.92	5.0'	55.4'
14	32°41.66	55.79	29°25.15	8.7'	27°5.92	4.9'	55.4'
15 16	47°41.43 62°41.19	· · 56.17 56.54	43°52.88 58°20.53	8.7' 8.6'	27°10.78 27°15.50	4.7' 4.6'	55.4' 55.4'
17	77° 40.95	56.91	72°48.11	8.5	27°20.08	4.4	55.5
18	92°40.71	S21°57.28	87°15.62	8.4'	\$27°24.52	4.3'	55.5'
19 20	107°40.47 122°40.23	57.65 58.02	101°43.06 116°10.43	8.4' 8.3'	27°28.82 27°32.97	4.2' 4.0'	55.5' 55.5'
21	122 40.23 137°39.98	• • 58.39	110 10.43 130°37.73	8.2'	27°36.97	3.9'	55.5'
22	152° 39.74	58.76	145° 4.97	8.2'	27°40.83	3.7'	55.5'
23	167°39.50	59.13	159°32.15	8.1'	27°44.54	3.6'	55.6'
	SD = 16.2'	d = 0.4'		SE	0 = 15.0'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:50	09:48			13:49	15:47
N 70°	07:33	09:09			14:28	16:03
68°	07:20	08:42	10:33	13:04	14:55	16:17
66°	07:09	08:22	09:45	13:52	15:15	16:28
64°	07:00	08:05	09:15	14:22	15:32	16:37
62°	06:52	07:51	08:52	14:45	15:46	16:45
60°	06:45	07:40	08:34	15:03	15:57	16:52
N 58°	06:39	07:30	08:19	15:18	16:08	16:59
56°	06:33	07:21	08:06	15:31	16:17	17:04
54°	06:27	07:12	07:55	15:43	16:25	17:10
52°	06:22	07:05	07:45	15:52	16:32	17:15
50°	06:18	06:59	07:36	16:01	16:39	17:19
45°	06:08	06:44	07:17	16:20	16:53	17:30
N 40°	05:58	06:32	07:02	16:35	17:05	17:39
35°	05:50	06:21	06:49	16:48	17:16	17:47
30°	05:42	06:12	06:38	17:00	17:26	17:55
20°	05:27	05:55	06:18	17:19	17:43	18:10
N 10°	05:13	05:39	06:01	17:36	17:59	18:25
0°	04:57	05:23	05:45	17:52	18:15	18:41
S 10°	04:39	05:06	05:29	18:09	18:32	18:58
20°	04:19	04:47	05:12	18:26	18:50	19:19
30°	03:52	04:24	04:51	18:47	19:14	19:46
35°	03:35	04:10	04:39	18:59	19:28	20:03
40°	03:14	03:54	04:26	19:12	19:44	20:25
45°	02:46	03:33	04:09	19:29	20:05	20:52
S 50°	02:07	03:07	03:49	19:49	20:32	21:32
52°	01:46	02:53	03:39	19:59	20:45	21:54
54°	01:16	02:38	03:28	20:10	21:01	22:24
56°	00:22	02:20	03:16	20:23	21:20	23:25
58°	////	01:56	03:02	20:37	21:43	////
S 60°	////	01:24	02:44	20:55	22:16	////

Lat.		Moonris	е		Moonset	
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°	08:31			11:50		
66°	07:50			12:31		
64°	07:23	09:26		13:00	12:35	
62°	07:02	08:47	10:47	13:22	13:15	13:02
60°	06:45	08:20	09:59	13:40	13:42	13:51
N 58°	06:31	08:00	09:29	13:55	14:04	14:21
56°	06:19	07:42	09:06	14:08	14:21	14:45
54°	06:08	07:28	08:47	14:19	14:36	15:04
52°	05:59	07:15	08:31	14:29	14:50	15:20
50°	05:50	07:04	08:18	14:38	15:01	15:33
45°	05:33	06:41	07:50	14:57	15:25	16:02
N 40°	05:18	06:23	07:28	15:12	15:44	16:24
35°	05:06	06:08	07:10	15:25	16:00	16:43
30°	04:56	05:54	06:55	15:37	16:14	16:59
20° N 10°	04:38 04:22	05:32 05:13	06:28 06:06	15:56 16:14	16:38 16:59	17:26 17:49
0°	04:22	05:15	05:45	16:14	17:19	18:11
S 10°	03:53	04:37	05:25	16:46	17:38	18:33
20° 30°	03:38 03:21	04:18 03:56	05:02 04:37	17:04 17:24	17:59 18:23	18:56 19:23
35°	03:21	03:50	04:37	17:24	18:38	19:23
40°	03:11	03:43	04:22	17:30	18:54	19:40
45°	02:39	03:29	03:44	18:06	19:14	20:21
S 50°	02:30	02:50				20:50
52°	02:30	02:50	03:18 03:05	18:26 18:35	19:40 19:52	20:50
54°	02:22	02:40	02:51	18:46	20:06	21:05
56°	02:14	02:29	02:31	18:58	20:00	21:42
58°	02:04	02:10	02:34	19:13	20:42	22:07
S 60°	01:41	01:43	01:49	19:30	21:06	22:41

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	28-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-0%	
29	11:44	11:33	11:48	10:19	22:42		
30	11:22	11:11	11:49	11:06	23:32		
01	11:00	10:49	11:49	11:58	-:-		

December 02, 03, 04 UT (Mon., Tue., Wed.)

1 86*22.24 150*5.20 43.39 317*17.80 17.14 10*22.27 7.74 101*18.54 36.15 2 101*24.71 165*4.53 42.87 332*20.07 17.21 25*25.10 7.71 116*20.94 36.11 3 116*27.17 180*3.87 · · 42.34 347*22.34 · · 17.28 40*27.93 · · 7.68 131*23.33 · · 36.08 4 131*29.63 195*3.20 41.82 2*24.61 17.34 55*30.76 7.66 146*25.73 36.04 5 146*32.10 210*2.54 41.29 17*26.88 17.41 70*33.58 7.63 161*28.13 36.01 6 161*34.56 225*1.87 \$23*40.77 32*29.15 N21*17.48 85*36.41 N22*7.60 176*30.53 \$08*35.97	heratz Ankaa chedar Diphda hernar Hamal Polaris camar Menkar	353°7.05 349°30.89 348°47.23 335°19.82 327°51.04	Dec 29°13.87 -42°10.41 56°40.71 -17°51.05 -57°6.80 23°34.94
1 86°22.24 150°5.20 43.39 317°17.80 17.14 10°22.27 7.74 101°18.54 36.15 2 101°24.71 165°4.53 42.87 332°20.07 17.21 25°25.10 7.71 116°20.94 36.11 3 116°27.17 180°3.87 · · 42.34 347°22.34 · · 17.28 40°27.93 · · 7.68 131°23.33 · · 36.08 4 131°29.63 195°3.20 41.82 2°24.61 17.34 55°30.76 7.66 146°25.73 36.04 5 146°32.10 210°2.54 41.29 17°26.88 17.41 70°33.58 7.63 161°28.13 36.01 6 161°34.56 225°1.87 \$23°40.77 32°29.15 N21°17.48 85°36.41 N22°7.60 176°30.53 \$508°35.97	Ankaa chedar Diphda hernar Hamal Polaris camar Menkar Mirfak	353°7.05 349°30.89 348°47.23 335°19.82 327°51.04 313°37.13	-42°10.41 56°40.71 -17°51.05 -57°6.80
1 86*22.24 150*5.20 43.39 317*17.80 17.14 10*22.27 7.74 101*18.54 36.15 2 101*24.71 165*4.53 42.87 332*20.07 17.21 25*25.10 7.71 116*20.94 36.11 3 116*27.17 180*3.87 · · 42.34 347*22.34 · · 17.28 40*27.93 · · 7.68 131*23.33 · · 36.08 4 131*29.63 195*3.20 41.82 2*24.61 17.34 55*30.76 7.66 146*25.73 36.04 5 146*32.10 210*2.54 41.29 17*26.88 17.41 70*33.58 7.63 161*28.13 36.01 6 161*34.56 225*1.87 \$23*40.77 32*29.15 N21*17.48 85*36.41 N22*7.60 176*30.53 \$08*35.97	Ankaa chedar Diphda hernar Hamal Polaris camar Menkar Mirfak	353°7.05 349°30.89 348°47.23 335°19.82 327°51.04 313°37.13	-42°10.41 56°40.71 -17°51.05 -57°6.80
3 116°27.17 180°3.87 · · 42.34 347°22.34 · · 17.28 40°27.93 · · 7.68 131°23.33 · · 36.08 4 131°29.63 195°3.20 41.82 2°24.61 17.34 55°30.76 7.66 146°25.73 36.04 5 146°32.10 210°2.54 41.29 17°26.88 17.41 70°33.58 7.63 161°28.13 36.01 6 161°34.56 225°1.87 \$23°40.77 32°29.15 N21°17.48 85°36.41 N22°7.60 176°30.53 \$08°35.97	Diphda hernar Hamal Polaris camar Menkar Mirfak	348°47.23 335°19.82 327°51.04 313°37.13	-17°51.05 -57°6.80
4 131°29.63 195°3.20 41.82 2°24.61 17.34 55°30.76 7.66 146°25.73 36.04 5 146°32.10 210°2.54 41.29 17°26.88 17.41 70°33.58 7.63 161°28.13 36.01 6 161°34.56 225°1.87 \$23°40.77 32°29.15 N21°17.48 85°36.41 N22°7.60 176°30.53 \$08°35.97	hernar Hamal Polaris camar Menkar Mirfak	335°19.82 327°51.04 313°37.13	-57°6.80
5 146°32.10 210°2.54 41.29 17°26.88 17.41 70°33.58 7.63 161°28.13 36.01 6 161°34.56 225°1.87 \$23°40.77 32°29.15 N21°17.48 85°36.41 N22°7.60 176°30.53 \$08°35.97	Hamal Polaris camar Jenkar Mirfak	327°51.04 313°37.13	
	Polaris .camar ⁄lenkar Mirfak	$313^{\circ}37.13$	
	camar Jenkar Mirfak		89°22.29
7 176°37.03 240°1.21 40.24 47°31.43 17.55 100°39.24 7.57 191°32.93 35.94	∕lenkar Mirfak		-40°12.33
8 191°39.49 255°0.54 39.71 62°33.70 17.62 115°42.06 7.55 206°35.33 35.90 1		$314^{\circ}5.95$	$4^{\circ}11.31$
10 221°44.42 284°59.22 38.65 92°38.26 17.76 145°47.72 7.49 236°40.12 35.84			49°57.09
11 236°46.88 299°58.56 38.12 107°40.54 17.83 160°50.55 7.46 251°42.52 35.80	ebaran	290°39.38	16°33.62
12 251°49.35 314°57.90 \$23°37.59 122°42.82 N21°17.90 175°53.37 N22°7.43 266°44.92 \$08°35.77	Rigel apella	281°3.62 280°21.56	-8°10.30 46°1.37
13 266°51.81 329°57.24 37.06 137°45.10 17.98 190°56.20 7.41 281°47.32 35.73 _R	ellatrix		6°22.39
14 281°54.28 344°56.58 36.52 152°47.38 18.05 205°59.03 7.38 296°49.72 35.70 15 296°56.74 359°55.92 · · 35.99 167°49.67 · · 18.12 221°1.86 · · 7.35 311°52.11 · · 35.66	Elnath	$278^{\circ}1.62$	28°37.72
16 311°59 21 14°55 26 35 45 182°51 95 18 19 236°4 68 7 32 326°54 51 35 62	Inilam	275°37.50	-1°11.09
17 327°1.67 29°54.61 34.91 197°54.24 18.27 251°7.51 7.30 341°56.91 35.59	lgeuse nopus		7°24.75 -52°42.33
18 342°4.13 44°53.95 \$23°34.37 212°50.53 N21°18.34 206°10.34 N22°7.27 356°59.30 \$08°35.55	Sirius		-32 42.33 -16°44.90
19 357°6.60 59°53.30 33.83 227°58.82 18.41 281°13.17 7.24 12°1.70 35.52	Adhara	255° 5.62	-29°0.18
20 12°9.06 74°52.64 33.29 243°1.11 18.49 296°15.99 7.21 27°4.10 35.48 21 27°11.53 89°51.99 · · 32.75 258°3.41 · · 18.56 311°18.82 · · 7.18 42°6.49 · · 35.45	rocyon	244°50.69	$5^{\circ}9.71$
22 42°13.99 104°51.33 32.20 273°5.70 18.64 326°21.65 7.16 57°8.89 35.41	Pollux		27°57.90
23 57°16.45 119°50.68 31.66 288°8.00 18.71 341°24.48 7.13 72°11.28 35.38	Avior Suhail	234°14.39 222°46.20	-59°35.04 -43°31.70
Mer.pass. 19:12 ν -0.7' d -0.5' m-4.20 ν 2.3' d 0.1' m-0.52 ν 2.8' d -0.0' m-2.81 ν 2.4' d -0.0' m0.95 Miap	acidus		-43 31.70 -69°48.79
	lphard	217°47.74	-8°45.88
Tue GHA GHA Dec GHA Dec GHA Dec	egulus		$11^{\circ}50.72$
0 70°10 00 124°E0 00 \$00°01 11 200°10 20 N01°10 70 256°07 21 N020°7 10 97°12 60 \$00°25 24	Dubhe		61°36.73
1 87°21 38 140°40 37 30 57 318°12 60 18 86 11°30 13 7.07 102°16 08 35 30	nebola	182°25.14 175°43.83	14°25.94 -17°40.67
2 102°23.85 164°48.72 30.02 333°14.90 18.94 26°32.96 7.05 117°18.47 35.27	Gienah Acrux	173 45.65 173°0.56	-17 40.07 -63°13.92
3 117° 26.31 179° 48.07 · · 29.47 348° 17.20 · · 19.02 41° 35.79 · · 7.02 132° 20.87 · · 35.23	Gacrux		-57°14.87
4 132°28.78 194°47.42 28.92 3°19.50 19.09 56°38.62 6.99 147°23.26 35.20 5 147°31.24 209°46.77 28.37 18°21.80 19.17 71°41.45 6.96 162°25.66 35.16	Alioth	$166^{\circ}13.35$	55°49.25
6 162°33.70 224°46.12 \$23°27.82 33°24.11 N21°19.25 86°44.28 N22°6.93 177°28.05 \$08°35.12	Spica	158°22.63	-11°17.39
7 177°36.17 239°45.48 27.26 48°26.42 19.33 101°47.10 6.91 192°30.45 35.09	Alkaid Hadar	152°52.44 148°36.70	49°11.16 -60°29.36
8 192°38.63 254°44.83 26.71 63°28.73 19.40 116°49.93 6.88 207°32.84 35.05	enkent		-36°29.38
9 207°41.10 269°44.18 ··· 26.15 78°31.04 ··· 19.48 131°52.76 ··· 6.85 222°35.23 ··· 35.01	cturus		19°3.12
11	Kent.	$139^{\circ}41.05$	-60°56.10
12 252°48.40 214°42.25 523°24.48 123°27.07 N21°10.72 177°1.25 N22°6.77 267°42.42 508°24.00	ochab	137°20.83	74°2.97
13 267°50.05 320°41.60 23.02 138°40.20 10.80 102°4.08 6.74 282°44.81 34.87	en'ubi ohecca	136°56.44 126°4.19	-16°8.63 26°37.81
14 282°53.42 344°40.96 23.36 153°42.61 19.88 207°6.90 6.71 297°47.20 34.83	intares		-26°29.18
15 297°55.88 359°40.32 ··· 22.80 168°44.92 ··· 19.96 222°9.73 ··· 6.68 312°49.60 ··· 34.79	Atria	107°11.24	-69°4.29
16 312°58.35 14°39.67 22.24 183°47.24 20.05 237°12.56 6.65 327°51.99 34.76 17 328°0.81 29°39.03 21.67 198°49.57 20.13 252°15.39 6.63 342°54.38 34.72	Sabik	$102^{\circ}3.25$	-15°45.32
18 3/3°3 28 //°38 30 \$23°21 11 213°51 80 N21°20 21 267°18 22 N22°6 60 357°56 77 \$08°3/ 68	Shaula	96°10.93	-37°7.31
10 358°5.74 50°37.75 20.54 228°54.21 20.20 282°21.05 6.57 12°50.17 34.65	lhague Eltanin		12°32.54 51°29.17
20 13°8.20 74°37.11 19.97 243°56.54 20.37 297°23.88 6.54 28°1.56 34.61 _{Kau}	Aust.		-34°22.41
21 28°10.67 89°36.47 · · 19.40 258°58.86 · · 20.46 312°26.71 · · 6.51 43°3.95 · · 34.57 22 43°13.13 104°35.84 18.83 274°1.19 20.54 327°29.54 6.48 58°6.34 34.53	Vega	80°33.69	38°48.48
22 43°13.13 104°35.84 18.83 274°1.19 20.54 327°29.54 6.48 58°6.34 34.53 23 58°15.60 119°35.20 18.26 289°3.52 20.63 342°32.37 6.46 73°8.74 34.50	Nunki	75°48.21	-26°15.99
	Altair	62°0.30	8°56.10
Mer.pass. 19:08 ν -0.7' d -0.5' m-4.21 ν 2.3' d 0.1' m-0.55 ν 2.8' d -0.0' m-2.81 ν 2.4' d -0.0' m0.95	eacock Deneb	53°6.24 49°26.14	-56°39.50 45°22.34
	Enif		9°59.43
Wed GHA GHA Dec GHA Dec GHA Dec GHA Dec	l Na'ir	27°33.12	-46°50.65
1 00000 50 140000 00 1710 01000 10 00 70 10000 00 640 100010 50 0440	alhaut	15°14.61	-29°29.56
2 102020 00 164022 00 16 FF 224010 FO 20 00 27040 0F 6 27 11001F 01 24 20	Scheat Narkab	13°45.29 13°29.98	28°13.26 15°20.47
3 118°25.45 179°32.66 · 15.97 349°12.85 · · 20.97 42°43.68 · · 6.34 133°18.30 · · 34.35	narkab	15 29.90	15 20.47
	2 Mon	SHA	Mer.pass
5 148°30.38 209°31.39 14.82 19°17.53 21.14 72°49.34 6.29 163°23.08 34.27 6 163°32.85 224°30.76 523°14.24 34°19.87 N21°21.22 87°52.17 N22°6.26 178°25.47 508°34.23	Venus Mars		15:00 03:50
	Jupiter		00:19
	Saturn	14°56.36	18:12
9 208°40 24 269°28 86 · · 12 50 79°26 89 · · 21 49 133°0 66 · · 6 17 223°32 64 · · 34 12	3 Tue	CHV	Mor pass
10 223-42.70 284-28.23 11.92 94-29.24 21.57 148-3.49 6.15 238-35.03 34.08	Venus	SHA 62°31.11	Mer.pass 15:01
11 238°45.17 299°27.60 11.33 109°31.58 21.66 163°6.32 6.12 253°37.42 34.04	Mars		03:47
13 268°50 10 329°26 35 10 16 139°36 28 21 84 193°11 98 6 06 283°42 20 33 97 1	Jupiter	284°8.39	00:14
14 283°52.56 344°25.72 9.58 154°38.63 21.93 208°14.81 6.03 298°44.59 33.93	Saturn	14°54.76	18:08
15 298°55.02 359°25.09 · · 8.99 169°40.98 · · 22.02 223°17.64 · · 6.01 313°46.98 · · 33.89 Dec 0	4 Wed	SHA	Mer.pass
16 313°57.49 14°24.47 8.40 184°43.33 22.11 238°20.47 5.98 328°49.37 33.85	Venus		15:02
17 328°59.95 29°23.84 7.81 199°45.69 22.20 253°23.30 5.95 343°51.76 33.81 18 344°2.42 44°23.22 \$23°7.22 214°48.05 N21°22.29 268°26.13 N22°5.92 358°54.15 \$08°33.77	Mars		03:43
	Jupiter Saturn	284°17.13 14°53.07	00:10 18:04
20 14°7.34 74°21.97 6.03 244°52.76 22.47 298°31.79 5.86 28°58.93 33.70			10.04
21 29°9.81 89°21.35 · · 5.44 259°55.12 · · 22.57 313°34.62 · · 5.83 44°1.31 · · 33.66	Horizo	ntal parallax	0.0
22 44°12.27 104°20.73 4.84 274°57.48 22.66 328°37.45 5.81 59°3.70 33.62		Venus: Mars:	0.2 0.2
23 59°14.74 119°20.11 4.25 289°59.85 22.75 343°40.28 5.78 74°6.09 33.58		ividi5.	0.2
Mer.pass. 19:04 ν -0.6' d -0.6' m-4.22 ν 2.3' d 0.1' m-0.57 ν 2.8' d -0.0' m-2.81 ν 2.4' d -0.0' m0.95			

h	Su	n			Moon		
Mon	GHA	Dec	GHA		Dec	d	HP
0	182° 39.26	\$21°59.50	173°59.27	ν 8.1'	\$27°48.11	3.4'	55.6'
1	197°39.02	21°59.86	188°26.32	8.0'	27°51.53	3.3'	55.6'
2	212°38.78	22°0.23	202°53.31	7.9'	27°54.79	3.1'	55.6'
3	227°38.53	• • 0.59	217°20.25	7.9'	27°57.91	3.0'	55.6'
4	242°38.29	0.96	231°47.13	7.8'	28°0.88	2.8'	55.7'
5	257° 38.05	1.32	246°13.95	7.8'	28°3.69	2.7'	55.7'
6	272°37.81	S22°1.68	260°40.73	7.7'	\$28°6.36	2.5'	55.7'
7	287°37.56	2.05	275°7.44	7.7'	28°8.87	2.4'	55.7'
8	302°37.32	2.41	289°34.11	7.6'	$28^{\circ}11.22$	2.2'	55.7'
9	317° 37.07	• • 2.77	304°0.73	7.6'	28°13.43	2.0'	55.8'
10	332°36.83	3.13	318°27.31	7.5'	28°15.47	1.9'	55.8'
11	347°36.59	3.49	332°53.83	7.5'	28°17.36	1.7'	55.8'
12	2°36.34	S22° 3.85	347°20.32	7.4'	\$28°19.10	1.6'	55.8'
13	17°36.10	4.20	1°46.76	7.4'	28°20.68	1.4'	55.8'
14	32°35.85	4.56	16°13.16 30°39.52	7.4'	28°22.10	1.3'	55.9'
15	47°35.61 62°35.36	• • 4.92	45° 5.85	7.3' 7.3'	28°23.36 28°24.47	1.1'	55.9'
16 17	77°35.11	5.27 5.63	45 5.65 59°32.14	7.3'	28°25.41	0.9' 0.8'	55.9' 55.9'
18	92°34.87	5.03 \$22° 5.98	73°58.39	7.2'	S28°26.20	0.6	55.9'
19	107°34.62	6.33	88°24.62	7.2'	28°26.83	0.5	56.0'
20	107 34.02 122°34.37	6.69	88 24.02 102°50.81	7.2'	28°27.29	0.5	56.0'
21	137°34.13	. 7.04	102 50.81 117°16.98	7.2 7.1'	28°27.60	0.3	56.0'
22	157° 34.13	7.39	131°43.12	7.1	28°27.74	-0.0'	56.0'
23	167°33.63	7.74	146° 9.24	7.1	28°27.73	-0.2	56.0'
	SD = 16.2'	d = 0.4'		SI	O = 15.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°33.38	\$22°8.09	160°35.34	7.1'	\$28°27.55	-0.3	56.0'
1	197°33.14	8.44	175°1.41	7.1'	28°27.21	-0.5'	56.1'
2	212°32.89	8.78	189°27.47	7.0'	28°26.71	-0.7'	56.1'
3	227°32.64	• • 9.13	203°53.51	7.0'	28°26.04	-0.8'	56.1'
4	242°32.39	9.48	218°19.53	7.0'	28°25.22	-1.0'	56.1'
5 6	257° 32.14 272° 31.89	9.82 \$22°10.17	232°45.54 247°11.54	7.0' 7.0'	28°24.23 \$28°23.08	-1.2' -1.3'	56.1' 56.2'
7	272 31.69 287°31.64	10.51	247 11.54 261°37.53	7.0'	28°21.76	-1.5'	56.2'
8	302°31.39	10.51	276° 3.52	7.0'	28°20.28	-1.5 -1.6'	56.2'
9	317° 31.14	. 11.20	290°29.49	7.0'	28°18.64	-1.8'	56.2
10	332°30.89	11.54	304°55.47	7.0'	28°16.84	-2.0'	56.2
11	347°30.64	11.88	319°21.44	7.0'	28°14.87	-2.1'	56.3'
12	2°30.39	S22°12.22	333°47.41	7.0'	\$28°12.74	-2.3'	56.3'
13	17°30.14	12.56	348°13.39	7.0'	28°10.44	-2.5'	56.3'
14	32°29.89	12.90	2°39.36	7.0'	28°7.98	-2.6'	56.3'
15	47°29.64	• • 13.24	$17^{\circ}5.35$	7.0'	28°5.36	-2.8'	56.3'
16	62°29.38	13.58	31°31.34	7.0'	28°2.58	-2.9'	56.4'
17	77°29.13	13.91	45°57.34	7.0'	27°59.63	-3.1'	56.4'
18	92°28.88	S22°14.25	60°23.35	7.0'	S27°56.52	-3.3'	56.4'
19	107°28.63	14.58	74°49.37		27°53.25	-3.4'	56.4'
20	122°28.37	14.92	89°15.41	7.1'	27°49.82	-3.6'	56.4'
21 22	137°28.12 152°27.87	· · 15.25 15.59	103°41.46 118°7.53	7.1' 7.1'	27°46.22 27°42.47	-3.8' -3.9'	56.5' 56.5'
23	152 27.87 167°27.61	15.59 15.92	118 7.53 132°33.62	7.1'	27 42.47 27°38.55	-3.9 -4.1'	56.5'
23	SD = 16.2'	d = 0.3'	132 33.02		O = 15.3'	-4.1	30.3
				اد —			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°27.36	S22°16.25	146°59.74	7.1'	\$27°34.47	-4.2'	56.5'
1	197°27.11	16.58	161°25.87	7.2'	27°30.23	-4.4'	56.5'
2	212°26.85 227°26.60	16.91 •• 17.24	175°52.03 190°18.21	7.2' 7.2'	27°25.83 27°21.27	-4.6' -4.7'	56.6'
3 4	227°26.60 242°26.34	17.57	190°18.21 204°44.43	7.2'	27°21.27 27°16.55	-4.7' -4.9'	56.6' 56.6'
5	257° 26.09	17.57	219°10.67	7.2 7.3'	27°11.67	-4.9 -5.0'	56.6
6	272°25.83	522°18.22	233°36.94	7.3'	\$27°6.63	-5.0 -5.2'	56.6
7	287° 25.58	18.55	248° 3.25	7.3'	27°1.44	-5.4'	56.7'
8	302°25.32	18.87	262°29.59	7.4	26°56.09	-5.5'	56.7'
9	317°25.06	• • 19.20	276°55.96	7.4'	26°50.58	-5.7'	56.7'
10	332°24.81	19.52	291°22.37	7.4'	$26^{\circ}44.91$	-5.8'	56.7'
11	347°24.55	19.85	305°48.82	7.5'	26°39.09	-6.0'	56.7'
12	2°24.29	\$22°20.17	320°15.30	7.5'	S26°33.11	-6.1'	56.8'
13	17°24.04	20.49	334°41.83	7.6'	26°26.98	-6.3	56.8'
14	32°23.78	20.81	349°8.40	7.6'	26°20.69	-6.4'	56.8'
15	47° 23.52	• • 21.13	3°35.01	7.7'	26°14.25	-6.6'	56.8'
16	62°23.27	21.45	18° 1.67	7.7'	26°7.66	-6.7'	56.9'
17	77°23.01 92°22.75	21.77 S 22°22.09	32°28.37 46°55.12	7.7'	26°0.92 \$25°54.03	-6.9'	56.9'
18 19	92°22.75 107°22.49	22.41	46°55.12 61°21.92	7.8' 7.8'	525°54.03 25°46.98	-7.0' -7.2'	56.9' 56.9'
20	107°22.49 122°22.23	22.41	75°48.76	7.8° 7.9°	25°46.98 25°39.79	-7.2 -7.3'	56.9'
21	122 22.23 137°21.97	• • 23.04	75 48.76 90°15.66	7.9 7.9'	25 39.79 25°32.44	-7.5'	50.9 57.0'
22	157 21.97 152°21.71	23.35	104°42.60	7.9 8.0'	25°24.95	-7.6'	57.0'
23	167°21.45	23.67	119° 9.60	8.0'	25°17.31	-7.8'	57.0'
	SD = 16.2'	d = 0.3'			D = 15.4'		
	3D = 10.2	u = 0.3		31	J — 15.4°		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	07:57	10:02			13:38	15:42
N 70°	07:40	09:19			14:20	15:59
68°	07:27	08:50	10:52	12:48	14:49	16:13
66°	07:15	08:29	09:55	13:44	15:11	16:24
64°	07:05	08:11	09:23	14:17	15:28	16:34
62°	06:57	07:57	08:59	14:41	15:43	16:43
60°	06:49	07:45	08:40	15:00	15:55	16:50
N 58°	06:43	07:34	08:24	15:16	16:05	16:57
56°	06:37	07:25	08:11	15:29	16:15	17:03
54°	06:31	07:17	07:59	15:40	16:23	17:08
52°	06:26	07:09	07:49	15:51	16:31	17:14
50°	06:21	07:02	07:40	16:00	16:37	17:18
45°	06:11	06:47	07:21	16:19	16:52	17:29
N 40°	06:01	06:35	07:05	16:35	17:05	17:39
35°	05:52	06:24	06:52	16:48	17:16	17:47
30°	05:44	06:14	06:40	17:00	17:26	17:55
20°	05:29	05:56	06:20	17:20	17:43	18:11
N 10°	05:14	05:40	06:03	17:37	18:00	18:26
0°	04:58	05:24	05:46	17:54	18:16	18:42
S 10°	04:40	05:07	05:30	18:10	18:33	19:00
20°	04:19	04:48	05:12	18:28	18:53	19:21
30°	03:51	04:24	04:51	18:49	19:16	19:49
35°	03:34	04:10	04:39	19:01	19:31	20:07
40°	03:12	03:53	04:25	19:15	19:48	20:28
45°	02:44	03:32	04:08	19:32	20:09	20:57
S 50°	02:04	03:04	03:47	19:53	20:36	21:38
52°	01:41	02:51	03:37	20:03	20:50	22:01
54°	01:08	02:35	03:26	20:15	21:06	22:34
56°	////	02:15	03:13	20:28	21:26	////
58°	////	01:51	02:58	20:43	21:51	////
S 60°	////	01:16	02:40	21:01	22:27	////
				I		

Lat.		Moonris	е		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	_					
N 70°						
68°						
66°						
64°						
62°	11.00	10.01	13:22	1116	15.00	16:17
60°	11:28	12:21	12:41	14:16	15:20	16:57
N 58°	10:48	11:43	12:13	14:56	15:58	17:25
56°	10:20	11:16	11:51	15:24	16:25	17:46
54° 52°	09:58 09:40	10:54 10:37	11:34 11:18	15:45	16:46	18:04
52 50°	09:40	10:37	11:18	16:03 16:19	17:04 17:19	18:18 18:31
45°	09.25	09:51	10:38	16:50	17:19	18:58
N 40°	08:31	09:31	10:36	17:14	18:12	19:19
35°	08:11	09:27	09:58	17:14	18:32	19:19
30°	07:54	09:00	09:42	17:50	18:48	19:51
20°	07:26	08:22	09:16	18:19	19:16	20:17
N 10°	07:02	07:58	08:53	18:43	19:40	20:38
0°	06:39	07:35	08:32	19:06	20:03	20:58
S 10°	06:17	07:13	08:10	19:29	20:25	21:18
20°	05:53	06:48	07:47	19:53	20:48	21:40
30°	05:25	06:20	07:21	20:22	21:16	22:04
35°	05:08	06:03	07:05	20:39	21:32	22:19
40°	04:49	05:43	06:47	20:58	21:51	22:35
45°	04:26	05:20	06:24	21:22	22:14	22:55
S 50°	03:56	04:49	05:56	21:53	22:43	23:20
52°	03:42	04:34	05:42	22:08	22:57	23:32
54°	03:25	04:16	05:26	22:26	23:13	23:45
56°	03:04	03:55	05:07	22:47	23:33	
58°	02:39	03:27	04:43	23:15	23:57	00.20
S 60°	02:05	02:48	04:11	23:54	•• ••	00:29

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.	
	00 ^h	12 ^h	Pass	Upper	Lower	1-3
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-8%
02	10:37	10:25	11:50	12:53	00:25	
03	10:14	10:02	11:50	13:49	01:21	
04	09:49	09:37	11:50	14:45	02:17	

December 05, 06, 07 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Star	S
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SH	A Dec
0	$74^{\circ}17.20$	134°19.49 \$23°3.65	305°2.21 N21°22.84	358°43.11 N22°5.75	89°8.48 S 08°33.54	Alpheratz 357°3	
1	89° 19.67	149° 18.87 3.05	320° 4.58 22.94	13°45.94 5.72	104°10.86 33.50	Ankaa 353°	
2	104°22.13	164° 18.25 2.45	335°6.94 23.03	28°48.77 5.69	119°13.25 33.46	Schedar 349°3	
3 4	119°24.59	179°17.63 · · 1.85	350°9.31 · · 23.13	43°51.60 · · 5.66	134°15.64 · · 33.42	Diphda 348°4	
5	134° 27.06 149° 29.52	194°17.01 1.25 209°16.40 0.65	5°11.68 23.22 20°14.05 23.32	58°54.43 5.64 73°57.26 5.61	149°18.03 33.38 164°20.41 33.34	Achernar 335°1	
6	164°31.99	224°15.78 \$23°0.05	35°16.43 N21°23.41	89°0.09 N22°5.58	179°22.80 S08°33.31	Hamal 327°5	
7	179°34.45	239°15.17 22°59.44	50°18.80 23.51	104°2.92 5.55	194°25.19 33.27	Polaris 313°3 Acamar 315°1	
8	194°36.92	254°14.55 58.84	65°21.18 23.60	119°5.75 5.52	209°27.57 33.23	Menkar 314°	
9	209°39.38	269°13.94 · · 58.23	80°23.56 · · 23.70	134°8.58 · · 5.49	224°29.96 · · 33.19	Mirfak 308°2	
10	224°41.84	284°13.33 57.62	95°25.93 23.80	149°11.41 5.46	239°32.35 33.15	Aldebaran 290°3	
11 12	239° 44.31 254° 46.77	299°12.71 57.01 314°12.10 \$22°56.40	110°28.31 23.89 125°30.70 N21°23.99	164°14.24 5.44 179°17.07 N22°5.41	254°34.73 33.11 269°37.12 \$08°33.07	Rigel 281°	
13	269° 49.24	329°11.49 55.79	140°33.08 24.09	194°19.90 5.38	284°39.50 33.03	Capella 280°2	
14	284°51.70	344°10.88 55.18	155°35.46 24.19	209°22.73 5.35	299°41.89 32.99	Bellatrix 278°2 Elnath 278°	
15	299°54.16	359° 10.27 · · 54.57	170°37.85 · · 24.29	224°25.56 · · 5.32	314°44.27 · · 32.95	Elnath 278° Alnilam 275°3	
16	314°56.63	14°9.66 53.95	185°40.24 24.38	239°28.39 5.29	329°46.66 32.91	Betelgeuse 270°5	
17	329°59.09 345°1.56	29°9.05 53.34	200°42.62 24.48	254°31.22 5.27	344°49.04 32.87	Canopus 263°5	
18 19	0°4.02	44°8.45 \$22°52.72 59°7.84 52.10	215°45.01 N21°24.58 230°47.41 24.68	269°34.05 N22°5.24 284°36.88 5.21	359°51.43 \$08°32.83 14°53.81 32.79	Sirius 258°2	
20	15°6.49	74°7.23 51.49	245°49.80 24.78	299°39.71 5.18	29°56.20 32.75	Adhara 255°	
21	30°8.95	89°6.63 · · 50.87	260°52.19 · · 24.89	314°42.54 · · 5.15	44°58.58 · · 32.70	Procyon 244°5 Pollux 243°1	
22	$45^{\circ}11.41$	104°6.02 50.25	275°54.59 24.99	329°45.37 5.12	60°0.96 32.66	Avior 234°1	
23	60°13.88	119°5.42 49.62	290°56.99 25.09	344°48.20 5.09	75°3.35 32.62	Suhail 222°4	
Mer.	pass. 19:00	ν-0.6' d-0.6' m-4.22	ν2.4' d0.1' m-0.59	ν2.8' d-0.0' m-2.81	ν2.4' d-0.0' m0.96	Miaplacidus 221°3	7.88 -69°48.81
						Alphard 217°4	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°3	
0	75° 16.34	134°4.82 \$22°49.00	305°59.38 N21°25.19	359°51.03 N22°5.06	90°5.73 \$08°32.58	Dubhe 193°4 Denebola 182°2	
1	90° 18.81	149°4.21 48.38	321°1.78 25.29	14°53.86 5.04	105° 8.12 32.54	Gienah 175°4	
2	105°21.27	164°3.61 47.75	336°4.19 25.39	29°56.69 5.01	120°10.50 32.50	Acrux 173°	
3 4	120°23.73 135°26.20	179°3.01 · · 47.13 194°2.41 46.50	351°6.59 · · 25.50 6°8.99 25.60	44°59.53 · · 4.98 60°2.36 4.95	135°12.88 · · 32.46 150°15.27 32.42	Gacrux 171°5	
5	150°28.66	209°1.81 45.88	21°11.40 25.71	75°5.19 4.92	165°17.65 32.38	Alioth 166°1	
6	165°31.13	224°1.21 S22°45.25	36°13.81 N21°25.81	90°8.02 N22°4.89	180°20.03	Spica 158°2	
7	180°33.59	239°0.61 44.62	51°16.21 25.91	105°10.85 4.86	195°22.41 32.30	Alkaid 152°5 Hadar 148°3	
8	195°36.06	254°0.02 43.99	66°18.62 26.02	120°13.68 4.84	210°24.80 32.26	Menkent 147°5	
9	210°38.52	268°59.42 · · 43.35	81°21.04 · · 26.12	135°16.51 · · 4.81	225°27.18 · · 32.21	Arcturus 145°4	
10 11	225° 40.98 240° 43.45	283°58.82 42.72 298°58.23 42.09	96°23.45 26.23 111°25.86 26.34	150°19.34 4.78 165°22.17 4.75	240°29.56 32.17 255°31.94 32.13	Rigil Kent. 139°4	
12	255° 45.91	313°57.63 \$22°41.45	126°28.28 N21°26.44	180°25.00 N22°4.72	270°34.32	Kochab 137°2	
13	270°48.38	328°57.04 40.82	141°30.70 26.55	195°27.83 4.69	285°36.71 32.05	Zuben'ubi 136°5 Alphecca 126°	
14	285°50.84	343°56.45 40.18	156°33.11 26.66	210°30.66 4.66	300°39.09 32.01	Antares 112°1	
15	300°53.30	358°55.85 · · 39.54	171°35.53 · · 26.76	225°33.49 · · 4.63	315°41.47 · · 31.96	Atria 107°1	
16 17	315°55.77	13°55.26 38.90	186°37.96 26.87	240°36.32 4.60 255°39.15 4.58	330°43.85 31.92 345°46.23 31.88	Sabik 102°	
18	330°58.23 346°0.70	28°54.67 38.26 43°54.08 \$22°37.62	201°40.38 26.98 216°42.80 N21°27.09	255°39.15 4.58 270°41.99 N22°4.55	345°46.23 31.88 0°48.61 \$08°31.84	Shaula 96°1	
19	1°3.16	58°53.49 36.98	231°45.23 27.20	285°44.82 4.52	15°50.99 31.80	Rasalhague 95°5	
20	16°5.63	73°52.90 36.34	246°47.66 27.31	300°47.65 4.49	30°53.37 31.76	Eltanin 90°4 Kaus Aust. 83°3	2.76 51°29.15 3.02 -34°22.40
21	31°8.09	88°52.32 · · 35.70	261°50.09 · · 27.42	315°50.48 · · 4.46	45°55.75 · · 31.71	Vega 80°3	
22	46° 10.55	103°51.73 35.05	276°52.52 27.53	330°53.31 4.43	60°58.13 31.67	Nunki 75°4	
23	61°13.02	118°51.14 34.40	291°54.95 27.64	345°56.14 4.40	76° 0.51 31.63	1	0.30 8°56.09
Mer. _I	pass. 18:56	ν -0.6' d-0.6' m-4.23	$ u 2.4' \ d0.1' \ \text{m-}0.61$	ν 2.8′ <i>d</i> -0.0′ m-2.81	ν 2.4′ <i>d</i> -0.0′ m0.96		6.25 -56°39.49
						Deneb 49°2 Enif 33°3	
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°3	
0	76° 15.48	133°50.56	306°57.38 N21°27.75	0°58.97 N22°4.37	91°2.89	Fomalhaut 15°1	
1	91°17.95	148°49.97 33.11	321°59.81 27.86	16°1.80 4.35	106° 5.27 31.54	Scheat 13°4	5.30 28°13.26
2	106° 20.41 121° 22.87	163°49.39 32.46 178°48.80 · · 31.81	337°2.25 27.97 352°4.69 · · 28.08	31°4.63 4.32 46°7.46 •• 4.29	121°7.65 31.50 136°10.03 · · 31.46	Markab 13°2	9.99 15°20.47
4	136°25.34	193°48.22 31.16	7°7.13 28.20	61°10.29 4.26	151°12.41 31.42	Dec 05 Thu SH	A Mer.pass
5	150° 25.54 151° 27.80	208° 47.64 30.51	22°9.57 28.31	76°13.12 4.23	166°14.79 31.37	I	2.29 15:03
6	166°30.27	223°47.06 \$22°29.85	37°12.01 N21°28.42	91°15.95 N22°4.20	181°17.17 S 08°31.33	Mars 230°4	5.01 03:39
7	181°32.73	238°46.48 29.20	52°14.45 28.53	106°18.79 4.17	196°19.55 31.29	Jupiter 284°2	
8	196°35.19	253°45.90 28.54	67°16.90 28.65	121°21.62 4.14	211°21.92 31.25	Saturn 14°5	1.28 18:01
9 10	211°37.66 226°40.12	268° 45.32 · · 27.89 283° 44.74 27.23	82°19.34 · · 28.76 97°21.79 28.88	136°24.45 · · 4.11 151°27.28 4.08	226°24.30 · · 31.20 241°26.68 31.16	Dec 06 Fri SH	•
11	241°42.59	298°44.16 26.57	112°24.24 28.99	166°30.11 4.06	256°29.06 31.12	Venus 58°4	
12	256° 45.05	313°43.58 \$22°25.91	127°26.69 N21°29.11	181°32.94 N22°4.03	271°31.44 \$08°31.07	Mars 230°4 Jupiter 284°3	
13	271°47.52	328° 43.01 25.25	142°29.14 29.22	196°35.77 4.00	286°33.81 31.03	Jupiter 284°3 Saturn 14°4	
14	286°49.98	343°42.43 24.59	157°31.59 29.34	211°38.60 3.97	301°36.19 30.99		
15 16	301°52.44 316°54.91	358°41.86 · · 23.93 13°41.29 23.27	172°34.05 · · 29.46 187°36.50 29.57	226°41.43 · · 3.94 241°44.26 3.91	316°38.57 · · · 30.94 331°40.95	Dec 07 Sat SH	
17	331° 57.37	28°40.71 22.60	202°38.96 29.69	256°47.09 3.88	346°43.32 30.86	Venus 57°3 Mars 230°4	
18	346° 59.84	43°40.14 S22°21.94	217°41.42 N21°29.81	271°49.92 N22°3.85	1°45.70 S08°30.81	Jupiter 284°4	
19	2°2.30	58°39.57 21.27	232°43.88 29.93	286°52.75 3.82	16°48.08 30.77	Saturn 14°4	
20	17°4.76	73°39.00 20.60	247°46.34 30.04	301°55.58 3.79	31°50.45 30.73	Horizontal para	allax
21 22	32°7.23 47°9.69	88°38.43 · · 19.94 103°37.86 19.27	262°48.81 · · 30.16 277°51.27 30.28	316°58.42 · · 3.77 332°1.25 3.74	46°52.83 · · 30.68 61°55.21 30.64		enus: 0.2
23	62° 12.16	118° 37.29 18.60	292°53.74 30.40	347°4.08 3.71	76°57.58 30.60		Mars: 0.2
	pass. 18:52	ν -0.6' d-0.6' m-4.24	$\nu 2.4' \ d0.1' \ \text{m-0.64}$	$\frac{1}{\nu^{2.8'} d^{-0.0'} m^{-2.81}}$	ν 2.4' d-0.0' m0.97		
ivier.	pass. 10:52	ν-0.0 α-0.0 m-4.24	ν2. 4 αυ.1 III-υ.υ4	ν∠.υ u-υ.υ III-∠.01	ν Δ.Ψ U-U.U IIIU.9/		

h	Su	n			— +09.133 Moon		
							LID
Thu 0	GHA 182°21.20	Dec \$22°23.98	GHA 133°36.65	u 8.1'	Dec \$25° 9.53	d -7.9'	HP 57.0'
1	197°20.94	24.29	148° 3.75	8.2	25° 1.60	-8.1'	57.0'
2	212°20.68	24.60	162°30.91	8.2'	24°53.52	-8.2'	57.1'
3	227° 20.42	• • 24.92	176°58.12	8.3'	24°45.30	-8.4'	57.1'
4	242°20.15	25.23	191°25.39	8.3'	24°36.94	-8.5'	57.1'
5 6	257°19.89 272°19.63	25.54 \$22°25.84	205°52.71 220°20.10	8.4' 8.4'	24°28.44 \$24°19.79	-8.6' -8.8'	57.1' 57.1'
7	272 19.03 287°19.37	26.15	234°47.54	8.5'	24°11.01	-0.0 -8.9'	57.1 57.2'
8	302°19.11	26.46	249°15.04	8.6'	24°2.09	-9.1'	57.2'
9	$317^{\circ}18.85$	• • 26.77	263°42.60	8.6'	23°53.02	-9.2'	57.2'
10	332°18.59	27.07	278°10.21	8.7'	23°43.83	-9.3'	57.2'
11	347° 18.32	27.38 \$22°27.68	292°37.89 307°5.63	8.7'	23°34.49	-9.5'	57.2'
12 13	2°18.06 17°17.80	27.99	307°5.63 321°33.43	8.8' 8.9'	\$23°25.02 23°15.42	-9.6' -9.7'	57.3' 57.3'
14	32° 17.54	28.29	336°1.30	8.9'	23°5.68	-9.7 -9.9'	57.3'
15	47° 17.27	• • 28.59	350°29.22	9.0'	22°55.81	-10.0'	57.3'
16	$62^{\circ}17.01$	28.89	4°57.21	9.0'	22°45.81	-10.1'	57.3'
17	77°16.75	29.19	19°25.26	9.1'	22°35.68	-10.3'	57.4'
18 19	92°16.48 107°16.22	\$22°29.49 29.79	33°53.37 48°21.54	9.2' 9.2'	\$22°25.42 22°15.04	-10.4' -10.5'	57.4' 57.4'
20	107 10.22 122° 15.96	30.09	62°49.78	9.2	22° 4.52	-10.5	57.4'
21	137° 15.69	30.39	77°18.08	9.4	21°53.88	-10.8'	57.4
22	152° 15.43	30.68	91°46.45	9.4'	21°43.12	-10.9'	57.5'
23	167° 15.16	30.98	106°14.88	9.5'	21°32.23	-11.0'	57.5'
	SD = 16.2'	d = 0.3'		SI	D = 15.5'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0 1	182°14.90 197°14.63	\$22°31.27 31.57	120°43.37 135°11.92	9.6' 9.6'	\$21°21.22 21°10.10	-11.1' -11.2'	57.5' 57.5'
2	212° 14.37	31.86	135 11.92 149°40.54	9.0 9.7'	21 10.10 20°58.85	-11.2 -11.4'	57.6'
3	227°14.10	32.15	164° 9.22	9.7'	20°47.48	-11.5'	57.6'
4	242°13.84	32.45	178°37.97	9.8'	20°35.99	-11.6'	57.6'
5	257° 13.57	32.74	193°6.78	9.9'	20°24.39	-11.7'	57.6'
6	272°13.30	\$22°33.03	207°35.65	9.9'	\$20°12.67	-11.8'	57.6'
7 8	287°13.04 302°12.77	33.32 33.61	222°4.59 236°33.58	10.0' 10.1'	20°0.84 19°48.89	-11.9' -12.1'	57.7' 57.7'
9	317° 12.50	33.90	250 55.56 251°2.64	10.1	19 46.69 19°36.84	-12.1 -12.2'	57.7'
10	332°12.24	34.18	265°31.77	10.2'	19°24.67	-12.3'	57.7'
11	$347^{\circ}11.97$	34.47	280° 0.95	10.2'	19°12.39	-12.4'	57.7'
12	2°11.70	S22°34.76	294°30.20	10.3'	S19°0.01	-12.5'	57.8'
13	17°11.43	35.04	308°59.50	10.4	18°47.52 18°34.92	-12.6'	57.8'
14 15	32°11.17 47°10.90	35.33 · · 35.61	323°28.87 337°58.30	10.4' 10.5'	18° 34.92 18° 22.22	-12.7' -12.8'	57.8' 57.8'
16	62°10.63	35.89	352°27.78	10.5'	18° 9.41	-12.9'	57.8'
17	77° 10.36	36.17	6°57.33	10.6'	17°56.51	-13.0'	57.9'
18	92°10.09	S22°36.46	21°26.93	10.7'	S17°43.50	-13.1'	57.9'
19	107°9.82	36.74	35°56.60	10.7'	17°30.39		57.9'
20 21	122°9.55 137°9.28	37.02 · · 37.29	50°26.32 64°56.09	10.8' 10.8'	17°17.18 17°3.88	-13.3' -13.4'	57.9' 57.9'
22	157 9.28 152° 9.01	37.57	79°25.93	10.6	16°50.48	-13.4 -13.5'	58.0'
23	167°8.74	37.85	93°55.82	10.9'	16°36.98	-13.6'	58.0'
	SD = 16.2'	d = 0.3'		SI	D = 15.7'		
	<u> </u>						
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°8.47	\$22°38.13	108°25.76	11.0'	\$16°23.40	-13.7'	58.0'
1 2	197°8.20 212°7.93	38.40 38.68	122°55.76 137°25.81	11.1' 11.1'	16° 9.72 15° 55.94	-13.8' -13.9'	58.0' 58.1'
3	212 7.93 227°7.66	38.08	151°55.92	11.1 11.2'	15 55.94 15°42.08	-13.9 -14.0'	58.1'
4	242°7.39	39.23	166°26.07	11.2'	15°28.13	-14.0'	58.1'
5	257°7.12	39.50	$180^{\circ}56.28$	11.3'	15°14.09	-14.1'	58.1'
6	272°6.85	S22°39.77	195°26.54	11.3'	\$14°59.97	-14.2'	58.1'
7	287°6.58	40.04	209°56.85	11.4'	14°45.76	-14.3'	58.2'
8 9	302°6.31 317°6.03	40.31 •• 40.58	224°27.21 238°57.61	11.4' 11.5'	14°31.47 14°17.10	-14.4' -14.5'	58.2' 58.2'
10	317 6.03 332°5.76	40.85	253°28.06	11.5'	14 17.10 14°2.64	-14.5'	58.2'
11	347°5.49	41.12	267°58.56	11.5'	13°48.10	-14.6'	58.2'
12	2°5.22	S22°41.39	282°29.11	11.6'	S 13°33.49	-14.7'	58.3'
13	17°4.94	41.65	296°59.69	11.6'	13°18.80	-14.8'	58.3'
14	32°4.67	41.92	311°30.32	11.7'	13°4.03	-14.8'	58.3'
15 16	47°4.40 62°4.13	· · 42.18 42.45	326°1.00 340°31.71	11.7' 11.8'	12°49.19 12°34.27	-14.9' -15.0'	58.3' 58.3'
17	77°3.85	42.45 42.71	355° 2.47	11.8	12 34.27 12°19.28	-15.0 -15.1'	58.4'
18	92°3.58	\$22°42.98	9°33.26	11.8'	S12°4.22	-15.1	58.4'
19	107°3.30	43.24	24°4.10	11.9'	11°49.10	-15.2'	58.4'
20	122°3.03	43.50	38°34.97	11.9'	11°33.90	-15.3'	58.4'
21	137°2.76	• • 43.76	53°5.87	11.9'	11°18.63	-15.3'	58.4'
22 23	152°2.48 167°2.21	44.02 44.28	67°36.81 82°7.79	12.0' 12.0'	11°3.30 10°47.91	-15.4' -15.5'	58.5' 58.5'
23			02 1.19			-13.5	50.5
	SD = 16.2'	d = 0.3'		SI	D = 15.8'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:05	10:15			13:27	15:37
N 70°	07:47	09:28			14:14	15:55
68°	07:32	08:58	11:14	12:28	14:44	16:10
66°	07:20	08:35	10:05	13:37	15:07	16:22
64°	07:10	08:17	09:30	14:12	15:25	16:32
62°	07:01	08:02	09:05	14:37	15:40	16:41
60°	06:54	07:49	08:45	14:57	15:53	16:48
N 58°	06:47	07:38	08:29	15:13	16:04	16:55
56°	06:40	07:29	08:15	15:27	16:13	17:02
54°	06:35	07:20	08:03	15:39	16:22	17:08
52°	06:29	07:13	07:53	15:49	16:30	17:13
50°	06:24	07:06	07:43	15:59	16:37	17:18
45°	06:13	06:50	07:24	16:18	16:52	17:29
N 40°	06:04	06:37	07:08	16:35	17:05	17:39
35°	05:55	06:26	06:54	16:48	17:16	17:48
30°	05:46	06:16	06:42	17:00	17:26	17:56
20°	05:31	05:58	06:22	17:20	17:44	18:12
N 10°	05:15	05:42	06:04	17:38	18:01	18:27
0°	04:59	05:25	05:48	17:55	18:17	18:43
S 10°	04:41	05:08	05:31	18:12	18:35	19:02
20°	04:19	04:48	05:12	18:30	18:54	19:23
30°	03:51	04:24	04:51	18:51	19:19	19:52
35°	03:33	04:10	04:39	19:04	19:33	20:09
40°	03:11	03:52	04:25	19:18	19:51	20:32
45°	02:42	03:31	04:07	19:35	20:12	21:01
S 50°	02:01	03:03	03:46	19:57	20:40	21:43
52°	01:36	02:49	03:36	20:07	20:55	22:08
54°	01:01	02:32	03:24	20:19	21:11	22:44
56°	////	02:12	03:11	20:32	21:32	////
58°	////	01:46	02:55	20:48	21:58	////
S 60°	////	01:08	02:37	21:07	22:37	////

Lat.		Moonris	e		Moonset	;
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°			14:18			20:53
N 70°		14:56	13:55		18:29	21:13
68°		14:14	13:37		19:09	21:30
66°	14:32	13:45	13:22	17:02	19:37	21:43
64°	13:43	13:23	13:10	17:50	19:58	21:53
62°	13:11	13:05	12:59	18:20	20:14	22:02
60°	12:48	12:50	12:50	18:43	20:28	22:10
N 58°	12:29	12:37	12:42	19:02	20:40	22:17
56°	12:13	12:26	12:35	19:17	20:50	22:22
54°	11:59	12:16	12:29	19:30	20:59	22:28
52°	11:47	12:08	12:23	19:42	21:07	22:32
50°	11:36	12:00	12:18	19:52	21:14	22:37
45°	11:14	11:43	12:07	20:13	21:29	22:46
N 40°	10:56	11:29	11:57	20:30	21:42	22:54
35°	10:41	11:18	11:49	20:44	21:52	23:00
30°	10:28	11:07	11:42	20:56	22:01	23:06
20°	10:05	10:49	11:30	21:17	22:17	23:16
N 10°	09:45	10:34	11:19	21:35	22:31	23:24
0°	09:27	10:19	11:09	21:52	22:43	23:32
S 10°	09:08	10:04	10:59	22:09	22:56	23:40
20°	08:48	09:49	10:48	22:26	23:09	23:48
30°	08:25	09:30	10:35	22:47	23:24	23:57
35°	08:11	09:20	10:28	22:58	23:33	
40°	07:56	09:07	10:19	23:12	23:42	
45°	07:37	08:53	10:09	23:28	23:54	
S 50°	07:13	08:35	09:58	23:47		80:00
52°	07:02	08:26	09:52	23:56		00:14
54°	06:49	08:17	09:46		00:06	00:21
56°	06:34	08:06	09:39	00:01	00:18	00:29
58°	06:16	07:54	09:31	00:19	00:31	00:38
S 60°	05:54	07:39	09:22	00:42	00:46	00:48

		Sun				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-32%
05	09:25	09:12	11:51	15:39	03:13	
06	09:00	08:47	11:51	16:31	04:06	
07	08:34	08:21	11:52	17:21	04:56	

December 08, 09, 10 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
0	$77^{\circ}14.62$	133°36.72 S 22°17.9	3 307°56.21 N21°30.52	2°6.91 N22°3.68	91°59.96 \$08°30.55	Alpheratz	357°34.78	29°13.87
1	92°17.08	148°36.15 17.2		17°9.74 3.65	107°2.33 30.51	Ankaa	353° 7.07	-42°10.42
2	107° 19.55	163°35.59 16.5		32°12.57 3.62	122°4.71 30.46	Schedar	349°30.93	56°40.72
3 4	122°22.01 137°24.48	178°35.02 · · 15.9 193°34.46 15.2		47°15.40 · · 3.59 62°18.23 3.56	137°7.08 · · · 30.42 152°9.46	Diphda	$348^{\circ}47.24$	$-17^{\circ}51.06$
5	152° 26.94	208° 33.89 14.5		77°21.06 3.53	167°11.83 30.33	Achernar	335°19.85	-57°6.81
6	167° 29.41	223°33.33		92°23.89 N22°3.50	182°14.21		327°51.04	23°34.95
7	$182^{\circ}31.87$	238°32.77 13.2		107°26.72 3.47	197°16.58 30.24		313°38.13 315°11.45	89°22.33 -40°12.35
8	197°34.33	253°32.21 12.5		122°29.55 3.45	212°18.96 30.20	Menkar	314°5.95	4°11.31
9	212°36.80 227°39.26	268°31.65 · · 11.8 283°31.09		137°32.38 · · 3.42	227°21.33 · · 30.15		308°27.91	49°57.11
10 11	242°41.73	283°31.09 11.1 298°30.53 10.4		152°35.21 3.39 167°38.04 3.36	242°23.71 30.11 257°26.08 30.07	Aldebaran	290°39.36	$16^{\circ}33.62$
12	257° 44.19	313°29.97 \$22°9.7		182°40.88 N22°3.33	272°28.45 \$08°30.02	Rigel	281°3.60	-8°10.31
13	$272^{\circ}46.65$	328°29.41 9.1	1 143°28.42 32.11	197°43.71 3.30	287°30.83 29.98	Capella Bellatrix	280°21.52 278°22.63	46°1.39 6°22.38
14	287°49.12	343°28.85 8.4		212°46.54 3.27	302°33.20 29.93	Elnath	278° 1.59	28°37.73
15 16	302°51.58 317°54.05	358°28.30 · · 7.7 13°27.74 7.0		227°49.37 · · 3.24 242°52.20 3.21	317°35.58 · · 29.89 332°37.95 29.84	Alnilam	$275^{\circ}37.47$	$-1^{\circ}11.10$
17	332° 56.51	28°27.19 6.3		257°55.03 3.18	347°40.32 29.80	1	270°51.84	7°24.74
18	347°58.97	43°26.63 \$22°5.6		272°57.86 N22°3.15	2°42.69 \$08°29.75		263°51.90	-52°42.36
19	3°1.44	58°26.08 4.9		288°0.69 3.12	17°45.07 29.71	Sirius Adhara	258°25.98 255°5.59	-16°44.92 -29°0.21
20	18°3.90	73°25.53 4.2		303°3.52 3.09	32°47.44 29.66		244°50.65	5°9.70
21	33°6.37	88°24.97 · · 3.6		318°6.35 · · 3.07	47°49.81 · · 29.62		243°17.11	27°57.89
22 23	48°8.83 63°11.29	103°24.42 2.9 118°23.87 2.2		333°9.18 3.04 348°12.01 3.01	62°52.18 29.57 77°54.56 29.53	Avior	$234^{\circ}14.33$	-59°35.06
		-					222°46.15	-43°31.72
Mer.p	bass. 18:48	ν-0.6′ d-0.7′ m-4.2	$\nu 2.5' \ d0.1' \ \text{m-}0.66$	ν2.8′ d-0.0′ m-2.81	ν2.4' d-0.0' m0.97		221°37.84	-69°48.82
							217°47.69 207°34.43	-8°45.90 11°50.70
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		193°41.06	61°36.71
0	78° 13.76	133°23.32 S22°1.5		3°14.84 N22°2.98	92°56.93		182°25.09	14°25.91
1 2	93° 16.22 108° 18.69	148°22.77 0.8 163°22.23 22°0.1		18°17.67 2.95 33°20.50 2.92	107°59.30 29.43 123°1.67 29.39	Gienah	$175^{\circ}43.78$	$-17^{\circ}40.69$
3	106 16.09 123°21.15	178°21.68 21°59.4		48°23.33 · · 2.89	138° 4.04 · · 29.34	Acrux	173°0.48	-63°13.92
4	138°23.61	193°21.13 58.7		63°26.16 2.86	153°6.41 29.30		171°51.98 166°13.28	-57°14.87 55°49.22
5	$153^{\circ}26.08$	208°20.59 58.0	3 24°8.41 34.15	78°28.99 2.83	168°8.79 29.25		158°22.59	-11°17.40
6	168°28.54	223°20.04 S21°57.3		93°31.82 N22°2.80	183°11.16		152°52.38	49°11.12
7	183°31.01	238°19.50 56.6		108°34.65 2.77	198°13.53 29.16		$148^{\circ}36.63$	$-60^{\circ}29.35$
8 9	198° 33.47 213° 35.94	253°18.96 55.9 268°18.41 • 55.2		123°37.48 2.74 138°40.31 •• 2.71	213°15.90 29.11 228°18.27 · · 29.07		147°58.02	-36°29.38
10	228°38.40	283°17.87 54.5		153°43.14 2.68	243°20.64 29.02		145°48.25	19°3.09
11	243°40.86	298° 17.33 53.8		168°45.97 2.65	258°23.01 28.98		139°40.98 137°20.76	-60°56.09 74°2.93
12	258° 43.33	313°16.79 S 21°53.1		183°48.80 N22°2.63	273°25.38 \$08°28.93		136°56.41	-16°8.65
13	273° 45.79	328° 16.25 52.4		198°51.63 2.60	288°27.75 28.88	Alphecca	126° 4.16	26°37.77
14	288° 48.26	343°15.71 51.6 358°15.17 · · · 50.9		213°54.46 2.57 228°57.29 · · 2.54	303°30.12 28.84 318°32.49 · · 28.79		$112^{\circ}16.32$	$-26^{\circ}29.19$
15 16	303°50.72 318°53.18	358° 15.17 · · · 50.9 13° 14.64		228°57.29 · · 2.54 244°0.12 2.51	318°32.49 · · 28.79 333°34.86 28.74		107°11.20	-69°4.27
17	333° 55.65	28°14.10 49.5		259°2.95 2.48	348°37.23 28.70	Sabik	102°3.24	-15°45.33
18	348°58.11	43°13.57 S 21°48.8	5 219°41.17 N21°35.88	274°5.78 N22°2.45	3°39.60 \$08°28.65	Shaula Rasalhague	96°10.91 95°58.98	-37°7.31 12°32.51
19	4°0.58	58°13.03 48.1		289°8.61 2.42	18°41.96 28.60	Eltanin	90°42.76	51°29.13
20	19°3.04	73°12.50 47.4		304°11.44 2.39	33°44.33 28.56	Kaus Aust.	83°33.02	-34°22.40
21 22	34°5.50 49°7.97	88°11.96 · · 46.7 103°11.43 45.9		319°14.27 · · · 2.36 334°17.10 2.33	48°46.70 · · 28.51 63°49.07 28.46	Vega	80°33.69	38°48.45
23	64° 10.43	118° 10.90 45.2		349°19.93 2.30	78°51.44 28.42	Nunki		-26°15.99
	pass. 18:44	ν-0.5′ d-0.7′ m-4.2		ν2.8' d-0.0' m-2.81	ν2.4' d-0.0' m0.98	Altair Peacock	62° 0.31 53° 6.26	8°56.08 -56°39.49
- Ivier.p	Dass. 10:44	ν-0.5 α-0.1 m-4.2	5 V2.3 d0.1 m-0.06	ν2.ο α-0.0 m-2.ο1	V2.4 d-0.0 m0.96	Deneb	49°26.17	45°22.32
						Enif	33°39.01	9°59.42
Tue 0	GHA 79° 12.90	GHA Dec 133°10.37 S 21°44.5	GHA Dec 5 309°56.38 N21°36.70	GHA Dec 4°22.76 N22°2.27	GHA Dec 93°53.81 S 08°28.37	Al Na'ir	27°33.14	-46°50.65
1	94° 15.36	148°9.84 43.8		19°25.59 2.24	108°56.17 28.32	Fomalhaut	15°14.63	-29°29.56
2	109° 17.82	163°9.31 43.1		34°28.42 2.21	123°58.54 28.28	Scheat Markab	13°45.31 13°30.00	28°13.26 15°20.47
3	$124^{\circ}20.29$	178°8.78 · · 42.3		49°31.25 · · 2.18	139°0.91 · · 28.23			
4	139°22.75	193°8.26 41.6		64°34.08 2.15	154° 3.28 28.18	Dec 08 Sun	SHA	Mer.pass
5	154° 25.22	208°7.73 40.9		79°36.91 2.13	169° 5.64 28.13	Venus	56°22.10 230°41.59	15:06
6 7	169°27.68 184°30.15	223°7.20 S21°40.2 238°6.68 39.5		94°39.74 N22°2.10 109°42.57 2.07	184°8.01 S08°28.09 199°10.38 28.04	Mars Jupiter	284°52.29	03:28 23:47
8	199°32.61	253°6.15 38.7		109 42.57 2.07 124°45.40 2.04	214°12.75 27.99	Saturn	14°45.34	17:49
9	214° 35.07	268°5.63 · · 38.0		139°48.23 · · 2.01	229°15.11 · · 27.94			
10	229° 37.54	283°5.11 37.3		154°51.06 1.98	244°17.48 27.90	Dec 09 Mon Venus	SHA 55° 9.56	Mer.pass 15:07
11	244°40.00	298°4.59 36.5		169°53.88 1.95	259°19.85 27.85		230°42.11	03:24
12 13	259° 42.47 274° 44.93	313°4.06		184°56.71 N22°1.92 199°59.54 1.89	274°22.21 \$08°27.80 289°24.58 27.75	Jupiter	$285^{\circ}1.08$	23:43
14	274 44.93 289°47.39	343°3.02 34.4		215°2.37 1.86	304°26.94 27.71	Saturn	14°43.17	17:45
15	304°49.86	358°2.51 · · 33.6		230°5.20 · · 1.83	319°29.31 · · 27.66	Dec 10 Tue	SHA	Mer.pass
16	319°52.32	13°1.99 32.9		245°8.03 1.80	334°31.67 27.61	Venus	53°57.47	15:08
17	334°54.79	28°1.47 32.2		260°10.86 1.77	349°34.04 27.56		230°43.48	03:20
18 19	349°57.25 4°59.71	43°0.95 S 21°31.4 58°0.44 30.7		275°13.69 N22°1.74 290°16.52 1.71	4°36.41 S08°27.51 19°38.77 27.46	Jupiter	285° 9.86	23:38
20	4 59.71 20°2.18	72°59.92 29.9		305°19.35 1.68	34°41.13 27.42	Saturn	14°40.91	17:42
21	35°4.64	87°59.41 · · 29.2		320°22.18 · · 1.65	49°43.50 · · 27.37	Horizont	tal parallax	
22	50°7.11	102°58.90 28.5		335°25.00 1.62	64°45.86 27.32		Venus:	0.2
23	65°9.57	117°58.38 27.7	8 295°55.16 39.96	350°27.83 1.59	79°48.23 27.27		Mars:	0.2
Mer.p	pass. 18:40	ν-0.5′ d-0.7′ m-4.2	6 $\nu 2.5' \ d0.1' \ \text{m-0.70}$	$\nu 2.8' \ d$ -0.0' m-2.81	ν2.4' d-0.0' m0.98			
			_					

	011-010 =	+0.0309 Sec		-011			
h	Su				Moon		
Sun	GHA	Dec	GHA	ν	Dec	d 15.5'	HP
0 1	182°1.93 197°1.66	\$22°44.54 44.79	96°38.80 111°9.84	12.0' 12.1'	\$10°32.45 10°16.93	-15.5' -15.6'	58.5' 58.5'
2	212°1.38	45.05	125°40.91	12.1'	10°10.93	-15.6'	58.5'
3	227°1.11	• • 45.31	140°12.01	12.1'	09°45.70	-15.7'	58.6'
4	242°0.83	45.56	154°43.13	12.2'	$09^{\circ}30.00$	-15.8'	58.6'
5	257°0.56	45.81	169° 14.29	12.2'	09°14.24	-15.8'	58.6'
6 7	272°0.28 287°0.00	\$22°46.07 46.32	183° 45.47 198° 16.67	12.2' 12.2'	\$08° 58.43 08° 42.56	-15.9' -15.9'	58.6' 58.6'
8	301°59.73	46.57	212° 47.90	12.3'	08° 26.64	-15.9 -16.0'	58.7
9	316°59.45	• • 46.82	227° 19.15	12.3'	08° 10.67	-16.0'	58.7'
10	331°59.17	47.07	241°50.43	12.3'	$07^{\circ}54.65$	-16.1'	58.7'
11	346°58.90	47.32	256°21.72	12.3'	07°38.58	-16.1'	58.7'
12 13	1°58.62 16°58.34	\$22°47.57 47.82	270°53.03 285°24.35	12.3' 12.3'	\$07°22.46 07°6.29	-16.2' -16.2'	58.7' 58.8'
14	31°58.06	48.07	299°55.70	12.4	06°50.08	-16.3	58.8'
15	46°57.79	• • 48.31	$314^{\circ}27.05$	12.4'	06°33.82	-16.3'	58.8'
16	61°57.51	48.56	328°58.42	12.4'	06° 17.52	-16.3'	58.8'
17	76°57.23 91°56.95	48.81 \$22°49.05	343°29.81 358°1.20	12.4' 12.4'	06°1.18 \$05°44.80	-16.4'	58.8' 58.9'
18 19	91°56.95 106°56.67	49.29	358° 1.20 12° 32.60	12.4	05°28.38	-16.4' -16.5'	58.9'
20	121°56.40	49.54	27°4.01	12.4	05° 11.92	-16.5'	58.9'
21	136°56.12	• • 49.78	41°35.43	12.4'	04°55.43	-16.5'	58.9'
22	151°55.84	50.02	56°6.85	12.4'	04°38.90	-16.6'	58.9'
23	166°55.56	50.26	70°38.28	12.4'	04°22.34	-16.6'	59.0'
	SD = 16.2'	d = 0.3'		SI	D = 16.0'		
N4	GHA	D	GHA		D	.1	НР
Mon 0	181°55.28	Dec \$22°50.50	85°9.71	u 12.4'	Dec 504°5.75	d -16.6'	пР 59.0'
1	196°55.00	50.74	99°41.14	12.4	03°49.13	-16.7	59.0'
2	211°54.72	50.97	$114^{\circ}12.57$	12.4'	03°32.47	-16.7'	59.0'
3	226°54.44	• • 51.21	128°44.00	12.4	03° 15.79	-16.7'	59.0'
4 5	241°54.16 256°53.88	51.45 51.68	143° 15.43 157° 46.85	12.4' 12.4'	02°59.08 02°42.35	-16.7' -16.8'	59.0' 59.1'
6	271°53.60	\$22°51.92	172° 18.27	12.4	S02° 25.60	-16.8	59.1
7	286°53.32	52.15	186°49.68	12.4	02°8.82	-16.8	59.1'
8	301°53.04	52.38	201°21.08	12.4'	$01^{\circ}52.02$	-16.8'	59.1'
9	316°52.76	• • 52.62	215°52.47	12.4'	01°35.20	-16.8'	59.1'
10 11	331°52.48 346°52.20	52.85 53.08	230°23.85 244°55.22	12.4' 12.4'	01°18.36 01°1.50	-16.9' -16.9'	59.2' 59.2'
12	1°51.91	53.06 S22°53.31	259°26.58	12.4	500°44.63	-16.9	59.2'
13	16°51.63	53.54	273°57.92	12.3'	00° 27.75	-16.9'	59.2'
14	31°51.35	53.77	$288^{\circ}29.24$	12.3'	S00°10.85	-16.9'	59.2'
15	46°51.07	• • 53.99	303°0.54	12.3'	N00°6.06	16.9'	59.2'
16 17	61°50.79 76°50.50	54.22 54.45	317°31.83 332°3.09	12.3' 12.2'	00°22.98 00°39.90	16.9' 16.9'	59.3' 59.3'
18	91°50.22	\$22°54.67	346°34.33	12.2'	N00° 56.84	16.9	59.3'
19	106°49.94	54.90	1°5.55		01°13.77	16.9'	59.3'
20	121°49.66	55.12	15°36.74	12.2'	01°30.72	16.9'	59.3'
21	136°49.37 151°49.09	• • 55.34	30°7.90 44°39.04	12.1'	01°47.66 02°4.61	16.9'	59.3'
22 23	151 49.09 166°48.81	55.57 55.79	59° 10.15	12.1' 12.1'	02 4.61 02°21.55	16.9' 16.9'	59.4' 59.4'
23	SD = 16.2'	d = 0.2'	33 10.13		D = 16.1'	10.5	33.4
	5D = 16.2	$a = 0.2^{\circ}$		- 51	$D = 10.1^{\circ}$		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°48.52	\$22°56.01	73°41.22	12.0'	N02°38.50	16.9'	59.4'
1 2	196°48.24 211°47.96	56.23 56.45	88° 12.27 102° 43.28	12.0' 12.0'	02°55.44 03°12.37	16.9' 16.9'	59.4' 59.4'
3	211 47.90 226°47.67	56.67	102 43.26 117°14.25	11.9'	03° 29.30	16.9	59.4'
4	241°47.39	56.88	131°45.19	11.9'	03°46.22	16.9	59.5'
5	256°47.10	57.10	146° 16.09	11.9'	04°3.13	16.9'	59.5'
6	271°46.82	\$22°57.32	160°46.95	11.8'	N04° 20.03	16.9'	59.5'
7 8	286°46.53 301°46.25	57.53 57.74	175° 17.77 189° 48.54	11.8' 11.7'	04°36.91 04°53.78	16.9' 16.9'	59.5' 59.5'
9	316°45.97	57.74	204° 19.28	11.7'	05° 10.64	16.8	59.5'
10	331°45.68	58.17	$218^{\circ}49.96$	11.6'	05°27.48	16.8'	59.5'
11	346°45.39	58.38	233°20.61	11.6'	05°44.30	16.8'	59.6'
12	1°45.11 16°44.82	\$22°58.59	247°51.20 262°21.74	11.5'	N06°1.10 06°17.87	16.8'	59.6'
13 14	16°44.82 31°44.54	58.80 59.01	262°21.74 276°52.24	11.5' 11.4'	06°17.87 06°34.62	16.8' 16.7'	59.6' 59.6'
15	46°44.25	59.22	291°22.68	11.4'	06°51.35	16.7	59.6'
16	61°43.97	59.43	$305^{\circ}53.06$	11.3'	$07^{\circ}8.05$	16.7'	59.6'
17	76°43.68	59.64	320°23.40	11.3'	07°24.72	16.6'	59.6'
18 19	91°43.39 106°43.11	\$22°59.84 23°0.05	334°53.67 349°23.89	11.2' 11.2'	N07°41.36 07°57.96	16.6' 16.6'	59.6' 59.7'
20	106 43.11 121°42.82	0.25	349°23.89 3°54.05	11.2	07°57.96 08°14.54	16.5	59.7' 59.7'
21	136°42.53	0.46	18°24.15	11.0'	08°31.07	16.5	59.7'
22	151°42.25	0.66	32°54.19	11.0'	08° 47.57	16.5'	59.7'
23	166°41.96	0.86	47°24.16	10.9'	09°4.04	16.4'	59.7'
	SD = 16.2'	d = 0.2'		SI	D = 16.2'		
			_				

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	08:11	10:27			13:17	15:34
N 70°	07:52	09:36			14:09	15:52
68°	07:37	09:04			14:41	16:07
66°	07:25	08:40	10:14	13:31	15:04	16:20
64°	07:14	08:22	09:37	14:08	15:23	16:30
62°	07:05	08:06	09:10	14:34	15:38	16:39
60°	06:57	07:53	08:50	14:55	15:51	16:47
N 58°	06:50	07:42	08:33	15:12	16:03	16:55
56°	06:44	07:32	08:19	15:26	16:12	17:01
54°	06:38	07:24	08:07	15:38	16:21	17:07
52°	06:32	07:16	07:56	15:49	16:29	17:12
50°	06:27	07:09	07:47	15:58	16:36	17:18
45°	06:16	06:53	07:27	16:18	16:52	17:29
N 40°	06:06	06:40	07:10	16:35	17:05	17:39
35°	05:57	06:29	06:57	16:48	17:16	17:48
30°	05:49	06:18	06:45	17:00	17:27	17:56
20°	05:33	06:00	06:24	17:21	17:45	18:12
N 10°	05:17	05:43	06:06	17:39	18:02	18:28
0°	05:00	05:26	05:49	17:56	18:19	18:45
S 10°	04:42	05:09	05:32	18:13	18:36	19:03
20°	04:20	04:49	05:13	18:32	18:56	19:26
30°	03:51	04:24	04:52	18:53	19:21	19:54
35°	03:33	04:10	04:39	19:06	19:36	20:12
40°	03:11	03:52	04:24	19:21	19:53	20:35
45°	02:41	03:30	04:07	19:38	20:15	21:04
S 50°	01:58	03:01	03:45	20:00	20:44	21:48
52°	01:33	02:47	03:35	20:11	20:59	22:14
54°	00:54	02:30	03:23	20:23	21:16	22:53
56°	////	02:09	03:09	20:36	21:37	////
58°	////	01:42	02:53	20:52	22:05	////
S 60°	////	01:00	02:34	21:12	22:47	////

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	13:30	12:52	12:15	23:23		01:46
N 70°	13:20	12:51	12:23	23:30		01:41
68°	13:12	12:50	12:29	23:35		01:38
66°	13:05	12:50	12:35	23:39		01:35
64°	12:59	12:49	12:40	23:43		01:32
62°	12:54	12:49	12:44	23:46		01:30
60°	12:49	12:49	12:48	23:49		01:28
N 58°	12:45	12:48	12:51	23:51		01:26
56°	12:42	12:48	12:54	23:54		01:25
54°	12:39	12:48	12:57	23:55		01:24
52°	12:36	12:47	12:59	23:57		01:22
50°	12:33	12:47	13:01	23:59		01:21
45°	12:27	12:47	13:06		00:02	01:19
N 40°	12:23	12:46	13:10		00:05	01:17
35°	12:18	12:46	13:14		00:07	01:15
30°	12:15	12:46	13:17		00:10	01:14
20°	12:08	12:45	13:23		00:13	01:11
N 10°	12:02	12:45	13:28		00:16	01:09
0°	11:57	12:44	13:32		00:19	01:07
S 10°	11:52	12:44	13:37		00:22	01:05
20°	11:46	12:43	13:42		00:25	01:02
30°	11:39	12:43	13:48		00:29	01:00
35°	11:35	12:43	13:51	00:03	00:31	00:58
40°	11:31	12:43	13:55	00:09	00:33	00:57
45°	11:26	12:42	14:00	00:16	00:35	00:55
S 50°	11:20	12:42	14:05	00:24	00:38	00:52
52°	11:17	12:42	14:08	00:28	00:40	00:51
54°	11:14	12:42	14:11	00:32	00:41	00:50
56°	11:10	12:41	14:14	00:37	00:43	00:49
58°	11:06	12:41	14:17	00:42	00:45	00:47
S 60°	11:02	12:41	14:21	00:47	00:47	00:46

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Juy	00 ^h	12 ^h	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	43-65%
08	08:08	07:54	11:52	18:08	05:44	
09	07:41	07:28	11:53	18:55	06:32	
10	07:14	07:00	11:53	19:44	07:19	

December 11, 12, 13 UT (Wed., Thu., Fri.)

h	Aries	Venus	М	ars	Jup	oiter	Sat	urn		Stars
Wed	GHA	GHA De	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	80° 12.03	132°57.87 \$21°2		N21°40.11	5°30.66	N22°1.56	94°50.59	508°27.22		
1	95° 14.50		5.30 326°0.31	40.25	20°33.49	1.53	109°52.96	27.17	Alpheratz	357°34.79
2	110° 16.96		5.55 341°2.89	40.40	35°36.32	1.50	124°55.32	27.13	Ankaa	353°7.09
3	125° 19.43	177°56.34 · · 2		40.55	50°39.15	. 1.48	139°57.68	27.08	Schedar	349°30.95
4	140°21.89		4.07 11°8.05	40.69	65°41.98	1.45	155°0.05	27.03	Diphda	348°47.25
5	155°24.36		3.32 26°10.63	40.84	80°44.80	1.42	170°2.41	26.98	Achernar	335°19.88
6	170°26.82	222°54.82 S21°2		N21°40.99	95°47.63	N22°1.39	185°4.78	S08°26.93	Hamal	
7	$185^{\circ}29.28$		1.83 56°15.80	41.14	110°50.46	1.36	200°7.14	26.88	Polaris	313°38.70
8	200°31.75	252°53.81 2	1.08 71°18.38	41.29	125°53.29	1.33	215°9.50	26.83	Acamar	315°11.46
9	215°34.21	267°53.31 · · · 2	0.33 86°20.97	• • 41.44	140°56.12	• • 1.30	230°11.86	• • 26.78	Menkar	314°5.95
10	230°36.68	282°52.80 1	9.58 101°23.56	41.59	155°58.95	1.27	245°14.23	26.73	Mirfak Aldebaran	308°27.91 290°39.36
11	245°39.14	297°52.30 1	3.83 116°26.15	41.74	$171^{\circ}1.77$	1.24	$260^{\circ}16.59$	26.68	Rigel	290 39.30 281°3.60
12	260°41.60	312°51.80 S 21°1		N21°41.89	186°4.60	N22°1.21	275°18.95	S08°26.63	Capella	280°21.52
13	275°44.07		7.32 146°31.33	42.04	201°7.43	1.18	290°21.31	26.59	Bellatrix	278°22.62
14	290° 46.53		5.57 161°33.93	42.19	216°10.26	1.15	305°23.68	26.54	Elnath	278°1.58
15	305°49.00	357°50.30 · · 1		• • 42.34	231°13.09	• • 1.12	320°26.04	• • 26.49	Alnilam	275°37.47
16	320°51.46		5.06 191°39.12	42.49	246°15.91	1.09	335°28.40	26.44	Betelgeuse	270°51.83
17	335°53.92		4.30 206°41.72	42.64	261°18.74	1.06	350°30.76	26.39	Canopus	263°51.89
18	350° 56.39	42°48.80 S21°1		N21°42.80	276°21.57	N22°1.03	5°33.12	S08°26.34	Sirius	258°25.97
19	5°58.85		2.79 236°46.92	42.95	291°24.40	1.00	20°35.48	26.29	Adhara	255°5.57
20	21°1.32		2.03 251°49.53	43.10	306°27.23	0.97	35° 37.84	26.24	Procyon	244°50.63
21	36°3.78	87°47.32 · · 1		• • 43.26	321°30.05	• • 0.94	50°40.21	• • 26.19	Pollux	243°17.09
22	51°6.25		0.51 281°54.74	43.41	336°32.88	0.91	65° 42.57	26.14	Avior	234°14.31
23	66°8.71	117°46.33	9.75 296°57.35	43.57	351°35.71	0.88	80°44.93	26.09	Suhail	222°46.12
Mer.p	oass. 18:36	ν -0.5 $'$ d -0.7 $'$ m-4	$.27 \nu 2.6' d0$.1' m-0.73	$\nu 2.8' \ d-0$.0′ m-2.81	$\nu 2.4' \ d-0$.0' m 0.98	Miaplacidus	221°37.79
									Alphard	217°47.67
Thu	GHA	GHA De	GHA	Dec	GHA	Dec	GHA	Dec		207°34.41
0	81°11.17	132°45.84 S 21°		N21°43.72	6°38.54	N22°0.85	95°47.29	508°26.04	Dubhe	193°41.02
1	96° 13.64		3.22 327°2.57	43.88	21°41.36	0.82	110°49.65	25.99	Denebola	182°25.07
2	111° 16.10		7.46 342°5.18	44.03	36°44.19	0.79	125°52.01	25.94		175°43.76
3	126° 18.57	177°44.37 · ·		• • 44.19	51°47.02	• • 0.76	140°54.37	25.89	Acrux	173°0.43
4	141°21.03		5.92 12°10.41	44.34	66°49.85	0.73	155° 56.73	25.84		171°51.95
5	156°23.49		5.16 27°13.03	44.50	81°52.67	0.70	170°59.09	25.79	Alioth	
6	171°25.96	222°42.90 S21°		N21°44.66	96°55.50	N22°0.67	186°1.45	S08°25.74	Spica	158°22.57
7	186°28.42		3.62 57°18.27	44.81	111°58.33	0.64	201°3.81	25.68	Alkaid	152°52.36
8	201°30.89		2.85 72°20.89	44.97	127°1.15	0.61	216°6.17	25.63	Hadar	148°36.59
9	216°33.35	267°41.45 · ·		• • 45.13	142°3.98	• • 0.58	231°8.52	• • 25.58		147°58.00
10	231°35.81		1.31 102°26.13	45.29	157°6.81	0.56	246° 10.88	25.53	1	145°48.23
11	246°38.28	297°40.48 21°		45.45	172°9.64	0.53	261°13.24	25.48	Rigil Kent. Kochab	139°40.95 137°20.73
12	261°40.74	312°40.00 \$20°5	9.76 132°31.39	N21°45.61	187°12.46	N22°0.50	276°15.60	S08°25.43	Zuben'ubi	136°56.39
13	276°43.21	327°39.52 5	3.98 147°34.02	45.77	202°15.29	0.47	291°17.96	25.38	Alphecca	126°4.15
14	291°45.67	342°39.04 5	3.21 162°36.65	45.92	217°18.12	0.44	306°20.32	25.33	Antares	112° 16.31
15	306°48.14	357°38.56 · · 5	7.43 177°39.28	• • 46.08	232°20.94	•• 0.41	321°22.67	• • 25.28	Atria	107°11.19
16	321°50.60	12°38.08 5	5.66 192°41.91	46.25	247°23.77	0.38	336°25.03	25.23	Sabik	102°3.23
17	336° 53.06	27°37.60 5	5.88 207°44.55	46.41	262°26.60	0.35	351°27.39	25.18	Shaula	96°10.91
18	351°55.53	42°37.12 S 20°5		N21°46.57	277°29.42	N22°0.32	6°29.75	S08°25.12	Rasalhague	95°58.97
19	6° 57.99		4.32 237°49.82	46.73	292°32.25	0.29	21°32.11	25.07	Eltanin	90°42.76
20	22°0.46		3.54 252°52.46	46.89	307°35.07	0.26	36°34.46	25.02	Kaus Aust.	83°33.02
21	37°2.92	87°35.70 · · 5		• • 47.05	322°37.90	• • 0.23	51°36.82	• • 24.97	Vega	80°33.70
22	52°5.38		1.97 282°57.75	47.22	337°40.73	0.20	66°39.18	24.92	Nunki	75°48.21
23	67°7.85	117°34.75 5	1.19 298°0.39	47.38	352°43.55	0.17	81°41.53	24.87	Altair	62°0.32
Mer.	pass. 18:32	ν -0.5' d-0.8' m-4	$-28 \nu 2.6' \ d0$.2′ m-0.75	$\nu 2.8' \ d-0$.0′ m-2.81	$\nu 2.4' \ d-0$.1′ m0.99	Peacock	53°6.28
									Deneb	49°26.19
				_		_		_	Enif	33°39.02
Fri	GHA	GHA De		Dec	GHA	Dec	GHA	Dec	Al Na'ir	$27^{\circ}33.16$
0	82°10.31	132°34.28 \$20°5		N21°47.54	7°46.38	N22°0.14	96°43.89	\$08°24.81	Fomalhaut	15° 14.64
1	97°12.78		9.62 328°5.68	47.71	22°49.21	0.11	111°46.25	24.76	Scheat	13°45.32
2	112° 15.24 127° 17.71	162°33.34 4 177°32.87 · · 4	3.83 343°8.33 3.05 358°10.98	47.87 •• 48.03	37°52.03 52°54.86	0.08	126°48.60 141°50.96	24.71 •• 24.66	Markab	13°30.01
3 4	127 17.71 142°20.17		7.26 13°13.63	48.20	52 54.86 67°57.68	0.05	141 50.96 156°53.32	24.61	Dec 11 Wed	SHA
5	157°22.63		5.47 28°16.29	48.36	83°0.51	59.99	171° 55.67	24.56	Venus	52°45.84
6	172°25.10	207 31.95 4 222°31.46 \$ 20°4			98°3.33	N21°59.96	171 55.07 186° 58.03			230°45.70
7	187° 27.56		4.89 58°21.60	48.70	113°6.16	21°59.93	202°0.38	24.45	Jupiter	
8	202°30.03		4.10 73°24.26	48.86	128°8.99	59.90	217°2.74	24.40	Saturn	14°38.56
9	217°32.49	267°30.07 · · 4		• • 49.03	143°11.81	• • 59.87	232°5.09	• • 24.35		
10	232°34.96		2.51 103°29.58	49.20	158°14.64	59.84	247°7.45	24.29	Dec 12 Thu	SHA
11	247°37.42		1.72 118°32.24	49.36	173°17.46	59.81	262°9.80	24.24	Venus	51°34.67
12	262°39.88	312°28.68 S 20°4		N21°49.53	188°20.29	N21°59.78	277° 12.16			230°48.78
13	277°42.35		0.13 148°37.57	49.70	203°23.11	59.75	$292^{\circ}14.51$	24.14	Jupiter	
14	292°44.81		9.33 163°40.24	49.87	218°25.94	59.72	$307^{\circ}16.87$	24.08	Saturn	14°36.11
15	$307^{\circ}47.28$	357°27.29 · · 3		• • 50.03	233°28.76	• • 59.69	$322^{\circ}19.22$	• • 24.03	Dec 13 Fri	SHA
16	$322^{\circ}49.74$		7.73 193°45.57	50.20	248°31.59	59.66	$337^{\circ}21.58$	23.98	Venus	50°23.96
17	337° 52.20		5.94 208°48.24	50.37	263°34.41	59.63	352°23.93	23.93		230°52.72
18	352°54.67	42°25.92 S 20°3		N21°50.54	278°37.24	N21°59.60	7°26.28	S08°23.87	Jupiter	285°36.07
19	7°57.13		5.33 238°53.59	50.71	293°40.06	59.57	22°28.64	23.82	Saturn	14°33.58
20	22°59.60		4.53 253°56.27	50.88	308°42.89	59.54	37°30.99	23.77	11	stal navall
21	38°2.06	87°24.55 · · 3		• • 51.05	323°45.71	• • 59.51	52°33.34	• • 23.71	Horizor	ntal parallax
22	53°4.53		2.93 284°1.62	51.23	338°48.53	59.48	67°35.70	23.66		Venus: Mars:
23	68°6.99	117°23.65 3	2.12 299°4.31	51.40	353°51.36	59.45	82°38.05	23.61		iviars:
Mer.p	pass. 18:28	ν-0.5′ d-0.8′ m-4	$.29 \nu 2.6' d0$.2′ m-0.77	ν 2.8′ d-0	.0′ m-2.81	ν 2.4′ d-0	.1′ m0.99		

Dec 29°13.86

-42°10.43

56°40.73

-17°51.07

-57°6.82

 $23^{\circ}34.95$

89°22.34

-40°12.37

4°11.30

49°57.12 16°33.62

-8°10.32

 $46^{\circ}1.40$

6°22.38

28°37.73

-1°11.11

 $7^{\circ}24.74$

-52°42.38

-16°44.93

-29°0.22

27°57.89

-59°35.08

-43°31.74

-69°48.83

-8°45.91

11°50.69

 $61^{\circ}36.71$

 $14^{\circ}25.90$

-17°40.69

-63°13.92 -57°14.87

55°49.21

-11°17.41

 $49^{\circ}11.11$ -60° 29.35

-36°29.38

 $19^{\circ}3.07$

74°2.92

-16°8.65

26°37.76

-26°29.18

-15°45.33

 $-37^{\circ}7.30$

 $12^{\circ}32.50$

51°29.12

-34°22.40

38°48.43

 $-26^{\circ}15.99$ 8°56.07

-56° 39.48

 $45^{\circ}22.31$

 $9^{\circ}59.41$

-46°50.64

-29°29.57

28°13.25

15°20.46

Mer.pass

15:09

03:16

23:34

17:38

15:09

03:11

23:29

17:34

15:10

03:07

23:24

17:30

0.2

0.2

Mer.pass

Mer.pass

-69°4.26

-60°56.08

 $5^{\circ}9.69$

h	Sui	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°41.67	S23°1.07	$61^{\circ}54.08$	10.8'	N09°20.46	16.4'	59.7'
1	196°41.38	1.27	76°23.92	10.8'	09°36.83	16.3'	59.7'
2	211°41.10 226°40.81	1.47 •• 1.67	90°53.70 105°23.41	10.7' 10.6'	09°53.17 10°9.45	16.3' 16.2'	59.7' 59.7'
4	241°40.52	1.86	119°53.05	10.6'	10° 25.69	16.2	59.8'
5	256°40.23	2.06	134°22.62	10.5'	10°41.88	16.1'	59.8'
6	271°39.94	\$23°2.26	148°52.12	10.4'	N10°58.02	16.1'	59.8'
7	286°39.66 301°39.37	2.45	163°21.55	10.4' 10.3'	11°14.11 11°30.14	16.0'	59.8'
8 9	301°39.37 316°39.08	2.65 •• 2.84	177°50.90 192°20.18	10.3	11° 30.14 11° 46.11	16.0' 15.9'	59.8' 59.8'
10	331° 38.79	3.04	206°49.38	10.2	12°2.03	15.9'	59.8'
11	346°38.50	3.23	221°18.50	10.0'	12°17.88	15.8'	59.8'
12	1°38.21	\$23°3.42	235°47.55	10.0'	N12°33.67	15.7'	59.8'
13 14	16°37.92 31°37.63	3.61 3.80	250°16.51 264°45.40	9.9' 9.8'	12°49.40 13°5.07	15.7' 15.6'	59.8' 59.8'
14 15	31 37.03 46°37.34	· · 3.99	204 45.40 279°14.20	9.8 9.7'	13 5.07 13°20.66	15.5'	59.8 59.9'
16	61°37.05	4.18	293°42.92	9.6'	13°36.19	15.5'	59.9'
17	76°36.76	4.37	$308^{\circ}11.55$	9.6'	13°51.64	15.4'	59.9'
18	91°36.47	S23°4.56	322°40.10	9.5'	N14°7.02	15.3'	59.9'
19 20	106°36.18 121°35.89	4.75 4.93	337°8.57 351°36.95	9.4' 9.3'	14°22.32 14°37.55	15.2' 15.1'	59.9' 59.9'
21	136°35.60	. 5.12	6°5.24	9.3 9.2'	14°52.70	15.1	59.9'
22	151°35.31	5.30	20°33.44	9.1'	15°7.77	15.0'	59.9'
23	$166^{\circ}35.02$	5.48	$35^{\circ}1.55$	9.0'	15°22.75	14.9'	59.9'
	SD = 16.2'	d = 0.2'	_	SE	0 = 16.3'		
T I.	CILA	D	CUA		D	.1	LIP
Thu 0	GHA 181°34.73	Dec \$23°5.67	GHA 49°29.57	ν 8.9'	Dec N15°37.65	<i>d</i> 14.8'	HP 59.9'
1	196°34.44	5.85	63°57.50	8.8'	15°52.47	14.7'	59.9'
2	211°34.15	6.03	78°25.34	8.7'	$16^{\circ}7.19$	14.6'	59.9'
3	226°33.86	• • 6.21	92°53.08	8.7'	16°21.82	14.5'	59.9'
4 5	241°33.56 256°33.27	6.39 6.57	107°20.73 121°48.29	8.6' 8.5'	16°36.37 16°50.81	14.4' 14.4'	59.9' 59.9'
6	271°32.98	S23°6.75	136°15.75	8.4'	N17°5.16	14.4	59.9'
7	286°32.69	6.92	150°43.12	8.3'	17°19.41	14.2'	59.9'
8	301°32.40	7.10	165°10.39	8.2'	17°33.56	14.0'	59.9'
9	316°32.10	• • 7.27	179°37.57	8.1'	17°47.61	13.9'	59.9'
10 11	331°31.81 346°31.52	7.45 7.62	194°4.65 208°31.63	8.0' 7.9'	18°1.56 18°15.40	13.8' 13.7'	59.9' 59.9'
12	1°31.23	\$23°7.80	222°58.51	7.8'	N18°29.13	13.6'	59.9'
13	16°30.93	7.97	237°25.30	7.7'	18°42.75	13.5'	59.9'
14	31°30.64	8.14	251°51.99	7.6'	18°56.26	13.4'	59.9'
15 16	46°30.35 61°30.05	· · 8.31 8.48	266°18.58 280°45.07	7.5' 7.4'	19°9.65 19°22.93	13.3' 13.2'	59.9' 59.9'
17	76°29.76	8.65	295°11.46	7.4	19°22.93 19°36.09	13.2	59.9'
18	91°29.47	S23°8.82	309°37.75	7.2'	N19°49.13	12.9'	59.9'
19	106°29.17	8.98	324°3.94	7.1'	20°2.04	12.8'	59.9'
20	121°28.88	9.15	338°30.03	7.0'	20°14.84		59.9'
21 22	136°28.59 151°28.29	• • 9.32 9.48	352°56.03 7°21.92	6.9' 6.8'	20°27.51 20°40.05	12.5' 12.4'	59.9' 59.9'
23	166°28.00	9.65	21°47.72	6.7'	20°52.46	12.3'	59.9'
	SD = 16.2'	d = 0.2'		SE	0 = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec		НР
0	181°27.70	\$23°9.81	36°13.41	ν 6.6'	N21°4.74	d 12.1'	59.9'
1	196°27.41	9.97	50°39.01	6.5'	21°16.88	12.0'	59.9'
2	211°27.12	10.13	65°4.51	6.4'	21°28.90	11.9'	59.9'
3 4	226°26.82 241°26.53	· · 10.30 10.46	79°29.91 93°55.21	6.3' 6.2'	21°40.77 21°52.50	11.7' 11.6'	59.9' 59.9'
4 5	241 20.53 256°26.23	10.46	93 55.21 108°20.41	6.2 6.1'	21 52.50 22°4.10	11.5	59.9' 59.9'
6	271°25.94	S23°10.77	122°45.52	6.0'	N22°15.55	11.3'	59.9'
7	286°25.64	10.93	137°10.53	5.9'	22°26.86	11.2'	59.9'
8	301°25.35 316°25.05	11.09	151°35.45 166°0.27	5.8'	22°38.02 22°49.03	11.0'	59.9'
9 10	316°25.05 331°24.75	· · 11.25 11.40	166°0.27 180°24.99	5.7' 5.6'	22°49.03 22°59.89	10.9' 10.7'	59.9' 59.9'
11	346°24.46	11.56	194°49.63	5.5'	23°10.60	10.6'	59.9'
12	1°24.16	S 23°11.71	209°14.16	5.4'	N23°21.16	10.4'	59.8'
13	16°23.87	11.86	223°38.61	5.4'	23°31.56	10.2'	59.8'
14 15	31°23.57 46°23.28	12.01 •• 12.17	238°2.97 252°27.23	5.3' 5.2'	23°41.80 23°51.89	10.1' 9.9'	59.8' 59.8'
16	61°22.98	12.17	266°51.41	5.2 5.1'	23 51.89 24°1.81	9.9 9.8'	59.8'
17	76°22.68	12.47	281°15.50	5.0'	24°11.58	9.6'	59.8'
18	91°22.39	S23°12.62	295°39.50	4.9'	N24°21.18	9.4'	59.8'
19	106°22.09 121°21.79	12.76	310°3.42 324°27.25	4.8' 4.8'	24°30.61 24°39.88	9.3'	59.8'
20 21	121°21.79 136°21.50	12.91 •• 13.06	324°27.25 338°51.00	4.8′ 4.7'	24°39.88 24°48.98	9.1' 8.9'	59.8' 59.8'
22	150°21.30 151°21.20	13.20	353°14.67	4.7 4.6'	24 46.96 24°57.91	8.8'	59.6 59.7'
23	166°20.90	13.35	7°38.26	4.5'	25°6.66	8.6'	59.7'
	SD = 16.2'	d = 0.2'		SE	0 = 16.3'		

Lat. N 72°	Naut. 08:16	Civil	Sunrise	Sunset		Twilight		
N 72°	08:16				Civil	Naut.		
		10:39			13:09	15:31		
N 70°	07:57	09:43			14:05	15:50		
68°	07:42	09:09			14:38	16:06		
66°	07:29	08:45	10:22	13:26	15:02	16:19		
64°	07:18	08:26	09:42	14:05	15:22	16:29		
62°	07:09	08:10	09:15	14:33	15:37	16:39		
60°	07:01	07:57	08:54	14:53	15:51	16:47		
N 58°	06:53	07:46	08:37	15:11	16:02	16:54		
56°	06:47	07:36	08:23	15:25	16:12	17:01		
54°	06:41	07:27	08:10	15:37	16:21	17:07		
52°	06:35	07:19	07:59	15:48	16:29	17:13		
50°	06:30	07:11	07:50	15:58	16:36	17:18		
45°	06:18	06:56	07:29	16:18	16:52	17:29		
N 40°	06:08	06:42	07:13	16:35	17:05	17:39		
35°	05:59	06:31	06:59	16:49	17:17	17:49		
30°	05:50	06:20	06:47	17:01	17:27	17:57		
20°	05:34	06:02	06:26	17:22	17:46	18:14		
N 10°	05:18	05:45	06:07	17:40	18:03	18:30		
0°	05:02	05:28	05:50	17:58	18:20	18:46		
S 10°	04:43	05:10	05:33	18:15	18:38	19:05		
20°	04:21	04:50	05:14	18:34	18:58	19:27		
30°	03:52	04:25	04:52	18:56	19:23	19:56		
35°	03:33	04:10	04:40	19:08	19:38	20:15		
40°	03:11	03:52	04:25	19:23	19:56	20:37		
45°	02:41	03:30	04:07	19:41	20:18	21:08		
S 50°	01:56	03:01	03:45	20:03	20:47	21:52		
52°	01:30	02:46	03:34	20:14	21:02	22:19		
54°	00:49	02:29	03:22	20:26	21:20	23:01		
56°	////	02:07	03:08	20:40	21:42	////		
58°	////	01:39	02:52	20:56	22:10	////		
S 60°	////	00:54	02:32	21:16	22:56	////		

Lat.		Moonris	e		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	11:28	09:39		04:18	07:58	
N 70°	11:49	10:51		04:00	06:48	
68°	12:05	11:29		03:46	06:12	
66°	12:18	11:56	11:10	03:34	05:46	08:31
64°	12:30	12:17	11:57	03:25	05:27	07:44
62°	12:39	12:34	12:28	03:17	05:11	07:14
60°	12:47	12:48	12:52	03:10	04:58	06:51
N 58°	12:55	13:01	13:11	03:04	04:46	06:33
56°	13:01	13:11	13:27	02:59	04:37	06:18
54°	13:07	13:21	13:40	02:54	04:28	06:05
52°	13:12	13:29	13:52	02:50	04:20	05:54
50°	13:17	13:37	14:03	02:46	04:14	05:44
45°	13:28	13:53	14:25	02:38	03:59	05:22
N 40°	13:36	14:07	14:44	02:31	03:47	05:06
35°	13:44	14:18	14:59	02:25	03:37	04:51
30°	13:51	14:28	15:12	02:20	03:28	04:39
20°	14:02	14:46	15:35	02:11	03:13	04:18
N 10°	14:13	15:01	15:55	02:03	03:00	04:00
0°	14:22	15:16	16:14	01:56	02:47	03:43
S 10°	14:32	15:31	16:33	01:48	02:35	03:26
20°	14:43	15:47	16:53	01:41	02:22	03:08
30°	14:55	16:05	17:17	01:32	02:07	02:48
35°	15:02	16:16	17:31	01:27	01:59	02:36
40°	15:10	16:28	17:47	01:21	01:49	02:22
45°	15:20	16:43	18:06	01:15	01:38	02:06
S 50°	15:32	17:01	18:31	01:07	01:24	01:46
52°	15:37	17:10	18:43	01:03	01:18	01:37
54°	15:43	17:19	18:57	00:59	01:11	01:27
56°	15:50	17:30	19:12	00:55	01:03	01:15
58°	15:57	17:43	19:31	00:50	00:54	01:02
S 60°	16:06	17:58	19:55	00:45	00:45	00:46

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-92%
11	06:47	06:33	11:53	20:35	08:09	
12	06:19	06:05	11:54	21:29	09:02	
13	05:51	05:37	11:54	22:28	09:58	

December 14, 15, 16 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	83°9.45	132°23.20 S 20°31.32	314°6.99 N21°51.57	8°54.18 N21°59.42	97°40.40 \$08°23.56	
1	$98^{\circ}11.92$	147°22.74 30.51	329° 9.67 51.74	23°57.01 59.39	112°42.76 23.50	Alpheratz 357°34.79 29°13.87 Ankaa 353°7.10 -42°10.44
2	113°14.38	162°22.29 29.70	344°12.36 51.91	38°59.83 59.36	127°45.11 23.45	Schedar 349°30.96 56°40.73
3	128° 16.85	177°21.84 · · 28.89	359°15.04 · · 52.09	54°2.66 · · 59.33	142°47.46 · · 23.40	Diphda 348°47.26 -17°51.07
4	143° 19.31	192°21.40 28.08	14°17.73 52.26	69°5.48 59.31	157°49.81 23.34	Achernar 335°19.90 -57°6.83
5 6	158° 21.78 173° 24.24	207°20.95 27.28 222°20.50 \$20°26.46	29°20.42 52.43 44°23.11 N21°52.61	84°8.30 59.28 99°11.13 N21°59.25	172°52.17 23.29 187°54.52 \$08°23.23	Hamal 327°51.05 23°34.95
7	188°26.70	237°20.05 25.65	59°25.80 52.78	114°13.95 59.22	202°56.87 23.18	Polaris 313°39.02 89°22.36
8	203°29.17	252°19.61 24.84	74°28.50 52.96	129°16.77 59.19	217°59.22 23.13	Acamar 315°11.47 -40°12.38
9	218°31.63	267°19.16 · · 24.03	89°31.19 · · 53.13	144°19.60 · · 59.16	233°1.57 · · 23.07	Menkar 314°5.95 4°11.30 Mirfak 308°27.91 49°57.13
10	233°34.10	282°18.72 23.21	104°33.89 53.31	159°22.42 59.13	248°3.92 23.02	Aldebaran 290°39.35 16°33.61
11	248°36.56	297°18.28 22.40	119°36.59 53.48	174°25.25 59.10	263°6.28 22.97	Rigel 281°3.59 -8°10.33
12	263°39.03	312°17.84 \$20°21.58	134°39.29 N21°53.66	189°28.07 N21°59.07	278°8.63 \$08°22.91	Capella 280°21.50 46°1.40
13 14	278° 41.49 293° 43.95	327°17.39 20.77 342°16.95 19.95	149°41.99 53.83 164°44.69 54.01	204°30.89 59.04 219°33.72 59.01	293°10.98 22.86 308°13.33 22.80	Bellatrix 278°22.61 6°22.37
15	308°46.42	357°16.51 · · 19.13	179°47.40 · · 54.19	234°36.54 · · 58.98	323°15.68 · · 22.75	Elnath 278°1.56 28°37.73
16	323°48.88	12°16.08 18.31	194°50.11 54.37	249°39.36 58.95	338°18.03 22.70	Alnilam 275°37.46 -1°11.12
17	$338^{\circ}51.35$	27°15.64 17.49	209°52.81 54.54	264°42.18 58.92	353°20.38 22.64	Betelgeuse 270°51.81 7°24.73
18	353°53.81	42°15.20 \$20°16.67	224°55.52 N21°54.72	279°45.01 N21°58.89	8°22.73 S 08°22.59	Canopus 263°51.87 -52°42.40 Sirius 258°25.96 -16°44.95
19	8°56.27	57° 14.76 15.85	239°58.23 54.90	294°47.83 58.86	23°25.08 22.53	Adhara 255°5.56 -29°0.24
20	23°58.74	72°14.33 15.03	255° 0.95 55.08	309°50.65 58.83	38°27.43 22.48	Procyon 244°50.61 5°9.68
21	39°1.20	87°13.90 · · 14.20 102°13.46 13.38	270°3.66 · · 55.26	324°53.47 · · 58.80	53°29.78 · · 22.42	Pollux 243°17.06 27°57.89
22 23	54°3.67 69°6.13	102°13.46 13.38 117°13.03 12.55	285°6.38 55.44 300°9.09 55.62	339°56.30 58.77 354°59.12 58.74	68° 32.13 22.37 83° 34.48 22.31	Avior 234°14.28 -59°35.10
			·			Suhail 222°46.09 -43°31.75
Mer.	pass. 18:24	ν-0.5' d-0.8' m-4.29	ν2.7' d0.2' m-0.80	ν2.8' d-0.0' m-2.81	ν2.4' d-0.1' m0.99	Miaplacidus 221°37.74 -69°48.85
						Alphard 217°47.64 -8°45.92
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.39 11°50.68 Dubhe 193°40.97 61°36.70
0	84°8.60	132°12.60 S 20°11.73	315°11.81 N21°55.80	10°1.94 N21°58.71	98°36.83 S 08°22.26	Duble 193 40.97 01 30.70 Denebola 182°25.04 14°25.89
1	99°11.06	147°12.17 10.90	330°14.53 55.98	25°4.76 58.68	113°39.18 22.20	Gienah 175° 43.73 -17° 40.71
2	114° 13.52	162°11.74 10.07	345°17.25 56.16	40°7.59 58.65	128° 41.52 22.15	Acrux 173°0.38 -63°13.93
3 4	129° 15.99 144° 18.45	177°11.31 · · 9.24 192°10.88 8.41	0°19.98 · · 56.34 15°22.70 56.52	55°10.41 · · 58.62 70°13.23 58.59	143°43.87 · · 22.10 158°46.22 22.04	Gacrux 171°51.90 -57°14.88
5	159° 20.92	207°10.45 7.58	30°25.43 56.70	85°16.05 58.56	173° 48.57 21.99	Alioth 166°13.22 55°49.20
6	174°23.38	222°10.02 \$20°6.75	45°28.15 N21°56.89	100°18.87 N21°58.53	188°50.92 S08°21.93	Spica 158°22.54 -11°17.42
7	189°25.85	237°9.60 5.92	60°30.88 57.07	115°21.70 58.50	203°53.27 21.87	Alkaid 152°52.33 49°11.10 Hadar 148°36.55 -60°29.34
8	204°28.31	252°9.17 5.09	75°33.61 57.25	130°24.52 58.47	218°55.62 21.82	Menkent 147°57.97 -36°29.39
9	219°30.77	267°8.75 · · 4.26	90°36.35 · · 57.43	145°27.34 · · 58.44	233°57.96 · · 21.76	Arcturus 145°48.21 19°3.06
10	234°33.24	282°8.33 3.42	105°39.08 57.62	160°30.16 58.41	249°0.31 21.71	Rigil Kent. 139°40.91 -60°56.08
11	249°35.70	297°7.90 2.59	120°41.82 57.80	175°32.98 58.38	264°2.66 21.65	Kochab 137°20.70 74°2.90
12 13	264° 38.17 279° 40.63	312°7.48 \$20°1.75 327°7.06 0.91	135°44.55 N21°57.99 150°47.29 58.17	190°35.80 N21°58.35 205°38.62 58.32	279°5.01 \$08°21.60 294°7.35 21.54	Zuben'ubi 136°56.37 -16°8.65
14	279 40.03 294°43.10	342°6.64 20°0.08	165°50.03 58.36	205 36.02 56.32 220°41.44 58.29	309°9.70 21.49	Alphecca 126°4.13 26°37.75
15	309°45.56	357°6.22 19°59.24	180°52.77 · · 58.54	235°44.27 · · 58.26	324°12.05 · · 21.43	Antares 112°16.29 -26°29.18
16	324°48.02	12°5.80 58.40	195°55.52 58.73	250°47.09 58.23	339°14.39 21.38	Atria 107°11.15 -69°4.25 Sabik 102°3.22 -15°45.33
17	$339^{\circ}50.49$	27°5.39 57.56	210°58.26 58.91	265°49.91 58.20	354°16.74 21.32	Shaula 96°10.89 -37°7.29
18	354° 52.95	42°4.97 S 19°56.72	226°1.01 N21°59.10	280°52.73 N21°58.17	9°19.09 S 08°21.26	Rasalhague 95°58.96 12°32.50
19	9°55.42	57°4.55 55.87	241°3.75 59.29	295°55.55 58.14	24°21.43 21.21	Eltanin 90°42.76 51°29.10
20	24°57.88	72°4.14 55.03	256° 6.50 59.47	310°58.37 58.11	39°23.78 21.15	Kaus Aust. 83°33.01 -34°22.39
21 22	40°0.35 55°2.81	87°3.73 · · 54.19 102°3.31 53.34	271°9.25 · · 59.66 286°12.01 21°59.85	326°1.19 · · 58.08 341°4.01 58.06	54°26.12 · · 21.10 69°28.47 21.04	Vega 80°33.70 38°48.42
23	70°5.27	117°2.90 52.50	301°14.76 22°0.04	356°6.83 58.03	84°30.82 20.98	Nunki 75°48.20 -26°15.98
						Altair 62°0.31 8°56.07
Mer.	pass. 18:20	ν-0.4' d-0.8' m-4.30	ν2.7' d0.2' m-0.82	ν2.8' d-0.0' m-2.80	ν2.3' d-0.1' m1.00	Peacock 53°6.28 -56°39.47 Deneb 49°26.19 45°22.31
						Enif 33°39.03 9°59.41
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 33.17 -46° 50.64
0	85°7.74	132°2.49 \$19°51.65	316°17.51 N22°0.23	11°9.65 N21°58.00	99°33.16 \$08°20.93	Fomalhaut 15°14.65 -29°29.57
1 2	100° 10.20 115° 12.67	147°2.08 50.81 162°1.67 49.96	331°20.27 0.41 346°23.03 0.60	26°12.47 57.97 41°15.29 57.94	114°35.51 20.87 129°37.85 20.82	Scheat 13°45.33 28°13.25
3	115 12.07 130° 15.13	102 1.07 49.90 177°1.26 · · 49.11	346°23.03 0.60 1°25.79 · · 0.79	56°18.11 · · 57.91	144°40.20 · · 20.76	Markab 13°30.02 15°20.46
4	145° 17.60	192°0.85 48.26	16°28.55 0.98	71°20.93 57.88	159° 42.54 20.70	Dec 14 Sat SHA Mer.pass
5	160°20.06	207°0.45 47.41	31°31.31 1.17	86°23.75 57.85	174°44.89 20.65	Venus 49°13.74 15:11
6	175°22.52	222°0.04 S 19°46.56	46°34.08 N22°1.36	101°26.57 N21°57.82	189°47.23 S 08°20.59	Mars 230° 57.53 03:03
7	190°24.99	236°59.63 45.71	61°36.84 1.55	116°29.39 57.79	204°49.58 20.53	Jupiter 285°44.73 23:20
8	205°27.45	251°59.23 44.86	76°39.61 1.74	131°32.21 57.76	219°51.92 20.48	Saturn 14°30.95 17:27
9	220°29.92	266° 58.83 · · 44.00	91°42.38 · · 1.94	146°35.03 · · 57.73	234°54.26 · · 20.42	Dec 15 Sun SHA Mer.pass
10 11	235° 32.38 250° 34.84	281°58.42 43.15 296°58.02 42.29	106°45.15 2.13 121°47.92 2.32	161°37.84 57.70 176°40.66 57.67	249° 56.61 20.36 264° 58.95 20.31	Venus 48°4.00 15:12
12	265° 37.31	311°57.62 \$19°41.44	136°50.70 N22°2.51	191°43.48 N21°57.64	280°1.30 S08°20.25	Mars 231°3.22 02:59
13	280° 39.77	326°57.22 40.58	151°53.47 2.71	206°46.30 57.61	295°3.64 20.19	Jupiter 285°53.35 23:15
14	295°42.24	341°56.82 39.72	166°56.25 2.90	221°49.12 57.58	310°5.98 20.13	Saturn 14°28.23 17:23
15	310°44.70	356°56.42 · · 38.87	181°59.03 · · 3.09	236°51.94 · · 57.55	325°8.33 · · 20.08	Dec 16 Mon SHA Mer.pass
16	325°47.17	11°56.02 38.01	197° 1.81 3.29	251°54.76 57.52	340°10.67 20.02	Venus 46° 54.75 15:12
17	340°49.63	26°55.63 37.15	212°4.59 3.48	266°57.58 57.49	355°13.01 19.96	Mars 231°9.78 02:54
18 19	355° 52.09 10° 54.56	41°55.23 \$19°36.29 56°54.84 35.43	227°7.37 N22°3.67 242°10.16 3.87	282°0.39 N21°57.46 297°3.21 57.43	10°15.35	Jupiter 286°1.91 23:11
20	25° 57.02	71°54.44 34.56	257°12.94 4.06	312°6.03 57.40	40°20.04 19.79	Saturn 14°25.42 17:19
21	40° 59.49	86°54.05 · · 33.70	272°15.73 · · 4.26	327°8.85 · · 57.37	55°22.38 · · 19.73	Horizontal parallax
22	$56^{\circ}1.95$	101°53.66 32.84	287°18.52 4.46	342°11.66 57.34	70°24.72 19.68	Venus: 0.2
23	71°4.42	116°53.27 31.97	302°21.31 4.65	357°14.48 57.31	85°27.07 19.62	Mars: 0.2
Mer.ı	pass. 18:16	ν-0.4' d-0.8' m-4.31	ν2.8' d0.2' m-0.84	ν2.8' d-0.0' m-2.80	ν2.3' d-0.1' m1.00	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°20.60	S23°13.49	22°1.77	4.4'	N25°15.25	8.4'	59.7'
1 2	196°20.31 211°20.01	13.64 13.78	36°25.21 50°48.57	4.4' 4.3'	25°23.66 25°31.90	8.2' 8.1'	59.7' 59.7'
3	226° 19.71	• • 13.92	65°11.85	4.2'	25°39.95	7.9'	59.7'
4	241°19.41	14.06	79°35.07	4.1'	25°47.83	7.7'	59.7'
5 6	256° 19.12 271° 18.82	14.20 S 23°14.34	93°58.22 108°21.30	4.1' 4.0'	25°55.53 N26°3.05	7.5' 7.3'	59.7' 59.6'
7	286° 18.52	14.48	122°44.31	3.9'	26°10.39	7.2'	59.6'
8	301° 18.22	14.62	137°7.26	3.9'	26°17.54	7.0'	59.6'
9 10	316° 17.92 331° 17.62	· · 14.76 14.89	151°30.15 165°52.98	3.8' 3.8'	26°24.51 26°31.30	6.8' 6.6'	59.6' 59.6'
11	346° 17.33	15.03	180°15.75	3.7'	26°37.89	6.4	59.6'
12	1°17.03	S23°15.16	194°38.47	3.7'	N26°44.30	6.2'	59.5'
13 14	16° 16.73 31° 16.43	15.30 15.43	209°1.13 223°23.75	3.6' 3.6'	26°50.52 26°56.56	6.0' 5.8'	59.5' 59.5'
15	46° 16.13	15.45	237°46.31	3.5'	20° 30.30° 27° 2.40	5.6'	59.5'
16	61°15.83	15.69	252°8.83	3.5'	$27^{\circ}8.05$	5.5'	59.5'
17 18	76° 15.53 91° 15.23	15.82 \$23°15.95	266°31.31 280°53.75	3.4' 3.4'	27°13.50 N27°18.77	5.3' 5.1'	59.5' 59.4'
18	91 15.23 106°14.93	16.08	280 53.75 295°16.15	3.4 3.4'	27°23.84	5.1 4.9'	59.4 59.4'
20	121° 14.63	16.21	309°38.52	3.3'	27°28.71	4.7'	59.4'
21	136°14.33	• • 16.34	324°0.85	3.3'	27°33.39	4.5'	59.4'
22 23	151° 14.03 166° 13.73	16.46 16.59	338°23.15 352°45.43	3.3' 3.3'	27°37.88 27°42.16	4.3' 4.1'	59.4' 59.3'
	SD = 16.2'	d = 0.1'			D = 16.3'		
	JD — 10.2	u — U.1		اد			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181° 13.43 196° 13.13	\$23°16.72 16.84	7°7.68 21°29.91	3.2' 3.2'	N27°46.26 27°50.15	3.9' 3.7'	59.3' 59.3'
2	211° 12.83	16.96	35°52.12	3.2'	27°53.85	3.5'	59.3'
3	226° 12.53	• • 17.09	50°14.32	3.2'	27°57.34	3.3'	59.3'
4 5	241° 12.23 256° 11.93	17.21 17.33	64°36.50 78°58.67	3.2' 3.2'	28°0.65 28°3.75	3.1' 2.9'	59.2' 59.2'
6	271°11.63	\$23°17.45	93°20.84	3.2'	N28° 6.65	2.7'	59.2'
7	286°11.33	17.57	107°43.00	3.2'	28°9.35	2.5'	59.2'
8 9	301°11.03 316°10.73	17.69 •• 17.80	122°5.16 136°27.31	3.2' 3.2'	28°11.86 28°14.16	2.3' 2.1'	59.1' 59.1'
10	331° 10.43	17.00	150° 49.48	3.2'	28°16.27	1.9'	59.1
11	346° 10.13	18.04	165°11.65	3.2'	28°18.18	1.7'	59.1'
12 13	1°9.83 16°9.52	\$23°18.15 18.27	179°33.83 193°56.03	3.2' 3.2'	N28°19.89 28°21.40	1.5' 1.3'	59.1' 59.0'
14	31°9.22	18.38	208° 18.24	3.2'	28°22.71	1.1'	59.0'
15	46°8.92	• 18.49	222°40.47	3.3'	28°23.82	0.9'	59.0'
16 17	61°8.62 76°8.32	18.61 18.72	237°2.72 251°24.99	3.3' 3.3'	28°24.73 28°25.45	0.7' 0.5'	59.0' 58.9'
18	91°8.02	\$23°18.83	265°47.30	3.3'	N28°25.97	0.3	58.9'
19	106°7.71	18.94	280° 9.63	3.4'	28°26.29	0.1'	58.9'
20 21	121°7.41 136°7.11	19.05 •• 19.15	294°32.00 308°54.40	3.4' 3.4'	28°26.41 28°26.34	-0.1' -0.3'	58.8' 58.8'
22	151°6.81	19.13	323°16.85	3.5'	28°26.07	-0.5'	58.8'
23	166°6.51	19.37	337°39.33	3.5'	$28^{\circ}25.61$	-0.7'	58.8'
	SD = 16.2'	d = 0.1'		SI	O = 16.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	181°6.20	S23°19.47	$352^{\circ}1.86$	3.6'	N28°24.95	-0.9'	58.7'
1 2	196°5.90 211°5.60	19.58 19.68	6°24.44 20°47.07	3.6' 3.7'	28°24.10 28°23.06	-1.0' -1.2'	58.7' 58.7'
3	211 5.00 226°5.29	19.08	20 47.07 35°9.75	3.7'	28°21.83	-1.2 -1.4'	58.7'
4	241°4.99	19.89	49°32.49	3.8'	28°20.40	-1.6'	58.6'
5	256°4.69	19.99	63°55.29	3.9'	28°18.78	-1.8'	58.6'
6 7	271°4.39 286°4.08	\$23°20.09 20.19	78°18.15 92°41.07	3.9' 4.0'	N28°16.98 28°14.98	-2.0' -2.2'	58.6' 58.5'
8	301°3.78	20.19	107°4.06	4.1'	28°12.80	-2.4'	58.5
9	316°3.48	• • 20.39	121°27.11	4.1'	28°10.43	-2.6'	58.5'
10 11	331°3.17 346°2.87	20.49 20.58	135°50.24 150°13.44	4.2' 4.3'	28°7.87 28°5.13	-2.7' -2.9'	58.5' 58.4'
12	1°2.57	\$23°20.68	164°36.72	4.4'	N28°2.21	-3.1'	58.4
13	16°2.26	20.77	179°0.07	4.4'	27°59.10	-3.3'	58.4'
14 15	31°1.96 46°1.65	20.87 •• 20.96	193°23.51 207°47.03	4.5' 4.6'	27°55.82 27°52.35	-3.5' -3.6'	58.3' 58.3'
16	61°1.35	21.06	222°10.63	4.7'	27°48.71	-3.8'	58.3'
17	76°1.05	21.15	236°34.32	4.8'	27°44.89	-4.0'	58.2'
18 19	91°0.74 106°0.44	\$23°21.24 21.33	250°58.10 265°21.98	4.9' 5.0'	N27°40.89 27°36.72	-4.2' -4.3'	58.2' 58.2'
20	100 0.44 121°0.13	21.33	205 21.96 279°45.94	5.1'	27°32.37	-4.5'	58.2
21	135° 59.83	• • 21.51	294°10.00	5.2'	27°27.85	-4.7'	58.1'
22 23	150° 59.52 165° 59.22	21.59 21.68	308°34.15 322°58.41	5.3' 5.4'	27°23.17 27°18.31	-4.9' -5.0'	58.1' 58.1'
23	SD = 16.2'	$\frac{21.08}{d = 0.1'}$	J2Z J0.41		O = 16.0'	-3.0	50.1
	JD = 10.2′	u = 0.1		51	$\nu = 10.0$		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	08:21	10:48			13:02	15:30
N 70°	08:01	09:48			14:02	15:50
68°	07:45	09:14			14:37	16:05
66°	07:32	08:49	10:28	13:22	15:02	16:18
64°	07:21	08:30	09:47	14:04	15:21	16:29
62°	07:12	08:14	09:19	14:32	15:37	16:39
60°	07:03	08:00	08:58	14:53	15:50	16:47
N 58°	06:56	07:49	08:40	15:10	16:02	16:55
56°	06:49	07:38	08:26	15:25	16:12	17:01
54°	06:43	07:29	08:13	15:37	16:21	17:07
52°	06:38	07:21	08:02	15:49	16:29	17:13
50°	06:32	07:14	07:52	15:58	16:37	17:18
45°	06:21	06:58	07:32	16:19	16:53	17:30
N 40°	06:10	06:44	07:15	16:36	17:06	17:40
35°	06:01	06:33	07:01	16:50	17:18	17:50
30°	05:52	06:22	06:49	17:02	17:28	17:58
20°	05:36	06:03	06:27	17:23	17:47	18:15
N 10°	05:20	05:46	06:09	17:42	18:05	18:31
0°	05:03	05:29	05:52	17:59	18:22	18:48
S 10°	04:44	05:11	05:34	18:17	18:40	19:07
20°	04:22	04:51	05:15	18:35	19:00	19:29
30°	03:53	04:26	04:53	18:57	19:25	19:58
35°	03:34	04:11	04:40	19:10	19:40	20:17
40°	03:11	03:53	04:25	19:25	19:58	20:40
45°	02:41	03:30	04:08	19:43	20:21	21:10
S 50°	01:56	03:01	03:45	20:06	20:50	21:55
52°	01:28	02:46	03:34	20:17	21:05	22:23
54°	00:44	02:28	03:22	20:29	21:23	23:08
56°	////	02:06	03:08	20:43	21:45	////
58°	////	01:37	02:51	21:00	22:15	////
S 60°	////	00:49	02:31	21:20	23:04	////

Lat.		Moonris	e		Moonset	:
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°						
64°						
62°	12:20	12.20	13:34	09:29	10.00	12:39
60°	13:02	13:32	14:46	08:48	10:29	11:27
N 58°	13:30	14:10	15:21	08:20	09:51	10:51
56°	13:53	14:37	15:47	07:58	09:24	10:25
54° 52°	14:11 14:26	14:59 15:16	16:07 16:24	07:40 07:25	09:03 08:46	10:05 09:48
50°	14:20	15:10	16:24	07:25	08:31	09:46
45°	15:08	16:02	17:08	06:45	08:00	09:03
N 40°	15:29	16:26	17:31	06:24	07:37	08:39
35°	15:48	16:46	17:50	06:06	07:17	08:20
30°	16:04	17:02	18:07	05:51	07:00	08:03
20°	16:30	17:31	18:34	05:25	06:32	07:35
N 10°	16:54	17:55	18:58	05:03	06:08	07:11
0°	17:15	18:18	19:20	04:43	05:45	06:48
S 10°	17:37	18:41	19:42	04:22	05:23	06:25
20°	18:01	19:06	20:06	04:00	04:59	06:01
30°	18:28	19:34	20:33	03:35	04:30	05:32
35°	18:44	19:52	20:49	03:20	04:14	05:15
40°	19:03	20:11	21:08	03:03	03:54	04:56
45°	19:26	20:36	21:31	02:43	03:31	04:32
S 50°	19:56	21:07	21:59	02:17	03:01	04:01
52°	20:10	21:22	22:14	02:05	02:46	03:45
54°	20:27	21:40	22:30	01:51	02:29	03:27
56°	20:48	22:03	22:49	01:34	02:08	03:05
58°	21:14	22:31	23:13	01:15	01:42	02:37
S 60°	21:49	23:12	23:45	00:51	01:06	01:55

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 ^h	12 ^h	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-99%
14	05:22	05:08	11:55	23:30	10:59	
15	04:54	04:39	11:55	-:-	12:02	
16	04:25	04:10	11:56	00:33	13:04	

December 17, 18, 19 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	86°6.88	131°52.88 S 19°31.11	317°24.10 N22°4.85	12°17.30 N21°57.28	100°29.41 S 08°19.56	
1	101°9.34	146°52.49 30.24	332°26.89 5.05	27°20.12 57.25	115°31.75 19.50	Alpheratz 357°34.80 29°13.87 Ankaa 353°7.11 -42°10.44
2	116°11.81	161°52.10 29.37	347°29.69 5.24	42°22.93 57.22	130°34.09 19.45	Schedar 349°30.97 56°40.74
3	131°14.27	176°51.71 · · 28.51	2°32.49 · · 5.44	57°25.75 · · 57.19	145°36.43 · · 19.39	Diphda 348°47.26 -17°51.07
4	146° 16.74	191°51.32 27.64	17°35.28 5.64	72°28.57 57.16	160°38.77 19.33	Achernar 335°19.91 -57°6.84
5 6	161°19.20 176°21.67	206°50.94 26.77 221°50.55 \$19°25.90	32°38.08 5.84 47°40.88 N22°6.03	87°31.39 57.13 102°34.20 N21°57.11	175°41.11 19.27 190°43.46 \$08°19.21	Hamal 327°51.04 23°34.95
7	170 21.07 191°24.13	236°50.17 25.03	62°43.69 6.23	117°37.02 57.08	205° 45.80 19.16	Polaris 313°39.56 89°22.37
8	206° 26.59	251°49.78 24.16	77°46.49 6.43	132°39.84 57.05	220° 48.14 19.10	Acamar 315°11.47 -40°12.39
9	221°29.06	266°49.40 · · 23.28	92°49.30 · · 6.63	147°42.65 · · 57.02	235°50.48 · · 19.04	Menkar 314°5.94 4°11.29
10	236°31.52	281°49.02 22.41	107°52.11 6.83	162°45.47 56.99	250° 52.82 18.98	Mirfak 308°27.90 49°57.14 Aldebaran 290°39.34 16°33.61
11	251°33.99	296° 48.64 21.54	122°54.91 7.03	177°48.29 56.96	265°55.16 18.92	Aldebaran 290°39.34 16°33.61 Rigel 281°3.57 -8°10.34
12	266°36.45	311°48.26 S 19°20.66	137°57.72 N22°7.23	192°51.10 N21°56.93	280°57.50 S 08°18.86	Capella 280°21.48 46°1.41
13	281°38.91	326°47.88 19.78	153° 0.54 7.43	207°53.92 56.90	295°59.84 18.81	Bellatrix 278°22.59 6°22.37
14	296°41.38	341°47.50 18.91	168° 3.35 7.63	222°56.73 56.87	311°2.18 18.75	Elnath 278°1.55 28°37.73
15	311° 43.84 326° 46.31	356° 47.12 · · 18.03 11° 46.74 17.15	183°6.17 · · 7.84	237°59.55 · · 56.84 253°2.37 56.81	326°4.52 · · 18.69 341°6.86 18.63	Alnilam 275°37.44 -1°11.13
16 17	341°48.77	11°46.74 17.15 26°46.37 16.27	198°8.98 8.04 213°11.80 8.24	253°2.37 56.81 268°5.18 56.78	341°6.86 18.63 356°9.20 18.57	Betelgeuse 270°51.80 7°24.73
18	356° 51.24	41°45.99 \$19°15.39	228°14.62 N22°8.44	283°8.00 N21°56.75	11°11.53 S08°18.51	Canopus 263°51.86 -52°42.42
19	11°53.70	56°45.62 14.51	243°17.44 8.64	298°10.81 56.72	26°13.87 18.45	Sirius 258°25.94 -16°44.96
20	26°56.16	71°45.25 13.63	258°20.26 8.85	313°13.63 56.69	41°16.21 18.40	Adhara 255°5.54 -29°0.26
21	41°58.63	86°44.87 · · 12.75	273°23.09 · · 9.05	328°16.44 · · 56.66	56° 18.55 · · 18.34	Procyon 244°50.59 5°9.67
22	57°1.09	101°44.50 11.87	288°25.91 9.25	343°19.26 56.63	71°20.89 18.28	Pollux 243°17.04 27°57.88 Avior 234°14.25 -59°35.12
23	72°3.56	116°44.13 10.99	303°28.74 9.46	358°22.07 56.60	86°23.23 18.22	Suhail 222°46.06 -43°31.77
Mer.r	pass. 18:13	ν-0.4' d-0.9' m-4.32	ν2.8' d0.2' m-0.87	ν2.8' d-0.0' m-2.80	ν2.3' d-0.1' m1.01	Miaplacidus 221°37.70 -69°48.86
						Alphard 217°47.62 -8°45.94
10/ 1	CIIA	CIIA D	CUA D	CUA D	CIIA D	Regulus 207°34.35 11°50.67
Wed 0	GHA 87°6.02	GHA Dec 131°43.76 \$19°10.10	GHA Dec 318°31.57 N 22°9.66	GHA Dec 13°24.89 N21°56.57	GHA Dec 101°25.57 S 08°18.16	Dubhe 193°40.92 61°36.69
1	102°8.49	146°43.39 9.22	333°34.40 9.87	28°27.70 56.54	116° 27.90 18.10	Denebola 182°25.01 14°25.88
2	102 0.49 117° 10.95	161°43.02 8.33	348°37.23 10.07	43°30.52 56.51	131°30.24 18.04	Gienah 175°43.70 -17°40.72
3	132° 13.41	176° 42.66 · · 7.44	3°40.07 · · 10.28	58°33.33 · · 56.48	146°32.58 · · 17.98	Acrux 173°0.33 -63°13.94
4	147° 15.88	191°42.29 6.56	18°42.90 10.48	73°36.15 56.45	161°34.92 17.92	Gacrux 171°51.85 -57°14.89
5	$162^{\circ}18.34$	206°41.93 5.67	33°45.74 10.69	88°38.96 56.42	176°37.25 17.86	Alioth 166°13.18 55°49.18 Spica 158°22.51 -11°17.43
6	$177^{\circ}20.81$	221°41.56 \$19°4.78	48°48.58 N22°10.90	103°41.77 N21°56.39	191°39.59 S08°17.80	Alkaid 152°52.30 49°11.08
7	192°23.27	236°41.20 3.89	63°51.42 11.10	118°44.59 56.37	206°41.93 17.74	Hadar 148°36.50 -60°29.34
8	207°25.73	251°40.83 3.00	78°54.26 11.31	133°47.40 56.34	221° 44.27 17.68	Menkent 147°57.94 -36°29.39
9	222°28.20	266° 40.47 · · 2.11	93°57.10 · · 11.52	148°50.21 · · 56.31	236° 46.60 · · 17.62	Arcturus 145°48.18 19°3.04
10	237°30.66	281°40.11 1.22	108°59.95 11.72	163°53.03 56.28	251° 48.94 17.56	Rigil Kent. 139°40.86 -60°56.08
11 12	252°33.13 267°35.59	296°39.75 19°0.32 311°39.39 \$18°59.43	124°2.79 11.93 139°5.64 N22°12.14	178°55.84 56.25 193°58.66 N21°56.22	266°51.28 17.51 281°53.61 \$08°17.45	Kochab 137°20.66 74°2.88
13	282° 38.06	326°39.03 58.54	154°8.49 12.35	209°1.47 56.19	296°55.95 17.39	Zuben'ubi 136°56.34 -16°8.66
14	297° 40.52	341°38.68 57.64	169°11.34 12.56	224°4.28 56.16	311°58.29 17.33	Alphecca 126°4.11 26°37.73
15	312°42.98	356°38.32 · · 56.74	184°14.19 · · 12.77	239°7.09 · · 56.13	327°0.62 · · 17.27	Antares 112°16.27 -26°29.19
16	327° 45.45	11°37.96 55.85	199°17.04 12.98	254°9.91 56.10	342°2.96 17.21	Atria 107°11.11 -69°4.24 Sabik 102°3.20 -15°45.33
17	$342^{\circ}47.91$	26°37.61 54.95	214°19.90 13.18	269°12.72 56.07	357°5.29 17.15	Shaula 96°10.87 -37°7.29
18	357°50.38	41°37.26 \$18°54.05	229°22.76 N22°13.40	284°15.53 N21°56.04	12°7.63 \$08°17.09	Rasalhague 95°58.95 12°32.48
19	12°52.84	56°36.90 53.15	244°25.61 13.61	299°18.34 56.01	27°9.96 17.02	Eltanin 90°42.76 51°29.09
20	27°55.30	71°36.55 52.25	259°28.47 13.82	314°21.16 55.98	42°12.30 16.96	Kaus Aust. 83°32.99 -34°22.39
21	42°57.77	86°36.20 · · 51.35	274°31.34 · · 14.03	329°23.97 · · 55.95 344°26.78 55.92	57°14.63 · · 16.90 72°16.97 16.84	Vega 80°33.69 38°48.41
22 23	58°0.23 73°2.70	101°35.85 50.45 116°35.50 49.55	289°34.20 14.24 304°37.06 14.45	344°26.78 55.92 359°29.59 55.89	72°16.97 16.84 87°19.30 16.78	Nunki 75°48.19 -26°15.98
						Altair 62°0.31 8°56.06
Mer.p	pass. 18:09	ν -0.4′ d -0.9′ m-4.33	$\nu 2.8' \ d0.2' \ \text{m-}0.89$	$\nu 2.8' \ d$ -0.0 $' \ m$ -2.80	$ u 2.3' \ d 0.1' \ \text{m} 1.01$	Peacock 53°6.28 -56°39.46
						Deneb 49°26.20 45°22.30
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.03 9°59.41 Al Na'ir 27°33.18 -46°50.63
0	88°5.16	131°35.15 \$18°48.65	319°39.93 N22°14.66	14°32.40 N21°55.86	102°21.64 S 08°16.72	Fomalhaut 15°14.65 -29°29.57
1	103°7.63	146°34.80 47.75	334°42.80 14.87	29°35.22 55.83	117°23.97 16.66	Scheat 13°45.33 28°13.25
2	118° 10.09	161°34.46 46.84	349°45.67 15.09	44°38.03 55.80	132°26.31 16.60	Markab 13°30.02 15°20.46
3	133° 12.55	176°34.11 · · 45.94	4°48.54 · · 15.30	59°40.84 · · 55.78	147°28.64 · · 16.54	
4	148° 15.02	191°33.76 45.03	19°51.41 15.51	74°43.65 55.75	162°30.97 16.48	Dec 17 Tue SHA Mer.pass
5	163°17.48	206°33.42 44.12	34°54.28 15.73	89°46.46 55.72	177°33.31 16.42	Venus 45°46.00 15:13 Mars 231°17.22 02:50
6 7	178° 19.95 193° 22.41	221°33.08 \$18°43.22 236°32.73 42.31	49°57.16 N22°15.94 65°0.03 16.15	104°49.27 N21°55.69 119°52.08 55.66	192°35.64 \$08°16.36 207°37.98 16.30	Jupiter 286°10.42 23:07
8	193 22.41 208°24.87	251°32.39 41.40	80°2.91 16.37	134°54.89 55.63	207 37.98 16.30 222°40.31 16.24	Saturn 14°22.53 17:15
9	208 24.87 223°27.34	266°32.05 · · 40.49	95° 5.79 · · 16.58	149°57.70 · · 55.60	237° 42.64 · · 16.18	
10	238° 29.80	281°31.71 39.58	110°8.67 16.80	165°0.51 55.57	252°44.98 16.11	Dec 18 Wed SHA Mer.pass
11	253°32.27	296°31.37 38.67	125°11.56 17.01	180°3.33 55.54	267° 47.31 16.05	Venus 44°37.74 15:13
12	268° 34.73	311°31.03 \$18°37.76	140°14.44 N22°17.23	195°6.14 N21°55.51	282°49.64 S08°15.99	Mars 231°25.55 02:45 Jupiter 286°18.87 23:02
13	283°37.20	326°30.70 36.85	155°17.33 17.45	210°8.95 55.48	297°51.97 15.93	Saturn 14°19.55 17:12
14	298°39.66	341°30.36 35.93	170°20.21 17.66	225°11.76 55.45	312°54.31 15.87	
15	313° 42.12	356°30.02 · · 35.02	185°23.10 · · 17.88	240°14.57 · · 55.42	327°56.64 · · 15.81	Dec 19 Thu SHA Mer.pass
16	328° 44.59	11°29.69 34.11	200°25.99 18.10	255°17.37 55.39	342°58.97 15.75	Venus 43°29.99 15:14
17 18	343° 47.05 358° 49.52	26°29.36 33.19 41°29.02 \$18°32.27	215°28.89 18.31 230°31.78 N22°18.53	270°20.18 55.36 285°22.99 N21°55.33	358°1.30 15.68 13°3.64 \$08°15.62	Mars 231°34.77 02:41
19	13°51.98	56°28.69 31.36	245°34.68 18.75	300°25.80 55.31	28°5.97 15.56	Jupiter 286°27.24 22:58 Saturn 14°16.48 17:08
20	28° 54.44	71°28.36 30.44	260°37.57 18.97	315°28.61 55.28	43°8.30 15.50	Saturn 14°16.48 17:08
21	43°56.91	86°28.03 · · 29.52	275°40.47 · · 19.18	330°31.42 · · 55.25	58° 10.63 · · 15.44	Horizontal parallax
22	58°59.37	101°27.70 28.60	290°43.37 19.40	345°34.23 55.22	73°12.96 15.38	Venus: 0.2
23	74°1.84	116°27.37 27.68	305°46.27 19.62	0°37.04 55.19	88°15.29 15.31	Mars: 0.2
Mer r	pass. 18:05	ν-0.3' d-0.9' m-4.33	ν2.9' d0.2' m-0.92	ν2.8' d-0.0' m-2.79	ν2.3' d-0.1' m1.01	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°58.92	S23°21.77	337°22.76	5.5'	N27°13.29	-5.2'	58.0'
1	195°58.61	21.85	351°47.22	5.6'	27°8.10	-5.4'	58.0'
2	210°58.31	21.94	6°11.78	5.7'	27°2.74	-5.5'	58.0'
3	225°58.00	• • 22.02	20°36.45	5.8'	26°57.22	-5.7'	57.9'
4	240°57.70	22.10	35°1.22	5.9'	$26^{\circ}51.55$	-5.8'	57.9'
5	255°57.39	22.19	49°26.10	6.0'	26°45.71	-6.0'	57.9'
6	270°57.09	S23°22.27	63°51.09	6.1'	N26°39.71	-6.2'	57.8'
7	285°56.78	22.35	78°16.19	6.2'	26°33.56	-6.3'	57.8'
8	300°56.48 315°56.17	22.43	92°41.40	6.3'	26°27.25 26°20.79	-6.5'	57.8'
9 10	315°56.17 330°55.86	· · 22.51 22.59	107°6.73 121°32.17	6.4' 6.6'	26° 20.79 26° 14.17	-6.6' -6.8'	57.7' 57.7'
11	345°55.56	22.59	121 32.17 135°57.72	6.7'	26°7.41	-0.6 -6.9'	57.7'
12	0°55.25	\$23°22.74	150°23.40	6.8'	N26°0.50	-7.1	57.6'
13	15°54.95	22.82	164°49.18	6.9'	25°53.44	-7.2'	57.6'
14	30°54.64	22.89	179°15.09	7.0'	25°46.24	-7.3	57.6'
15	45°54.34	• • 22.96	193°41.12	7.1'	25°38.89	-7.5'	57.5'
16	60°54.03	23.04	208°7.26	7.3'	25°31.40	-7.6'	57.5'
17	75°53.72	23.11	222°33.53	7.4'	25°23.78	-7.8'	57.5'
18	90°53.42	S23°23.18	236°59.92	7.5'	N25°16.01	-7.9'	57.4'
19	105°53.11	23.25	251°26.43	7.6'	25°8.11	-8.0'	57.4'
20	120°52.81	23.32	265°53.06	7.8'	25°0.07	-8.2'	57.4'
21 22	135°52.50 150°52.19	· · 23.39 23.46	280°19.81 294°46.69	7.9' 8.0'	24°51.90 24°43.60	-8.3' -8.4'	57.3' 57.3'
22	150°52.19 165°51.89	23.46	294°46.69 309°13.69	8.0'	24°43.60 24°35.17	-8.4° -8.6'	57.3'
23						.0.0	51.5
	SD = 16.2'	d = 0.1'		SI	O = 15.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.58	\$23°23.60	323°40.82	8.2'	N24°26.61	-8.7'	57.2'
1	195°51.27 210°50.97	23.66	338°8.07	8.4'	24°17.92 24°9.12	-8.8'	57.2'
2	210°50.97 225°50.66	23.73	352°35.44 7°2.94	8.5' 8.6'	24°9.12 24°0.18	-8.9' -9.1'	57.2' 57.1'
4	240°50.35	23.79	21°30.56	8.7'	24 0.16 23°51.13	-9.1 -9.2'	57.1'
5	255°50.05	23.92	35°58.31	8.9'	23°41.96	-9.3	57.1'
6	270°49.74	S23°23.98	50°26.19	9.0'	N23°32.67	-9.4	57.0'
7	285°49.43	24.04	64°54.19	9.1'	23°23.27	-9.5'	57.0'
8	300°49.13	24.10	79°22.31	9.2'	23°13.75	-9.6'	57.0'
9	315°48.82	• • 24.16	93°50.56	9.4'	23°4.12	-9.7'	56.9'
10	330°48.51	24.22	108°18.93	9.5'	22°54.37	-9.9'	56.9'
11	345°48.20	24.28 5 23°24.33	122°47.43 137°16.05	9.6'	22°44.52 N22°34.56	-10.0'	56.9'
12 13	0°47.90 15°47.59	24.39	151°44.79	9.7' 9.9'	N22° 34.50 22° 24.50	-10.1' -10.2'	56.8' 56.8'
14	30°47.28	24.45	166° 13.66	10.0'	22°14.33	-10.2	56.8'
15	45°46.97	24.50	180°42.66	10.1	22°4.06	-10.4	56.7'
16	60°46.67	24.55	195°11.77	10.2'	21°53.69	-10.5'	56.7'
17	75°46.36	24.61	$209^{\circ}41.01$	10.4'	21°43.22	-10.6'	56.7'
18	90°46.05	\$23°24.66	224°10.37	10.5'	N21°32.66	-10.7'	56.6'
19	105°45.74	24.71	238°39.85	10.6'	21°22.00	-10.8'	56.6'
20	120°45.44	24.76	253°9.45	10.7'	21°11.24	-10.8'	56.6'
21 22	135°45.13 150°44.82	· · 24.81 24.86	267°39.18 282°9.02	10.8' 11.0'	21°0.39 20°49.45	-10.9' -11.0'	56.5' 56.5'
23	150 44.82 165°44.51	24.80	282 9.02 296°38.98	11.1'	20 49.45 20°38.42	-11.0 -11.1'	56.5'
23	SD = 16.2'		290 30.90			-11.1	30.5
	SD = 10.2'	d = 0.1'		51	D = 15.6'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.20	S23°24.96	311°9.06	11.2'	N20°27.31	-11.2'	56.5'
1	195°43.90	25.00	325°39.26	11.3'	20°16.10	-11.3'	56.4'
2	210°43.59 225°43.28	25.05	340°9.58 354°40.01	11.4'	20°4.82 19°53.44	-11.4'	56.4'
3 4	225°43.28 240°42.97	· · 25.09 25.14	354°40.01 9°10.56	11.5' 11.7'	19°53.44 19°41.99	-11.5' -11.5'	56.4' 56.3'
5	255°42.66	25.14	23°41.22	11.7	19°41.99	-11.5'	56.3
6	270°42.35	S23°25.22	38°12.00	11.9'	N19°18.85	-11.7'	56.3'
7	285°42.05	25.26	52°42.89	12.0'	19°7.16	-11.8'	56.2'
8	300°41.74	25.30	67°13.89	12.1'	18°55.40	-11.8'	56.2'
9	315°41.43	• • 25.34	81°45.01	12.2'	18°43.56	-11.9'	56.2'
10	330°41.12	25.38	96°16.23	12.3'	18°31.65	-12.0'	56.1'
11	345°40.81	25.42	110°47.57	12.4'	18°19.67	-12.1'	56.1'
12 13	0°40.50 15°40.19	\$23°25.46 25.50	125°19.01 139°50.56	12.6' 12.7'	N18°7.61 17°55.49	-12.1' -12.2'	56.1' 56.0'
13 14	30°39.89	25.50 25.53	139°50.56 154°22.22	12.7	17°55.49 17°43.31	-12.2' -12.3'	56.0'
15	45°39.58	25.57	168°53.99	12.9'	17°31.05	-12.3'	56.0'
16	60°39.27	25.60	183°25.86	13.0'	17°18.73	-12.4'	56.0'
17	75°38.96	25.63	197°57.83	13.1'	17°6.35	-12.4'	55.9'
18	90°38.65	S23°25.67	212°29.90	13.2'	$N16^{\circ}53.91$	-12.5'	55.9'
19	105°38.34	25.70	227°2.08	13.3'	16°41.41	-12.6'	55.9'
20	120°38.03	25.73	241°34.36	13.4'	16°28.85	-12.6'	55.8'
21 22	135°37.72 150°37.41	· · 25.76 25.79	256°6.74 270°39.21	13.5' 13.6'	16°16.22 16°3.55	-12.7' -12.7'	55.8' 55.8'
23	165°37.10	25.79	270 39.21 285°11.79	13.7'	15°50.82	-12. <i>1</i> -12.8'	55.7'
	SD = 16.2'	d = 0.0'			D = 15.4'	0	
	JD — 10.2	<u>u — 0.0</u>		31			

Lat.	Twilight		Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.	
N 72°	08:24	10:55			12:59	15:30	
N 70°	08:04	09:52			14:01	15:50	
68°	07:48	09:17			14:36	16:06	
66°	07:35	08:52	10:33	13:21	15:02	16:19	
64°	07:24	08:32	09:50	14:03	15:21	16:30	
62°	07:14	08:16	09:22	14:32	15:37	16:39	
60°	07:06	08:03	09:00	14:53	15:51	16:48	
N 58°	06:58	07:51	08:43	15:11	16:03	16:55	
56°	06:51	07:41	08:28	15:25	16:13	17:02	
54°	06:45	07:32	08:15	15:38	16:22	17:08	
52°	06:40	07:23	08:04	15:49	16:30	17:14	
50°	06:34	07:16	07:54	15:59	16:38	17:19	
45°	06:23	07:00	07:34	16:20	16:54	17:31	
N 40°	06:12	06:46	07:17	16:37	17:07	17:41	
35°	06:03	06:34	07:03	16:51	17:19	17:51	
30°	05:54	06:24	06:50	17:03	17:30	18:00	
20°	05:38	06:05	06:29	17:25	17:49	18:16	
N 10°	05:21	05:48	06:11	17:43	18:06	18:32	
0°	05:04	05:31	05:53	18:01	18:23	18:49	
S 10°	04:45	05:12	05:35	18:18	18:41	19:08	
20°	04:23	04:52	05:17	18:37	19:02	19:31	
30°	03:54	04:27	04:54	18:59	19:27	20:00	
35°	03:35	04:12	04:41	19:12	19:42	20:19	
40°	03:12	03:54	04:26	19:27	20:00	20:42	
45°	02:41	03:31	04:08	19:45	20:23	21:13	
S 50°	01:56	03:01	03:46	20:08	20:53	21:58	
52°	01:28	02:46	03:35	20:19	21:08	22:26	
54°	00:42	02:28	03:23	20:31	21:26	23:13	
56°	////	02:06	03:08	20:45	21:48	////	
58°	////	01:36	02:52	21:02	22:18	////	
S 60°	////	00:46	02:31	21:23	23:09	////	

Lat.		Moonris	e		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°			17:09			14:46
N 70°			18:07			13:46
68°		15:23	18:40		14:48	13:11
66°		16:49	19:04		13:20	12:46
64°	14:51	17:26	19:23	13:25	12:42	12:26
62°	15:54	17:53	19:38	12:22	12:15	12:09
60°	16:28	18:13	19:51	11:47	11:54	11:56
N 58°	16:53	18:30	20:02	11:21	11:36	11:44
56°	17:13	18:44	20:11	11:01	11:22	11:34
54°	17:29	18:56	20:19	10:44	11:09	11:25
52°	17:44	19:06	20:27	10:30	10:58	11:17
50°	17:56	19:16	20:34	10:17	10:48	11:09
45°	18:21	19:36	20:48	09:51	10:26	10:53
N 40°	18:41	19:52	20:59	09:30	10:09	10:40
35°	18:58	20:05	21:09	09:12	09:55	10:29
30°	19:13	20:17	21:18	08:57	09:42	10:19
20°	19:37	20:37	21:33	08:31	09:20	10:02
N 10°	19:58	20:54	21:46	08:09	09:01	09:48
0°	20:18	21:10	21:58	07:48	08:44	09:34
S 10°	20:37	21:26	22:10	07:27	08:26	09:19
20°	20:58	21:43	22:22	07:05	08:06	09:04
30°	21:22	22:03	22:37	06:38	07:44	08:47
35°	21:36	22:14	22:45	06:22	07:31	08:36
40°	21:52	22:27	22:55	06:04	07:15	08:25
45°	22:12	22:42	23:06	05:42	06:57	08:11
S 50°	22:36	23:01	23:19	05:14	06:34	07:53
52°	22:47	23:10	23:25	05:00	06:23	07:45
54°	23:00	23:20	23:32	04:44	06:10	07:36
56°	23:15	23:31	23:40	04:25	05:56	07:26
58°	23:33	23:43	23:48	04:01	05:39	07:14
S 60°	23:55	23:58	23:58	03:30	05:18	07:00

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-85%	
17	03:56	03:41	11:56	01:34	14:03		
18	03:26	03:12	11:57	02:31	14:57		
19	02:57	02:42	11:57	03:22	15:46		

December 20, 21, 22 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	89°4.30	131°27.04 \$18°26.76	320°49.17 N22°19.84	15°39.85 N21°55.16	103°17.62 \$08°15.25	
1	104°6.77	146°26.72 25.84	335°52.08 20.06	30°42.65 55.13	118° 19.95 15.19	Alpheratz 357°34.81 29°13.86
2	119°9.23	161°26.39 24.92	350°54.99 20.28	45°45.46 55.10	133°22.28 15.13	Ankaa 353°7.12 -42°10.44
3	134°11.69	176°26.07 · · 24.00	5°57.89 · · 20.50	60°48.27 · · 55.07	148°24.62 · · 15.07	Schedar 349°31.00 56°40.74
4	$149^{\circ}14.16$	191°25.74 23.07	21°0.80 20.72	75°51.08 55.04	163°26.95 15.00	Diphda 348°47.27 -17°51.08
5	$164^{\circ}16.62$	206°25.42 22.15	36° 3.71 20.94	90°53.89 55.01	178°29.28 14.94	Achernar 335°19.93 -57°6.84 Hamal 327°51.05 23°34.95
6	$179^{\circ}19.09$	221°25.10 \$18°21.23	51°6.62 N22°21.16	105°56.69 N21°54.98	193°31.61 S08°14.88	Polaris 313°40.47 89°22.39
7	194°21.55	236°24.78 20.30	66° 9.54 21.38	120°59.50 54.95	208° 33.94 14.82	Acamar 315°11.48 -40°12.40
8	209°24.01	251°24.46 19.37	81°12.45 21.61	136°2.31 54.92	223°36.27 14.75	Menkar 314°5.95 4°11.29
9	224° 26.48	266°24.14 · · 18.45	96°15.37 · · 21.83	151°5.12 · · 54.89	238°38.60 · · 14.69	Mirfak 308°27.91 49°57.15
10	239° 28.94	281°23.82 17.52	111°18.29 22.05	166°7.92 54.87	253°40.93 14.63	Aldebaran 290°39.34 16°33.61
11	254°31.41	296°23.50 16.59 311°23.18 \$18°15.66	126°21.21 22.27 141°24.13 N22°22.50	181°10.73 54.84 196°13.54 N21°54.81	268° 43.25 14.57 283° 45.58 \$08° 14.50	Rigel 281°3.57 -8°10.35
12 13	269° 33.87 284° 36.33	311°23.18 \$18°15.66 326°22.87 14.73	156°27.05 22.72	196°13.54 N21°54.81 211°16.34 54.78	283°45.58	Capella 280°21.47 46°1.42
14	299° 38.80	341°22.55 13.80	171°29.98 22.72	211 10.34 54.76 226°19.15 54.75	313°50.24 14.38	Bellatrix 278°22.59 6°22.36
15	314°41.26	356°22.24 · · 12.87	186°32.90 · · 23.17	241°21.96 · · 54.72	328°52.57 ·· 14.32	Elnath 278°1.54 28°37.73
16	329°43.73	11°21.92 11.94	201°35.83 23.39	256°24.76 54.69	343°54.90 14.25	Alnilam 275°37.43 -1°11.13
17	344°46.19	26°21.61 11.01	216°38.76 23.61	271°27.57 54.66	358°57.23 14.19	Betelgeuse 270°51.79 7°24.72
18	359°48.66	41°21.30 S 18°10.07	231°41.69 N22°23.84	286°30.37 N21°54.63	13°59.56 \$08°14.13	Canopus 263°51.85 -52°42.44
19	$14^{\circ}51.12$	56°20.99 9.14	246°44.62 24.06	301°33.18 54.60	29°1.88 14.06	Sirius 258°25.93 -16°44.97 Adhara 255°5.53 -29°0.27
20	29°53.58	71°20.68 8.20	261°47.56 24.29	316°35.99 54.57	44°4.21 14.00	
21	44°56.05	86°20.37 · · 7.27	276°50.49 · · 24.52	331°38.79 · · 54.54	59°6.54 · · 13.94	Procyon 244°50.57 5°9.66 Pollux 243°17.02 27°57.89
22	59°58.51	101°20.06 6.33	291°53.43 24.74	346°41.60 54.52	74°8.87 13.87	Avior 234°14.23 -59°35.13
23	75°0.98	116° 19.76 5.39	306°56.37 24.97	1°44.40 54.49	89°11.20 13.81	Suhail 222°46.04 -43°31.78
Mer	pass. 18:01	ν-0.3' d-0.9' m-4.34	ν 2.9' d0.2' m-0.94	ν2.8' d-0.0' m-2.79	ν2.3' d-0.1' m1.02	Miaplacidus 221°37.67 -69°48.88
						Alphard 217°47.59 -8°45.95
						Regulus 207°34.33 11°50.66
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.87 61°36.69
0	90°3.44	131°19.45 \$18°4.46	321°59.30 N22°25.19	16°47.21 N21°54.46	104°13.52 S08°13.75	Denebola 182°24.98 14°25.87
1	105°5.90	146°19.14 3.52	337°2.25 25.42	31°50.01 54.43	119° 15.85 13.68	Gienah 175°43.67 -17°40.73
2	120°8.37	161°18.84 2.58 176°18.54 •• 1.64	352°5.19 25.65 7°8.13 · · 25.87	46°52.82 54.40	134°18.18 13.62	Acrux 173°0.29 -63°13.94
3 4	135° 10.83 150° 13.30	176°18.54 · · 1.64 191°18.23 18°0.70	7°8.13 · · · 25.87 22°11.08 26.10	61°55.62 · · 54.37 76°58.42 54.34	149°20.50 · · 13.56 164°22.83 13.49	Gacrux 171°51.82 -57°14.89
5	165° 15.76	206°17.93 17°59.76	37°14.03 26.33	92°1.23 54.31	164°22.83 13.49 179°25.16 13.43	Alioth 166°13.14 55°49.17
6	180° 18.22	200 17.93 17 59.70 221°17.63 \$17°58.82	52°16.98 N22°26.56	107°4.03 N21°54.28	194°27.49 S08°13.37	Spica 158°22.49 -11°17.44
7	195° 20.69	236°17.33 57.87	67°19.93 26.79	122°6.84 54.25	209°29.81 13.30	Alkaid 152°52.27 49°11.06
8	210°23.15	251°17.03 56.93	82°22.88 27.01	137°9.64 54.22	224°32.14 13.24	Hadar 148°36.46 -60°29.34
9	225°25.62	266°16.73 · · 55.99	97°25.83 · · 27.24	152°12.44 · · 54.19	239° 34.46 · · 13.17	Menkent 147°57.91 -36°29.40
10	240°28.08	281°16.43 55.04	112°28.79 27.47	167°15.25 54.17	254°36.79 13.11	Arcturus 145°48.16 19°3.03
11	255°30.54	296°16.14 54.10	127°31.74 27.70	182°18.05 54.14	269°39.12 13.05	Rigil Kent. 139°40.83 -60°56.07 Kochab 137°20.61 74°2.86
12	270°33.01	311°15.84 S 17°53.15	142°34.70 N22°27.93	197°20.85 N21°54.11	284°41.44 \$08°12.98	Zuben'ubi 136°56.32 -16°8.67
13	285°35.47	326°15.55 52.20	157°37.66 28.16	212°23.66 54.08	299° 43.77 12.92	Alphecca 126°4.09 26°37.71
14	$300^{\circ}37.94$	341°15.25 51.26	172°40.62 28.39	227°26.46 54.05	314°46.09 12.85	Antares 112°16.25 -26°29.19
15	315°40.40	356°14.96 · · 50.31	187°43.58 · · 28.62	242°29.26 · · 54.02	329°48.42 · · 12.79	Atria 107°11.09 -69°4.23
16	330°42.87	11°14.67 49.36	202°46.55 28.85	257°32.06 53.99	344°50.74 12.72	Sabik 102°3.19 -15°45.34
17	345°45.33	26°14.38 48.41	217°49.51 29.08	272°34.87 53.96	359°53.07 12.66	Shaula 96°10.86 -37°7.29
18	0°47.79	41°14.09 \$17°47.46	232°52.48 N22°29.32	287°37.67 N21°53.93	14°55.39 \$08°12.60	Rasalhague 95°58.94 12°32.47
19	15° 50.26	56°13.80 46.51	247°55.45 29.55	302°40.47 53.90	29° 57.72 12.53	Eltanin 90°42.75 51°29.07
20 21	30° 52.72 45° 55.19	71°13.51 45.56 86°13.22 •• 44.60	262°58.42 29.78 278°1.39 · · 30.01	317°43.27 53.88 332°46.07 · · 53.85	45°0.04 12.47 60°2.37 · · 12.40	Kaus Aust. 83°32.99 -34°22.39
22	60° 57.65	101°12.94 43.65	293°4.37 30.24	347°48.88 53.82	75°4.69 12.34	Vega 80°33.69 38°48.39
23	76°0.11	116° 12.65 42.70	308°7.34 30.48	2°51.68 53.79	90°7.01 12.27	Nunki 75°48.18 -26°15.98
				-		Altair 62°0.31 8°56.05
Mer.	pass. 17:57	ν -0.3′ <i>d</i> -0.9′ m-4.35	$ u 2.9' \ d0.2' \ \text{m-}0.96$	$\nu 2.8' \ d$ -0.0' m-2.79	$ u 2.3' \ d$ -0.1' m1.02	Peacock 53°6.28 -56°39.45
						Deneb 49°26.21 45°22.28
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.04 9°59.40 Al Na'ir 27°33.19 -46°50.63
0	91°2.58	131°12.37 S 17°41.74	323°10.32 N22°30.71	17°54.48 N21°53.76	105°9.34 \$08°12.21	Fomalhaut 15°14.66 -29°29.57
1	106°5.04	146°12.08 40.79	338°13.29 30.94	32°57.28 53.73	120°11.66 12.14	Scheat 13°45.35 28°13.24
2	121°7.51	161°11.80 39.83	353°16.27 31.18	48°0.08 53.70	135° 13.99 12.08	Markab 13°30.03 15°20.46
3	136°9.97	176°11.52 · · 38.88	8°19.25 · · 31.41	63°2.88 · · 53.67	150°16.31 · · 12.01	
4	151°12.43	191°11.23 37.92	23°22.24 31.65	78°5.68 53.64	165°18.63 11.95	Dec 20 Fri SHA Mer.pass
5	166° 14.90	206°10.95 36.96	38°25.22 31.88	93°8.48 53.62	180°20.96 11.88	Venus 42°22.74 15:15
6	181°17.36	221°10.67 \$17°36.00	53°28.21 N22°32.11	108°11.28 N21°53.59	195°23.28	Mars 231°44.87 02:36
7	196° 19.83	236°10.40 35.04	68°31.19 32.35	123°14.08 53.56	210°25.60 11.75	Jupiter 286°35.55 22:53 Saturn 14°13.32 17:04
8 9	211°22.29 226°24.75	251°10.12 34.08 266°9.84 · · 33.12	83°34.18 32.58 98°37.17 · · · 32.82	138°16.88 53.53 153°19.68 •• 53.50	225°27.92 11.69 240°30.25 · · 11.62	
10	241° 27.22	281°9.57 32.16	113°40.16 33.06	168°22.48 53.47	255° 32.57 11.56	Dec 21 Sat SHA Mer.pass
11	256° 29.68	296°9.29 31.20	128°43.16 33.29	183°25.28 53.44	270°34.89 11.49	Venus 41°16.01 15:15
12	271°32.15	311°9.02 S17°30.24	143°46.15 N22°33.53	198°28.08 N21°53.41	285°37.21 S08°11.43	Mars 231°55.87 02:32
13	286° 34.61	326°8.74 29.28	158°49.15 33.76	213°30.88 53.38	300°39.54 11.36	Jupiter 286° 43.77 22:49
14	301°37.08	341°8.47 28.31	173°52.14 34.00	228°33.68 53.36	315°41.86 11.29	Saturn 14°10.08 17:00
15	$316^{\circ}39.54$	356°8.20 · · 27.35	188°55.14 · · 34.24	243°36.48 · · 53.33	330°44.18 · · 11.23	Dec 22 Sun SHA Mer.pass
16	331°42.00	11°7.93 26.38	203°58.14 34.48	258°39.27 53.30	345°46.50 11.16	Venus 40°9.79 15:15
17	346° 44.47	26°7.66 25.42	219°1.15 34.71	273°42.07 53.27	0°48.82 11.10	Mars 232°7.74 02:27
18	1°46.93	41°7.39 S 17°24.45	234°4.15 N22°34.95	288°44.87 N21°53.24	15°51.14 \$08°11.03	Jupiter 286°51.90 22:44
19	16°49.40	56°7.12 23.48	249°7.15 35.19	303°47.67 53.21	30°53.47 10.97	Saturn 14° 6.76 16:57
20	31°51.86	71°6.86 22.51	264°10.16 35.43	318°50.47 53.18	45°55.79 10.90	Horizontal parallax
21	46° 54.32	86°6.59 · · 21.55	279°13.17 · · 35.67	333°53.26 · · 53.15	60°58.11 · · 10.83	Venus: 0.2
22 23	61°56.79 76°59.25	101°6.32 20.58 116°6.06 19.61	294°16.18 35.91 309°19.19 36.14	348°56.06 53.13 3°58.86 53.10	76° 0.43 10.77 91° 2.75 10.70	Mars: 0.2
Mer.	pass. 17:53	ν-0.3′ d-1.0′ m-4.36	ν3.0′ d0.2′ m-0.99	$\nu 2.8' \ d$ -0.0' m-2.79	ν2.3′ d-0.1′ m1.02	
_						

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.79	\$23°25.85	299°44.46	13.8'	N15°38.03	-12.8'	55.7'
1	195°36.49	25.87	314° 17.22	13.9'	15°25.19	-12.9'	55.7'
2	210°36.18	25.90	328°50.08	14.0'	15°12.30	-12.9'	55.7'
3 4	225°35.87 240°35.56	· · 25.92 25.95	343°23.03 357°56.07	14.0' 14.1'	14°59.36 14°46.37	-13.0' -13.0'	55.6' 55.6'
5	255°35.25	25.95	12°29.21	14.1	14°40.37 14°33.33	-13.1'	55.6'
6	270°34.94	\$23°26.00	27°2.43	14.3'	N14°20.24	-13.1'	55.6'
7	285°34.63	26.02	41°35.74	14.4'	$14^{\circ}7.11$	-13.2'	55.5'
8	300°34.32	26.04	56°9.14	14.5'	13°53.94	-13.2'	55.5'
9	315°34.01 330°33.70	• • 26.06	70°42.62 85°16.19	14.6'	13°40.72 13°27.45	-13.3'	55.5'
10 11	345°33.39	26.08 26.10	99°49.84	14.7' 14.7'	13 27.45 13°14.15	-13.3' -13.3'	55.4' 55.4'
12	0°33.08	\$23°26.12	114°23.57	14.8'	N13°0.81	-13.4	55.4'
13	15°32.77	26.13	128°57.38	14.9'	$12^{\circ}47.43$	-13.4'	55.4'
14	30°32.46	26.15	143°31.28	15.0'	12°34.00	-13.5'	55.3'
15	45°32.15	•• 26.16	158°5.25	15.0'	12°20.55	-13.5'	55.3'
16 17	60°31.84 75°31.53	26.18 26.19	172°39.29 187°13.42	15.1' 15.2'	12°7.05 11°53.52	-13.5' -13.6'	55.3' 55.3'
18	90°31.22	523°26.21	201°47.62	15.3'	N11°39.96	-13.6'	55.2'
19	105°30.91	26.22	216°21.89	15.3'	11°26.36	-13.6'	55.2'
20	120°30.60	26.23	230°56.23	15.4'	$11^{\circ}12.74$	-13.7'	55.2'
21	135°30.29	• • 26.24	245°30.65	15.5'	10°59.08	-13.7'	55.2'
22	150°29.98	26.25 26.26	260°5.13 274°39.68	15.6'	10°45.39	-13.7' -13.7'	55.1'
23	165°29.67		214-39.68	15.6'	10°31.67	-13.7	55.1'
	SD = 16.2'	d = 0.0'		SI	D = 15.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.36	\$23°26.27	289°14.30	15.7'	$N10^{\circ}17.92$	-13.8'	55.1'
1	195°29.05	26.27	303°48.99	15.7'	10°4.15	-13.8'	55.1'
2	210°28.74	26.28	318°23.74	15.8'	09°50.35	-13.8'	55.1'
3 4	225°28.43 240°28.12	· · 26.29 26.29	332°58.55 347°33.43	15.9' 15.9'	09°36.52 09°22.67	-13.9' -13.9'	55.0' 55.0'
5	255°27.81	26.30	2°8.36	16.0'	09°22.07	-13.9'	55.0'
6	270°27.50	S23°26.30	16°43.36	16.1'	N08°54.90	-13.9'	55.0'
7	285°27.19	26.30	$31^{\circ}18.41$	16.1'	08°40.99	-13.9'	54.9'
8	300°26.88	26.30	45°53.52	16.2'	08°27.05	-14.0'	54.9'
9	315°26.57	• • 26.30	60°28.69	16.2	08°13.09	-14.0'	54.9'
10 11	330°26.26 345°25.95	26.30 26.30	75°3.90 89°39.18	16.3' 16.3'	07°59.11 07°45.11	-14.0' -14.0'	54.9' 54.9'
12	0°25.64	\$23°26.30	104°14.50	16.4	N07°31.09	-14.0'	54.8'
13	15°25.33	26.30	118°49.88	16.4	07°17.06	-14.0'	54.8'
14	30°25.02	26.30	133°25.30	16.5'	$07^{\circ}3.01$	-14.1'	54.8'
15	45°24.70	• • 26.29	148°0.77	16.5'	06°48.95	-14.1'	54.8'
16	60°24.39 75°24.08	26.29 26.28	162°36.29 177°11.85	16.6'	06°34.87 06°20.78	-14.1'	54.8'
17 18	90°23.77	20.28 \$23°26.27	177 11.85 191°47.46	16.6' 16.7'	N06°6.67	-14.1' -14.1'	54.7' 54.7'
19	105°23.46	26.27	206°23.11	16.7	05°52.56	-14.1'	54.7'
20	120°23.15	26.26	220°58.80		05°38.43	-14.1'	54.7'
21	135°22.84	• • 26.25	235°34.54	16.8'	05°24.29	-14.1'	54.7'
22	150°22.53 165°22.22	26.24	250°10.31 264°46.12	16.8'	05°10.14 04°55.98	-14.2'	54.6'
23		26.23	204 40.12	16.8'		-14.2'	54.6'
	SD = 16.3'	d = 0.0'		SI	D = 15.0'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.91	\$23°26.22	279°21.96	16.9'	N04°41.82	-14.2'	54.6'
1	195°21.60	26.21	293°57.84	16.9'	04°27.64	-14.2'	54.6'
2	210°21.29 225°20.98	26.19	308°33.76 323°9.71	16.9'	04°13.46 03°59.27	-14.2' -14.2'	54.6'
3 4	225°20.98 240°20.67	· · 26.18 26.16	323°9.71 337°45.69	17.0' 17.0'	03°59.27 03°45.08	-14.2' -14.2'	54.6' 54.5'
5	255°20.36	26.15	352°21.69	17.0'	03°30.88	-14.2'	54.5'
6	270°20.04	\$23°26.13	6°57.73	17.1'	N03°16.68	-14.2'	54.5'
7	285°19.73	26.11	21°33.80	17.1'	03°2.47	-14.2'	54.5'
8	300°19.42 315°19.11	26.10	36°9.89	17.1'	02°48.26 02°34.05	-14.2'	54.5'
9 10	315°19.11 330°18.80	· · 26.08 26.06	50°46.01 65°22.15	17.1' 17.2'	02°34.05 02°19.84	-14.2' -14.2'	54.5' 54.5'
11	345°18.49	26.04	79°58.31	17.2'	02°5.63	-14.2'	54.4'
12	0°18.18	S23°26.02	94°34.50	17.2'	N01°51.41	-14.2'	54.4'
13	15°17.87	25.99	109°10.71	17.2'	01°37.20	-14.2'	54.4'
14	30°17.56	25.97	123°46.93	17.2'	01°22.99	-14.2'	54.4'
15 16	45°17.25 60°16.94	· · 25.95 25.92	138°23.17 152°59.43	17.3' 17.3'	01°8.78 00°54.57	-14.2' -14.2'	54.4' 54.4'
17	75°16.63	25.92 25.90	152 59.43 167°35.71	17.3	00° 40.37	-14.2'	54.4' 54.4'
18	90°16.31	\$23°25.87	182°11.99	17.3'	N00°26.17	-14.2'	54.4'
19	105°16.00	25.84	196°48.30	17.3'	N00°11.98	-14.2'	54.3'
20	120°15.69	25.82	211°24.61	17.3'	S00°2.21	14.2'	54.3'
21 22	135°15.38 150°15.07	· · 25.79 25.76	226°0.93 240°37.26	17.3' 17.3'	00°16.40 00°30.58	14.2' 14.2'	54.3' 54.3'
23	150° 15.07 165° 14.76	25.76 25.73	240°37.26 255°13.60	17.3'	00°30.58	14.2'	54.3'
20	SD = 16.3'				D = 14.9'	- 1.4	51.5
	JD = 10.3′	d = -0.0'		51	∪ = 14.9°		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Juliuse	Juliset	Civil	Naut.
N 72°	08:26	10:58			12:58	15:31
N 70°	08:06	09:55			14:02	15:51
68°	07:50	09:19			14:37	16:07
66°	07:37	08:54	10:35	13:21	15:03	16:20
64°	07:26	08:34	09:52	14:04	15:22	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:07	08:04	09:02	14:54	15:52	16:49
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:53	07:42	08:30	15:27	16:14	17:03
54°	06:47	07:33	08:17	15:39	16:23	17:10
52°	06:41	07:25	08:06	15:51	16:32	17:15
50°	06:36	07:18	07:56	16:00	16:39	17:21
45°	06:24	07:01	07:35	16:21	16:55	17:32
N 40°	06:14	06:48	07:18	16:38	17:09	17:43
35°	06:04	06:36	07:04	16:52	17:21	17:52
30°	05:56	06:25	06:52	17:05	17:31	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:49	06:12	17:45	18:07	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
S 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:53	05:18	18:39	19:03	19:32
30°	03:55	04:28	04:56	19:01	19:28	20:02
35°	03:36	04:13	04:43	19:14	19:44	20:20
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:42	03:32	04:10	19:47	20:24	21:14
S 50°	01:57	03:02	03:47	20:10	20:54	22:00
52°	01:29	02:47	03:36	20:20	21:09	22:28
54°	00:41	02:29	03:24	20:33	21:27	23:15
56°	////	02:07	03:10	20:47	21:50	////
58°	////	01:37	02:53	21:04	22:20	////
S 60°	////	00:46	02:32	21:24	23:11	////

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	20:08	22:17		13:19	12:37	12:03
N 70°	20:28	22:25		12:57	12:26	12:01
68°	20:43	22:31		12:40	12:18	11:59
66°	20:55	22:36		12:26	12:11	11:58
64°	21:06	22:40		12:14	12:05	11:56
62°	21:14	22:43		12:04	12:00	11:55
60°	21:21	22:47		11:56	11:55	11:54
N 58°	21:28	22:49		11:48	11:51	11:53
56°	21:34	22:52		11:42	11:47	11:52
54°	21:39	22:54		11:36	11:44	11:51
52°	21:43	22:56		11:30	11:41	11:51
50°	21:47	22:58		11:25	11:38	11:50
45°	21:56	23:02		11:15	11:32	11:48
N 40°	22:04	23:05		11:06	11:27	11:47
35°	22:10	23:08		10:58	11:23	11:46
30°	22:16	23:10		10:51	11:19	11:45
20°	22:25	23:15		10:39	11:13	11:44
N 10°	22:33	23:18		10:29	11:07	11:42
0°	22:41	23:22		10:19	11:01	11:41
S 10°	22:49	23:25		10:09	10:55	11:39
20°	22:57	23:29		09:58	10:49	11:38
30°	23:07	23:33	23:59	09:46	10:42	11:36
35°	23:12	23:36	23:58	09:39	10:38	11:35
40°	23:18	23:39	23:58	09:31	10:34	11:34
45°	23:25	23:42	23:57	09:21	10:28	11:33
S 50°	23:33	23:45	23:57	09:09	10:22	11:31
52°	23:37	23:47	23:56	09:04	10:19	11:30
54°	23:42	23:49	23:56	08:58	10:15	11:29
56°	23:46	23:51	23:55	08:51	10:12	11:28
58°	23:51	23:53	23:55	08:44	10:07	11:27
S 60°	23:57	23:56	23:55	08:35	10:03	11:26

December 23, 24, 25 UT (Mon., Tue., Wed.)

h	Aries	Ve	nus		ars	Jur	oiter	Sat	urn		Stars
				CIIA							
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	92°1.72	131°5.80	S17°18.64	324°22.20	N22°36.38	19°1.66	N21°53.07	106°5.07	S08°10.64	Alpheratz	357°34.83
1	$107^{\circ}4.18$	146°5.53	17.67	339°25.22	36.62	34°4.45	53.04	121°7.39	10.57	Ankaa	353°7.14
2	122°6.64	161°5.27	16.69	354°28.23	36.86	49°7.25	53.01	$136^{\circ}9.71$	10.50		
3	137°9.11	176°5.01	• • 15.72	9°31.25	• • 37.10	64°10.05	• • 52.98	151°12.03	• • 10.44	Schedar	349°31.02
4	152° 11.57	191°4.75	14.75	24°34.27	37.34	79°12.84	52.95	166°14.35	10.37	Diphda	348° 47.28
5	167° 14.04	206°4.49	13.77	39°37.29	37.58	94°15.64	52.92	181°16.67	10.30	Achernar	335° 19.95
6	182° 16.50	221°4.24	S17°12.80	54°40.31	N22°37.83	109°18.43	N21°52.90	196° 18.99	S08°10.24	Hamal	327°51.06
7	197° 18.96	236°3.98	11.82	69°43.33	38.07	124°21.23	52.87	211°21.31	10.17	Polaris	313°41.44
		250° 3.90 251° 3.72								Acamar	315°11.49
8	212°21.43		10.85	84°46.36	38.31	139°24.03	52.84	226°23.63	10.10	Menkar	314°5.95
9	227°23.89	266°3.47	• • 9.87	99°49.38	• • 38.55	154°26.82	• • 52.81	241°25.95	• • 10.04	Mirfak	308° 27.92
10	242°26.36	281°3.21	8.90	114°52.41	38.79	169°29.62	52.78	256° 28.27	9.97	Aldebaran	290°39.34
11	257°28.82	296°2.96	7.92	129°55.44	39.03	184°32.41	52.75	271°30.58	9.90	Rigel	281°3.57
12	272°31.28	$311^{\circ}2.71$	S17°6.94	144°58.47	N22°39.28	199°35.21	N21°52.72	286°32.90	S08° 9.84	Capella	280° 21.47
13	287°33.75	326°2.45	5.96	160°1.50	39.52	214°38.00	52.70	301°35.22	9.77		278° 22.58
14	302°36.21	341°2.20	4.98	175°4.54	39.76	229°40.80	52.67	316°37.54	9.70	Bellatrix	
15	317°38.68	356°1.95	• • 4.00	190°7.57	• • 40.00	244°43.59	• • 52.64	331°39.86	• • 9.64	Elnath	278°1.54
16	332°41.14	11°1.71	3.02	205°10.61	40.25	259°46.39	52.61	346°42.18	9.57	Alnilam	275°37.43
17	347°43.61	26°1.46	2.04	220°13.65	40.49	274°49.18	52.58	1°44.50	9.50	Betelgeuse	270°51.78
18	2°46.07	41°1.21	\$17°1.06	235°16.69	N22°40.74	289°51.97	N21°52.55	16°46.81	508° 9.43	Canopus	263°51.85
	17°48.53			250°19.73				31°49.13		Sirius	258° 25.92
19		56°0.96	17°0.07		40.98	304°54.77	52.53		9.37	Adhara	255°5.52
20	32°51.00	71°0.72	16°59.09	265°22.77	41.22	319°57.56	52.50	46°51.45	9.30	Procyon	244°50.56
21	47°53.46	86°0.47	• • 58.11	280°25.82	• • 41.47	335°0.35	• • 52.47	61°53.77	• • 9.23	Pollux	
22	62°55.93	101°0.23	57.12	295°28.86	41.71	350°3.15	52.44	76°56.08	9.16	Avior	234°14.21
23	77°58.39	115°59.99	56.13	310°31.91	41.96	5°5.94	52.41	91°58.40	9.10	Suhail	222°46.02
1/104	17.40	0 2/ 4 1	0′ m-4.37	2 0/ 40	2/ 1.01	0/ 4 0	.0′ m-2.78	$\nu 2.3' \ d-0$	1/1 02	1	
ivier.p	pass. 17:49	ν -0.5 a -1	υ 111-4.37	νs.υ αυ.	2′ m-1.01	ν2.0 a-0	.0 111-2.78	ν2.5 a-U	.1111.03	Miaplacidus Alphard	221°37.63
											217° 47.58
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.31
0	93°0.85	130°59.75	S16°55.15	325°34.96	N22°42.20	20°8.73	N21°52.38	107°0.72	S08° 9.03		193°40.83
1	108°3.32	145°59.51	54.16	340°38.01	42.45	35°11.53	52.35	122°3.03	8.96	Denebola	182°24.96
2	123°5.78	160°59.27	53.17	355°41.06	42.70	50°14.32	52.33	137°5.35	8.89	Gienah	175°43.65
										Acrux	173°0.25
3	138°8.25	175°59.03	• • 52.19	10°44.11	• • 42.94	65°17.11	• • 52.30	152°7.67	• • 8.83	Gacrux	171°51.78
4	153° 10.71	190°58.79	51.20	25°47.17	43.19	80°19.90	52.27	167°9.98	8.76	Alioth	166°13.10
5	168° 13.17	205°58.55	50.21	40°50.22	43.43	95°22.69	52.24	182°12.30	8.69	1	158° 22.47
6	183° 15.64	220°58.31	S16°49.22	55°53.28	N22°43.68	110°25.49	N21°52.21	197°14.62	S08°8.62	Alkaid	152°52.24
7	$198^{\circ}18.10$	235°58.08	48.23	70°56.34	43.93	125°28.28	52.18	$212^{\circ}16.93$	8.55	Hadar	148° 36.43
8	213°20.57	250°57.84	47.24	85°59.40	44.18	140°31.07	52.16	227° 19.25	8.49	I	140° 50.45
9	228°23.03	265°57.61	• • 46.25	101°2.46	• • 44.42	155°33.86	• • 52.13	242°21.56	• • 8.42		
10	243°25.49	280°57.38	45.25	116°5.52	44.67	170°36.65	52.10	257° 23.88	8.35	Arcturus	145°48.14
11	258° 27.96	295°57.15	44.26	131°8.59	44.92	185°39.44	52.07	272°26.19	8.28	Rigil Kent.	139° 40.80
12	273°30.42	310°56.92	S16°43.27	146°11.66	N22°45.17	200°42.23	N21°52.04	287°28.51	S08°8.21	Kochab	137° 20.56
13	288°32.89	325°56.69	42.27	161°14.72	45.42	215°45.02	52.01	302°30.82	8.15		136°56.30
14	303°35.35	340°56.46	41.28	176° 17.79	45.66	230°47.81	51.99	317°33.14	8.08	Alphecca	126°4.07
15	318° 37.82	355°56.23	• • 40.28	191°20.86	• • 45.91	245°50.60	51.96	332°35.45	. 8.01	Antares	112°16.24
16	333°40.28	10°56.00	39.29	206°23.94	46.16	245 50.00 260°53.39	51.93	347°37.77	7.94	Atria	$107^{\circ}11.06$
17	348° 42.74	25°55.77	39.29	200 23.94 221°27.01		275°56.18		2°40.08		Sabik	102°3.18
	3°45.21	40°55.55	S16°37.29	236°30.09	46.41 N22°46.66	290°58.97	51.90 N21°51.87	17° 42.40	7.87 \$08°7.80	Shaula	96° 10.85
18		0								Rasalhague	95°58.94
19	18° 47.67	55°55.32	36.29	251°33.16	46.91	306°1.76	51.85	32°44.71	7.73	Eltanin	90°42.75
20	33°50.14	70°55.10	35.29	266°36.24	47.16	321°4.55	51.82	47°47.03	7.67	Kaus Aust.	83°32.98
21	48°52.60	85°54.88	• • 34.30	281°39.32	• • 47.41	336°7.34	• • 51.79	62°49.34	• • 7.60	Vega	80°33.69
22	63°55.06	100°54.66	33.30	296°42.40	47.66	351°10.13	51.76	77°51.65	7.53	Nunki	75°48.18
23	78° 57.53	115°54.44	32.29	311°45.48	47.91	6°12.92	51.73	92°53.97	7.46	Altair	62°0.31
Morr	pass. 17:45	11 0 2' d 1	0′ m-4.38	1/3 1/ d0	2′ m-1.03	1/3 8/ 4 0	.0′ m-2.78	$\nu 2.3' \ d-0$	1' m1 03	Peacock	53°6.29
- IVICI.	Jass. 11.45	ν-0.2 u-1	0 111-4.50	νσ.1 do.		ν2.0 u-0	.0 111-2.70	ν2.5 u-0	.1 1111.05	Deneb	49°26.23
										Enif	33°39.05
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.20
0	93° 59.99	130°54.22		326°48.57	N22°48.16	21°15.70	N21°51.70	107°56.28	S08°7.39	1	
1	109°2.46	145°54.00	30.29	341°51.65	48.41	36°18.49	51.68	122°58.60	7.32	Fomalhaut	15° 14.68
2	124°4.92	160°53.78	29.29	356°54.74	48.66	51°21.28	51.65	138° 0.91	7.25	Scheat	13°45.36
3	139°7.38	175°53.56	. 28.29	11°57.83	• 48.92	66°24.07	51.62	153° 3.22	· · 7.18	Markab	13°30.04
	159 7.56 154°9.85	175 53.50 190°53.34		27° 0.92		81°26.85		168° 5.53		Dec 23 Mon	SHA
4			27.28		49.17		51.59		7.11		39°4.08
5	169°12.31	205°53.13	26.28	42°4.01	49.42	96°29.64	51.56	183°7.85	7.04	Venus	
6	184° 14.78		\$16°25.27	57°7.10	N22°49.67	111°32.43	N21°51.54	198° 10.16	508° 6.97		232°20.49
7	199° 17.24	235°52.70	24.27	72°10.20	49.92	126°35.22	51.51	213°12.47	6.91	Jupiter	286°59.94
8	214° 19.71	250°52.49	23.26	87°13.29	50.18	141°38.00	51.48	228° 14.79	6.84	Saturn	14°3.35
9	229°22.17	265°52.28	• • 22.26	102°16.39	• • 50.43	156°40.79	•• 51.45	243°17.10	• • 6.77	Dec 24 Tue	SHA
10	244°24.63	280°52.07	21.25	$117^{\circ}19.49$	50.68	171°43.58	51.42	258° 19.41	6.70	Venus	37° 58.89
11	$259^{\circ}27.10$	295°51.86	20.24	132°22.59	50.94	186°46.36	51.40	273°21.72	6.63		
12	274°29.56	310°51.65	S16°19.23	147°25.69	N22°51.19	201°49.15	N21°51.37	288°24.03	S08° 6.56	Mars	232 34.10 287°7.88
13	289°32.03	325°51.44	18.22	162°28.79	51.44	216°51.93	51.34	303°26.35	6.49	Jupiter	
14	304°34.49	340°51.23	17.21	177°31.90	51.70	231°54.72	51.31	318°28.66	6.42	Saturn	13°59.86
15	319°36.95	355°51.02	• • 16.20	192°35.00	•• 51.95	246°57.50	• • 51.29	333°30.97	• • 6.35	Dec 25 Wed	SHA
16	334°39.42	10°50.82	15.19	207°38.11	52.21	262°0.29	51.26	348°33.28	6.28	Venus	36°54.22
17	349°41.88	25°50.61	14.18	222°41.22	52.46	277°3.07	51.23	3°35.59	6.21	Mars	
18	4°44.35		S16°13.17	237°44.33	N22°52.71	292°5.86	N21°51.20	18° 37.90	508° 6.14	Jupiter	
19	19°46.81	55° 50.21	12.16	252°47.44	52.97	307°8.64	51.17	33°40.21	6.07	Saturn	13°56.29
20	34°49.27	70°50.01	11.14	267°50.56	53.22	322°11.43	51.15	48° 42.52	6.00	Jatuill	10 30.29
21	49°51.74	85°49.81	. 10.13	282°53.67	• • 53.48	337°14.21	51.12	63°44.83	• • 5.93	Horizor	ıtal parallax
22	64°54.20	100°49.61	9.12	297°56.79	53.74	352°17.00	51.09	78° 47.14	5.86		Venus:
23	79° 56.67	100 49.01 115°49.41	9.12 8.10	312°59.90	53.74	7°19.78	51.09	93°49.46	5.79		Mars:
23	19.00			J12 J9.90	23.99			93 49.40 ————————————————————————————————————	5.19		
Mer.p	oass. 17:41	ν -0.2′ d-1	0′ m-4.38	ν 3.1′ d0.	3′ m-1.06	ν 2.8′ d-0	.0′ m-2.77	ν 2.3′ d-0	.1′ m1.03		

Dec

29°13.86 -42°10.44

56°40.74

-17°51.08

-57°6.85 $23^{\circ}34.95$

89°22.40

-40°12.41

4°11.29

49°57.16

16°33.61

-8°10.35

 $46^{\circ}1.43$ 6°22.36

28°37.74

-1°11.14

 $7^{\circ}24.72$

-52°42.45

-16°44.98

-29°0.28

-59°35.15

-43°31.80

-69°48.89

-8°45.96 11°50.65

 $61^{\circ}36.69$

14°25.86

 $-17^{\circ}40.74$

-63°13.94 -57°14.90

55°49.16

-11°17.45

49°11.05

-60°29.34

 $-36^{\circ}29.40$

-60°56.07

 $19^{\circ}3.02$

 $74^{\circ}\,2.85$

-16°8.68

26°37.70 -26°29.19

-69°4.21

-15°45.34

-37°7.29

 $12^{\circ}32.46$

51°29.05

-34°22.38

38°48.37

 $-26^{\circ}15.98$ 8°56.04

-56°39.44

 $45^{\circ}22.27$

 $9^{\circ}59.39$

-46°50.63

-29°29.57

28°13.24 15°20.45

Mer.pass

15:16

02:22

22:40

16:53

15:16

02:17

22:35

16:49

15:17

02:12

22:31

16:46

0.2 0.2

Mer.pass

Mer.pass

 $5^{\circ}9.66$ 27°57.89

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°14.45	\$23°25.70	$269^{\circ}49.95$	17.4'	S00°58.91	14.2'	54.3'
1	195°14.14	25.66	284°26.30	17.4	01°13.06	14.1'	54.3'
2	210°13.83 225°13.52	25.63 •• 25.60	299°2.66 313°39.02	17.4' 17.4'	01°27.21 01°41.35	14.1' 14.1'	54.3' 54.3'
4	240°13.21	25.56	328° 15.38	17.4	01°55.47	14.1'	54.3'
5	255°12.90	25.53	342°51.74	17.4'	02°9.59	14.1'	54.3'
6	270°12.58	\$23°25.49	357°28.10	17.4'	S02°23.69	14.1'	54.2'
7	285°12.27 300°11.96	25.46	12°4.46	17.4	02°37.78 02°51.86	14.1'	54.2'
8 9	300°11.96 315°11.65	25.42 •• 25.38	26° 40.82 41° 17.17	17.4' 17.3'	02°51.86	14.1' 14.1'	54.2' 54.2'
10	330°11.34	25.34	55°53.52	17.3	03° 19.98	14.0'	54.2'
11	345°11.03	25.30	70°29.86	17.3'	$03^{\circ}34.01$	14.0'	54.2'
12	0°10.72	\$23°25.26	85°6.19	17.3'	S03°48.03	14.0'	54.2'
13 14	15°10.41 30°10.10	25.22 25.18	99° 42.51 114° 18.82	17.3' 17.3'	04°2.04 04°16.03	14.0' 14.0'	54.2' 54.2'
14 15	45°9.79	25.18	114 18.82 128°55.13	17.3'	04 16.03 04°30.00	14.0'	54.2'
16	60°9.48	25.09	143°31.41	17.3'	04°43.95	13.9'	54.2'
17	75°9.17	25.04	158°7.69	17.3'	$04^{\circ}57.88$	13.9'	54.2'
18	90°8.85	\$23°25.00	172°43.95	17.2'	S05°11.80	13.9'	54.2'
19 20	105°8.54 120°8.23	24.95 24.90	187°20.19 201°56.42	17.2' 17.2'	05° 25.70 05° 39.57	13.9' 13.9'	54.2' 54.2'
21	135°7.92	• • 24.85	216° 32.63	17.2'	05°53.43	13.8'	54.2'
22	150°7.61	24.81	231°8.82	17.2'	06°7.26	13.8'	54.2'
23	165°7.30	24.76	245°44.99	17.1'	$06^{\circ}21.07$	13.8'	54.2'
	SD = 16.3'	d = -0.0'		SE	0 = 14.8'		
_						,	
Tue 0	GHA 180° 6.99	Dec \$23°24.70	GHA 260°21.13	u 17.1'	Dec 506° 34.86	<i>d</i> 13.8'	HP 54.2'
1	195°6.68	24.65	274° 57.25	17.1	06°48.62	13.7'	54.2'
2	210°6.37	24.60	289°33.35	17.1'	$07^{\circ}2.36$	13.7'	54.2'
3	225°6.06	• • 24.55	304°9.43	17.0'	07°16.07	13.7'	54.2'
4	240°5.75 255°5.44	24.49	318° 45.47 333° 21.49	17.0'	07° 29.76 07° 43.42	13.7'	54.2'
5 6	255°5.44 270°5.13	24.44 \$23°24.38	333°21.49 347°57.48	17.0' 17.0'	507° 57.06	13.6' 13.6'	54.1' 54.1'
7	285°4.82	24.33	2°33.44	16.9'	08° 10.67	13.6'	54.1'
8	300°4.50	24.27	17°9.37	16.9'	$08^{\circ}24.25$	13.6'	54.1'
9	315°4.19	· · 24.21	31°45.26	16.9'	08°37.80	13.5'	54.1'
10 11	330°3.88 345°3.57	24.15 24.09	46°21.12 60°56.95	16.8' 16.8'	08°51.32 09°4.81	13.5' 13.5'	54.1' 54.2'
12	0°3.26	\$23°24.03	75°32.74	16.8	S09° 18.27	13.4	54.2'
13	15°2.95	23.97	90°8.50	16.7'	09°31.69	13.4'	54.2'
14	30°2.64	23.91	$104^{\circ}44.21$	16.7'	$09^{\circ}45.09$	13.4'	54.2'
15	45°2.33	• • 23.85	119° 19.89	16.6'	09°58.45 10°11.78	13.3'	54.2'
16 17	60°2.02 75°1.71	23.78 23.72	133°55.52 148°31.12	16.6' 16.6'	10°11.78 10°25.07	13.3' 13.3'	54.2' 54.2'
18	90°1.40	\$23°23.65	163°6.67	16.5'	S10°38.33	13.2'	54.2'
19	105°1.09	23.59	$177^{\circ}42.18$	16.5'	$10^{\circ}51.55$	13.2'	54.2'
20	120°0.78	23.52	192° 17.64		11°4.73		54.2'
21 22	135°0.47 150°0.16	· · 23.45 23.38	206°53.06 221°28.43	16.4' 16.3'	11°17.88 11°30.99	13.1' 13.1'	54.2' 54.2'
23	164°59.85	23.31	236°3.76	16.3'	11°44.06	13.1	54.2'
	SD = 16.3'	d = -0.1'		SE	0 = 14.8'		
Wed 0	GHA 179°59.54	Dec \$23°23.24	GHA 250° 39.03	u 16.2'	Dec \$11° 57.08	<i>d</i> 13.0'	HP 54.2'
1	179 59.54 194°59.23	23.17	265° 14.25	16.2'	12° 10.07	13.0 12.9'	54.2'
2	209°58.92	23.10	279°49.42	16.1'	12°23.02	12.9'	54.2'
3	224°58.61	• • 23.03	294°24.54	16.1'	12°35.93	12.9'	54.2'
4 5	239°58.30 254°57.99	22.95 22.88	308°59.61 323°34.62	16.0' 16.0'	12°48.79 13°1.61	12.8' 12.8'	54.2' 54.2'
6	254 57.99 269°57.68	22.88 \$23°22.80	323°34.62 338°9.58	15.9'	\$13° 14.38	12.8	54.2'
7	284°57.37	22.73	352° 44.47	15.8'	13°27.11	12.7'	54.2'
8	299°57.06	22.65	7° 19.31	15.8'	13°39.79	12.6'	54.2'
9	314°56.75	• • 22.57	21°54.10	15.7'	13°52.43	12.6'	54.2'
10 11	329°56.44 344°56.13	22.49 22.41	36°28.82 51°3.48	15.7' 15.6'	14°5.01 14°17.55	12.5' 12.5'	54.3' 54.3'
12	359°55.82	\$23°22.33	65°38.08	15.5'	\$14°30.04	12.4	54.3'
13	14°55.51	22.25	80° 12.62	15.5'	14°42.48	12.4'	54.3'
14	29°55.20	22.17	94° 47.09	15.4'	14° 54.87	12.3'	54.3'
15 16	44°54.89 59°54.58	· · 22.09 22.01	109°21.50 123°55.84	15.3' 15.3'	15°7.20 15°19.48	12.3' 12.2'	54.3' 54.3'
17	59 54.58 74°54.27	22.01	123 55.84 138°30.11	15.3 15.2'	15 19.48 15°31.71	12.2'	54.3'
18	89°53.96	S23°21.84	153°4.32	15.1'	S15°43.89	12.1'	54.3'
19	104°53.65	21.75	167°38.46	15.1'	15°56.00	12.1'	54.3'
20	119°53.34 134°53.03	21.66	182° 12.53	15.0' 14.9'	16°8.06 16°20.07	12.0'	54.3' 54.3'
21 22	134°53.03 149°52.72	· · 21.58 21.49	196° 46.52 211° 20.45	14.9' 14.9'	16°20.07 16°32.01	11.9' 11.9'	54.3° 54.4'
23	164°52.41	21.49	225°54.30	14.8'	16°43.90	11.8'	54.4'
	SD = 16.3'	d = -0.1'		SE	0 = 14.8'		
			-		-		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	08:27	10:58			13:02	15:33
N 70°	08:07	09:55			14:04	15:53
68°	07:51	09:20			14:39	16:09
66°	07:38	08:55	10:36	13:24	15:05	16:22
64°	07:27	08:35	09:53	14:06	15:24	16:33
62°	07:17	08:19	09:25	14:35	15:41	16:43
60°	07:09	08:06	09:03	14:56	15:54	16:51
N 58°	07:01	07:54	08:46	15:14	16:06	16:58
56°	06:54	07:44	08:31	15:29	16:16	17:05
54°	06:48	07:35	08:18	15:41	16:25	17:11
52°	06:43	07:26	08:07	15:52	16:33	17:17
50°	06:37	07:19	07:57	16:02	16:41	17:22
45°	06:26	07:03	07:37	16:23	16:57	17:34
N 40°	06:15	06:49	07:20	16:40	17:10	17:44
35°	06:06	06:37	07:06	16:54	17:22	17:54
30°	05:57	06:27	06:53	17:06	17:33	18:03
20°	05:40	06:08	06:32	17:28	17:52	18:19
N 10°	05:24	05:51	06:13	17:46	18:09	18:35
0°	05:07	05:33	05:56	18:04	18:26	18:52
S 10°	04:48	05:15	05:38	18:21	18:44	19:11
20°	04:26	04:55	05:19	18:40	19:05	19:34
30°	03:57	04:30	04:57	19:02	19:30	20:03
35°	03:38	04:15	04:44	19:15	19:45	20:22
40°	03:15	03:56	04:29	19:30	20:03	20:45
45°	02:44	03:34	04:11	19:48	20:26	21:15
S 50°	01:58	03:04	03:49	20:11	20:55	22:01
52°	01:31	02:49	03:38	20:22	21:10	22:29
54°	00:44	02:31	03:26	20:34	21:28	23:15
56°	////	02:09	03:11	20:48	21:51	////
58°	////	01:39	02:54	21:05	22:20	////
S 60°	////	00:48	02:34	21:25	23:11	////

Lat.		Moonris	е		Moonset			
Lat.	Mon	Tue	Wed	Mon	Tue	Wed		
N 72°	00:15	02:13	04:26	11:32	10:57	10:10		
N 70°	00:13	02:02	04:00	11:37	11:11	10:37		
68°	00:12	01:54	03:41	11:41	11:22	10:58		
66°	00:11	01:46	03:26	11:45	11:31	11:15		
64°	00:10	01:40	03:13	11:48	11:39	11:29		
62°	00:09	01:35	03:03	11:50	11:45	11:40		
60°	00:09	01:30	02:54	11:52	11:51	11:50		
N 58°	00:08	01:26	02:46	11:54	11:56	11:59		
56°	00:08	01:23	02:39	11:56	12:01	12:07		
54°	00:07	01:20	02:33	11:58	12:05	12:13		
52°	00:07	01:17	02:28	11:59	12:09	12:20		
50°	00:06	01:14	02:23	12:01	12:12	12:25		
45°	00:05	01:08	02:13	12:04	12:20	12:37		
N 40°	00:05	01:04	02:04	12:06	12:26	12:48		
35°	00:04	01:00	01:56	12:09	12:32	12:56		
30°	00:03	00:56	01:50	12:11	12:36	13:04		
20°	00:03	00:50	01:39	12:14	12:45	13:17		
N 10°	00:02	00:45	01:29	12:17	12:52	13:29		
0°	00:01	00:40	01:20	12:20	12:59	13:40		
S 10°	00:00	00:35	01:11	12:23	13:06	13:51		
20°	00:00	00:30	01:01	12:26	13:13	14:03		
30°		00:24	00:51	12:29	13:22	14:16		
35°		00:21	00:45	12:31	13:27	14:24		
40°		00:17	00:38	12:33	13:33	14:33		
45°		00:13	00:29	12:36	13:39	14:44		
S 50°		80:00	00:20	12:39	13:47	14:57		
52°		00:05	00:15	12:40	13:51	15:03		
54°		00:03	00:10	12:42	13:55	15:10		
56°		00:00	00:05	12:44	13:59	15:17		
58°	23:57	23:59	•• ••	12:46	14:04	15:26		
S 60°	23:53	23:52	23:52	12:48	14:10	15:35		

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 ^h	12 ^h	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	49-31%	
23	00:58	00:43	11:59	06:10	18:30		
24	00:28	00:13	12:00	06:49	19:09		
25	00:02	00:17	12:00	07:30	19:51		

December 26, 27, 28 UT (Thu., Fri., Sat.)

h	Aries	Venu	JS	M	ars	Jup	oiter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	94°59.13		S16°7.08	328° 3.02	N22°54.25	22°22.56	N21°51.03	108°51.77	S08°5.72			
1	$110^{\circ}1.60$	145°49.01	6.07	343°6.14	54.50	37°25.35	51.01	123°54.08	5.65	Alpheratz	357°34.84 353°7.15	29°13.86 -42°10.45
2	$125^{\circ}4.06$	160°48.81	5.05	358° 9.26	54.76	52°28.13	50.98	138°56.39	5.58	Ankaa Schedar	349°31.04	56°40.74
3	140°6.52	175°48.62	• • 4.03	13°12.39	• • 55.02	67°30.91	• • 50.95	153°58.69	• • 5.51	Diphda	348°47.29	-17°51.09
4	155°8.99	190°48.42	3.02	28°15.51	55.27	82°33.69	50.92	169°1.00	5.43	Achernar	$335^{\circ}19.98$	-57°6.86
5 6	170° 11.45 185° 13.92	205°48.23 220°48.04	2.00 \$16°0.98	43°18.64 58°21.77	55.53 N22°55.79	97°36.48 112°39.26	50.90 N21°50.87	184°3.31 199°5.62	5.36 \$08°5.29	Hamal	$327^{\circ}51.07$	23°34.95
7	200° 16.38		15°59.96	73°24.90	56.04	127°42.04	50.84	214°7.93	5.22	Polaris	313°42.27	89°22.42
8	215° 18.84		15°58.94	88°28.03	56.30	142°44.82	50.81	229° 10.24	5.15	Acamar	315°11.50	-40°12.42
9	$230^{\circ}21.31$	265°47.47	• • 57.92	103°31.16	• • 56.56	157°47.60	• • 50.79	244° 12.55	• • 5.08	Menkar Mirfak	314°5.96 308°27.92	4°11.28 49°57.16
10	245°23.77	280°47.28	56.90	118°34.29	56.82	172°50.39	50.76	259°14.86	5.01	Aldebaran	290°39.34	16°33.61
11	260° 26.24	295°47.09	55.87	133°37.43	57.07	187°53.17	50.73	274° 17.17	4.94	Rigel	281°3.57	-8°10.36
12 13	275°28.70 290°31.17	310°46.90 S 325°46.71	515°54.85 53.83	148°40.56 163°43.70	N22°57.33 57.59	202°55.95 217°58.73	N21°50.70 50.68	289°19.48 304°21.78	\$08°4.87 4.80	Capella	280°21.47	46°1.43
14	305° 33.63	340°46.53	52.81	178°46.84	57.39 57.85	233°1.51	50.65	319°24.09	4.73	Bellatrix	278°22.58	6°22.35
15	320° 36.09		• • 51.78	193°49.98	• • 58.11	248°4.29	50.62	334°26.40	• • 4.65	Elnath	278°1.53	28°37.74
16	335°38.56	10°46.16	50.76	208°53.12	58.37	263°7.07	50.59	349°28.71	4.58	Alnilam	275°37.43	-1°11.15 7°24.71
17	350°41.02	25°45.98	49.73	223°56.26	58.63	278°9.85	50.57	4°31.02	4.51	Betelgeuse Canopus	270°51.78 263°51.85	-52°42.47
18	5°43.49		15°48.70	238°59.41	N22°58.89	293°12.63	N21°50.54	19°33.32	S08°4.44	Sirius	258°25.91	-16°45.00
19	20° 45.95	55° 45.62	47.68	254°2.55	59.15	308°15.41	50.51	34°35.63	4.37	Adhara	255°5.51	-29°0.30
20 21	35° 48.41 50° 50.88	70° 45.44 85° 45.26	46.65 •• 45.62	269° 5.70 284° 8.85	59.41 •• 59.67	323°18.19 338°20.97	50.48 •• 50.46	49°37.94 64°40.25	4.30 •• 4.23	Procyon	244°50.55	$5^{\circ}9.65$
22	65°53.34	100°45.08	44.59	299°12.00	22°59.93	353° 23.75	50.43	79° 42.55	4.25	Pollux	243°16.99	27°57.88
23	80°55.81	115° 44.90	43.57	314°15.15	23°0.19	8°26.52	50.40	94°44.86	4.08	Avior	234°14.19	-59°35.17
				-	-		.0′ m-2.77			Suhail	222°46.00	-43°31.82
ivier.	pass. 17:37	ν -0.2' d-1.0	m-4.39	ν 3.1 au.	3′ m-1.08	ν2.8 a-0	.0 m-2.77	$\nu 2.3' \ d-0.$	1 m1.04	Miaplacidus Alphard	221°37.60 217°47.56	-69°48.91 -8°45.97
										Regulus	207°34.29	11°50.64
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°40.79	61°36.69
0	95° 58.27	130°44.73 S 145°44.55	15°42.54	329°18.31	N23°0.45	23°29.30	N21°50.37	109°47.17	S08°4.01	Denebola	$182^{\circ}24.94$	14°25.85
1 2	111°0.73 126°3.20	145 44.55 160°44.38	41.51 40.48	344°21.46 359°24.62	0.71 0.97	38°32.08 53°34.86	50.35 50.32	124°49.47 139°51.78	3.94 3.87	Gienah	175°43.62	-17°40.75
3	141°5.66		• • 39.44	14°27.77	. 1.23	68°37.64	50.29	154° 54.09	• • 3.80	Acrux	173°0.20	-63°13.95
4	156°8.13	190°44.03	38.41	29°30.93	1.49	83°40.41	50.27	169° 56.39	3.72	Gacrux Alioth	171°51.74 166°13.07	-57°14.90 55°49.15
5	171° 10.59	205°43.86	37.38	44°34.09	1.75	98°43.19	50.24	184°58.70	3.65	Spica	158° 22.44	-11°17.46
6	186° 13.06		15°36.35	59°37.25	N23°2.01	113°45.97	N21°50.21	200°1.01	S08°3.58	Alkaid	152°52.21	49°11.04
7	201°15.52	235°43.52	35.31	74°40.42	2.27	128°48.75	50.18	215°3.31	3.51	Hadar	148°36.39	-60°29.34
8 9	216° 17.98 231° 20.45	250°43.35 265°43.18	34.28	89°43.58	2.54	143°51.52	50.16 •• 50.13	230°5.62	3.44	Menkent	147°57.86	-36°29.40
10	246° 22.91	280°43.01	· · 33.25 32.21	104°46.75 119°49.91	· · 2.80 3.06	158°54.30 173°57.08	· · 50.13 50.10	245°7.92 260°10.23	· · 3.36 3.29	Arcturus	145°48.12	19°3.01
11	261°25.38	295° 42.85	31.18	134°53.08	3.32	188°59.85	50.07	275° 12.53	3.29	Rigil Kent.	139°40.76	-60°56.07
12	276° 27.84		515°30.14	149°56.25	N23°3.58	204°2.63	N21°50.05	290°14.84	S08°3.15	Kochab	137°20.52 136°56.28	74°2.84 -16°8.68
13	291°30.30	325°42.52	29.10	164°59.42	3.85	219°5.40	50.02	$305^{\circ}17.14$	3.07	Zuben'ubi Alphecca	126° 4.06	26°37.69
14	306°32.77	340°42.35	28.06	180°2.60	4.11	234°8.18	49.99	320° 19.45	3.00	Antares	112° 16.22	-26°29.19
15	321°35.23		• • 27.03	195°5.77	• • 4.37	249°10.95	• • 49.97	335°21.75	· · 2.93	Atria	107°11.03	-69°4.20
16 17	336° 37.70 351° 40.16	10°42.03 25°41.87	25.99 24.95	210°8.95 225°12.12	4.64 4.90	264°13.73 279°16.50	49.94 49.91	350°24.06 5°26.36	2.86 2.78	Sabik	$102^{\circ}3.16$	-15°45.34
18	6° 42.63		24.95 15°23.91	240°15.30	N23°5.16	279 10.50 294°19.28	N21°49.89	20°28.67	508°2.71	Shaula	96°10.84	-37°7.28
19	21°45.09	55°41.55	22.87	255°18.48	5.43	309°22.05	49.86	35°30.97	2.64	Rasalhague	95°58.93	12°32.45
20	36° 47.55	70°41.39	21.83	270°21.66	5.69	324°24.83	49.83	50°33.27	2.57	Eltanin Kaus Aust.	90°42.75 83°32.98	51°29.03 -34°22.38
21	$51^{\circ}50.02$		• • 20.79	285°24.84	• • 5.95	339°27.60	• • 49.80	65°35.58	• • 2.49	Vega	80°33.69	38°48.36
22	66°52.48	100°41.08	19.75	300°28.03	6.22	354°30.37	49.78	80°37.88	2.42	Nunki	75°48.18	-26°15.98
23	81°54.95	115°40.93	18.70	315°31.21	6.48	9°33.15	49.75	95°40.19	2.35	Altair	62°0.31	8°56.04
Mer.	pass. 17:33	ν -0.2′ d-1.0	′ m-4.40	ν 3.2′ d0.	3′ m-1.10	ν 2.8′ d-0	.0′ m-2.77	ν 2.3′ d-0.	1' m 1.04	Peacock	53°6.30	-56°39.43
										Deneb	49°26.24	45°22.26
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.05	9°59.39
0	96° 57.41		15°17.66	330°34.40	N23°6.75	24°35.92	N21°49.72	110°42.49	S08°2.27	Al Na'ir Fomalhaut	27°33.22 15°14.69	-46°50.62 -29°29.57
1	$111^{\circ}59.88$	145°40.62	16.62	345°37.59	7.01	39°38.69	49.70	$125^{\circ}44.79$	2.20	Scheat	13°45.37	28°13.23
2	127°2.34	160°40.47	15.57	0°40.78	7.28	54°41.47	49.67	140°47.10	2.13	Markab	13°30.05	15°20.44
3	142°4.80		14.53	15°43.97	· · 7.54	69°44.24	49.64	155°49.40	. 2.05	Dec 26 Th	CHA	
4 5	157°7.27 172°9.73	190°40.16 205°40.01	13.49 12.44	30°47.16 45°50.35	7.81 8.07	84°47.01 99°49.78	49.62 49.59	170°51.70 185°54.00	1.98 1.91	Dec 26 Thu Venus	SHA 35°50.08	Mer.pass 15:17
6	172 9.73 187° 12.20	200°39.87 S		60°53.55	N23°8.34	114°52.55	49.59 N21°49.56	200° 56.31	508°1.83	Mars	233°3.89	02:07
7	202° 14.66	235°39.72	10.35	75°56.74	8.60	129°55.33	49.54	215°58.61	1.76	Jupiter	287°23.43	22:26
8	$217^{\circ}17.12$	250°39.57	9.30	90°59.94	8.87	144°58.10	49.51	231°0.91	1.69	Saturn	13°52.63	16:42
9	232° 19.59	265°39.42	• • 8.25	106° 3.14	• • 9.13	160°0.87	• • 49.48	246°3.21	• • 1.61	Dec 27 Fri	SHA	Mer.pass
10	247° 22.05	280°39.28	7.20	121°6.34	9.40	175°3.64	49.46	261°5.52	1.54	Venus	34°46.45	15:17
11	262° 24.52 277° 26.98	295°39.14 310°38.99	6.16 \$15°5.11	136° 9.54 151° 12.74	9.67 N23°0 03	190°6.41 205°9.18	49.43 N21°49.40	276°7.82 291°10.12	1.47 \$08°1.39	Mars	233°20.03	02:02
12 13	277 20.98 292° 29.45	310 38.99 325°38.85	\$15°5.11 4.06	151 12.74 166°15.95	N23°9.93 10.20	205 9.18 220°11.95	N21 49.40 49.38	306°12.42	1.32	Jupiter	287°31.03	22:22
14	307°31.91	340°38.71	3.01	181°19.15	10.20	235°14.72	49.35	321°14.72	1.24	Saturn	13°48.90	16:38
15	322° 34.37	355°38.57	• 1.96	196°22.36	• • 10.73	250°17.49	• • 49.32	336°17.03	. 1.17	Dec 28 Sat	SHA	Mer.pass
16	337°36.84	10°38.43	$15^{\circ}0.90$	211°25.57	11.00	265°20.26	49.30	351°19.33	1.10	Venus	33°43.36	15:17
17	352° 39.30		14°59.85	226°28.78	11.27	280°23.03	49.27	6°21.63	1.02	Mars	233°36.99	01:57
18	7°41.77		14°58.80	241°31.99	N23°11.53	295°25.80	N21°49.24	21°23.93	\$08°0.95	Jupiter	287°38.51	22:17
19 20	22°44.23 37°46.70	55° 38.02 70° 37.88	57.75 56.69	256°35.20 271°38.42	11.80 12.07	310°28.57 325°31.34	49.22 49.19	36°26.23 51°28.53	0.87 0.80	Saturn	13°45.08	16:35
21	52°49.16		55.64	271 38.42 286°41.63	• 12.07	340°34.10	49.19 · · 49.16	66° 30.83	0.73	Horizor	ntal parallax	
22	67° 51.62	100°37.61	54.59	301°44.85	12.60	355°36.87	49.14	81°33.13	0.65		Venus:	0.2
23	82°54.09	115°37.48	53.53	316°48.06	12.87	10°39.64	49.11	96°35.43	0.58		Mars:	0.2
Mer	pass. 17:29	ν-0.2' d-1.0	′ m-4.41	ν 3.2' d0	3′ m-1.13	ν2.8′ d-0	.0′ m-2.76	$\nu 2.3' \ d-0.0$	1' m1.04			
						0		0				

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	$179^{\circ}52.10$	\$23°21.31	240°28.08	14.7'	S 16°55.73	11.8'	54.4'
1	194°51.80	21.22	255°1.79	14.6'	17°7.49	11.7'	54.4'
2	209°51.49 224°51.18	21.13	269°35.42 284°8.97	14.6' 14.5'	17°19.19 17°30.83	11.6' 11.6'	54.4' 54.4'
4	239°50.87	20.94	298° 42.45	14.4'	17°42.41	11.5'	54.4'
5	254°50.56	20.85	$313^{\circ}15.85$	14.3'	$17^{\circ}53.92$	11.4'	54.4'
6	269°50.25	\$23°20.75	327°49.17	14.2'	\$18°5.36	11.4'	54.5'
7 8	284°49.94 299°49.63	20.66 20.56	342°22.41 356°55.57	14.2' 14.1'	18°16.74 18°28.05	11.3' 11.2'	54.5' 54.5'
9	314°49.32	20.46	11°28.65	14.1	18°39.29	11.2'	54.5
10	329°49.01	20.36	26°1.65	13.9'	18°50.46	11.1'	54.5'
11	344°48.71	20.27	40°34.57	13.8'	19° 1.56	11.0'	54.5'
12 13	359°48.40 14°48.09	\$23°20.17 20.07	55°7.40 69°40.14	13.7' 13.7'	\$19°12.58 19°23.54	11.0' 10.9'	54.5' 54.5'
14	29°47.78	19.96	84°12.81	13.6'	19 23.54 19°34.41	10.9	54.6'
15	44° 47.47	• • 19.86	98° 45.38	13.5'	19°45.22	10.7'	54.6'
16	59° 47.16	19.76	113° 17.87	13.4'	19°55.94	10.6'	54.6'
17	74°46.85	19.66 \$23°19.55	127° 50.28	13.3'	20°6.59	10.6'	54.6'
18 19	89°46.55 104°46.24	19.45	142°22.59 156°54.82	13.2' 13.1'	\$20°17.17 20°27.66	10.5' 10.4'	54.6' 54.6'
20	119°45.93	19.34	171°26.96	13.0'	20°38.07	10.3	54.7'
21	134°45.62	• • 19.23	185°59.01	13.0'	20°48.40	10.2'	54.7'
22	149°45.31	19.12	200°30.97	12.9'	20°58.64	10.2'	54.7'
23	164°45.01	19.02	215°2.84	12.8'	21°8.80	10.1'	54.7'
	SD = 16.3'	d = -0.1'		SE	0 = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 44.70	\$23°18.91	229°34.62	12.7'	S21°18.88	10.0'	54.7'
1 2	194°44.39 209°44.08	18.80 18.68	244°6.30 258°37.90	12.6' 12.5'	21°28.87 21°38.77	9.9' 9.8'	54.7' 54.8'
3	224° 43.77	. 18.57	273°9.40	12.4'	21°48.59	9.7'	54.8'
4	239° 43.47	18.46	287°40.81	12.3'	$21^{\circ}58.31$	9.6'	54.8'
5	254° 43.16	18.35 \$23°18.23	302°12.13	12.2'	22°7.94	9.5'	54.8'
6 7	269° 42.85 284° 42.54	18.12	316°43.35 331°14.48	12.1' 12.0'	\$22°17.49 22°26.93	9.4' 9.4'	54.8' 54.8'
8	299° 42.24	18.00	345°45.51	11.9'	22°36.29	9.3'	54.9'
9	314°41.93	•• 17.88	$0^{\circ}16.45$	11.8'	22°45.54	9.2'	54.9'
10	329°41.62	17.77	14°47.29	11.7'	22°54.71	9.1'	54.9'
11 12	344°41.31 359°41.01	17.65 \$23°17.53	29° 18.04 43° 48.70	11.7' 11.6'	23°3.77 S 23°12.73	9.0' 8.9'	54.9' 54.9'
13	14°40.70	17.41	58° 19.26	11.5'	23°21.60	8.8'	54.9'
14	29°40.39	17.29	72°49.72	11.4'	$23^{\circ}30.36$	8.7'	55.0'
15 16	44°40.09 59°39.78	· · 17.17 17.04	87°20.08 101°50.35	11.3' 11.2'	23°39.02 23°47.57	8.6' 8.4'	55.0' 55.0'
17	74°39.47	16.92	101 50.55 116°20.53	11.1'	23°56.02	8.3'	55.0'
18	89°39.16	\$23°16.80	130°50.61	11.0'	\$24°4.36	8.2'	55.0'
19	104°38.86	16.67	145°20.59	10.9'	24°12.60	8.1'	55.1'
20 21	119°38.55 134°38.24	16.55 •• 16.42	159°50.48 174°20.27	10.8' 10.7'	24°20.73 24°28.74	8.0' 7.9'	55.1' 55.1'
22	149°37.94	16.29	188° 49.96	10.6'	24° 36.65	7.8'	55.1'
23	164°37.63	16.16	203°19.56	10.5'	24°44.44	7.7'	55.1'
	SD = 16.3'	d = -0.1'		SE	0 = 14.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	179°37.33	\$23°16.03	217°49.06	10.4'	S24°52.12	7.6'	55.2'
1	194°37.02 209°36.71	15.90	232° 18.47	10.3' 10.2'	24°59.68	7.4'	55.2'
2	209°36.71 224°36.41	15.77 •• 15.64	246°47.78 261°17.00	10.2′ 10.1′	25°7.13 25°14.46	7.3' 7.2'	55.2' 55.2'
4	239°36.10	15.51	201 17.00 275°46.12	10.1	25°21.67	7.2 7.1'	55.2'
5	254°35.79	15.38	290° 15.15	9.9'	25°28.76	7.0'	55.3'
6	269°35.49	S23°15.24	304°44.09	9.8'	\$25°35.73	6.8'	55.3'
7 8	284°35.18 299°34.88	15.11 14.97	319° 12.93 333° 41.68	9.7' 9.7'	25°42.58 25°49.31	6.7' 6.6'	55.3' 55.3'
9	299 34.88 314°34.57	14.97	333 41.08 348°10.33	9.7 9.6'	25 49.31 25°55.91	6.5'	55.4'
10	329°34.27	14.70	2°38.90	9.5'	26°2.38	6.3'	55.4'
11	344°33.96	14.56	17°7.37	9.4'	26°8.73	6.2'	55.4'
12 13	359°33.66 14°33.35	\$23°14.42 14.28	31°35.75 46°4.04	9.3' 9.2'	\$26°14.95 26°21.04	6.1' 6.0'	55.4' 55.4'
14	29°33.04	14.26	60°32.25	9.2 9.1'	26°27.00	5.8'	55.5'
15	44°32.74	• • 14.00	75°0.36	9.0'	$26^{\circ}32.83$	5.7'	55.5'
16	59°32.43 74°32.13	13.86	89°28.39 103°56.33	8.9'	26°38.52 26°44.08	5.6'	55.5'
17 18	74° 32.13 89° 31.82	13.72 \$23°13.57	103°56.33 118°24.18	8.9' 8.8'	26°44.08 S26°49.51	5.4' 5.3'	55.5' 55.6'
19	104°31.52	13.43	132°51.95	8.7'	26°54.79	5.2	55.6'
20	119°31.21	13.28	147° 19.63	8.6'	26°59.94	5.0'	55.6'
21 22	134°30.91 149°30.61	· · 13.14 12.99	161°47.23 176°14.75	8.5' 8.4'	27° 4.96 27° 9.83	4.9' 4.7'	55.6' 55.6'
23	149 30.61 164°30.30	12.99	176 14.75 190°42.18	8.4'	27 9.83 27°14.56	4. <i>1</i> 4.6'	55.7'
	SD = 16.3'	d = -0.1'			0 = 15.0'		
	<u> </u>	<u> </u>		JL			

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°	08:27	10:54		_	13:09	15:36
N 70°	08:07	09:54			14:08	15:56
68°	07:51	09:20			14:43	16:12
66°	07:38	08:55	10:34	13:29	15:08	16:25
64°	07:27	08:35	09:53	14:10	15:27	16:35
62°	07:18	08:20	09:25	14:38	15:43	16:45
60°	07:09	08:06	09:04	14:59	15:57	16:53
N 58°	07:02	07:54	08:46	15:16	16:08	17:01
56°	06:55	07:44	08:32	15:31	16:18	17:07
54°	06:49	07:35	08:19	15:44	16:27	17:14
52°	06:43	07:27	80:80	15:55	16:35	17:19
50°	06:38	07:20	07:58	16:04	16:43	17:24
45°	06:27	07:04	07:38	16:25	16:59	17:36
N 40°	06:16	06:50	07:21	16:42	17:12	17:46
35°	06:07	06:39	07:07	16:56	17:24	17:56
30°	05:58	06:28	06:54	17:08	17:34	18:04
20°	05:42	06:09	06:33	17:29	17:53	18:21
N 10°	05:26	05:52	06:15	17:48	18:10	18:37
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	04:50	05:17	05:40	18:22	18:46	19:13
20°	04:27	04:57	05:21	18:41	19:06	19:35
30°	03:58	04:32	04:59	19:03	19:31	20:04
35°	03:40	04:17	04:46	19:16	19:46	20:23
40°	03:17	03:58	04:31	19:31	20:04	20:46
45°	02:46	03:36	04:13	19:49	20:26	21:16
S 50°	02:01	03:06	03:51	20:11	20:56	22:01
52°	01:34	02:51	03:40	20:22	21:11	22:28
54°	00:49	02:34	03:28	20:34	21:29	23:12
56°	////	02:12	03:14	20:48	21:50	////
58°	////	01:42	02:57	21:05	22:20	////
S 60°	////	00:53	02:37	21:25	23:07	////

Lat.		Moonris	e		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°	06:30			09:36		
68°	05:45			10:23		
66°	05:16	07:34		10:53	10:10	
64°	04:54	06:47		11:16	10:58	
62°	04:36	06:17	08:10	11:35	11:28	11:19
60°	04:22	05:55	07:33	11:50	11:52	11:57
N 58°	04:09	05:37	07:06	12:03	12:10	12:24
56°	03:59	05:22	06:46	12:14	12:26	12:45
54°	03:50	05:09	06:29	12:24	12:40	13:03
52°	03:41	04:57	06:14	12:33	12:52	13:18
50°	03:34	04:47	06:01	12:41	13:02	13:31
45°	03:18	04:26	05:35	12:58	13:24	13:58
N 40°	03:06	04:09	05:15	13:12	13:42	14:19
35°	02:55	03:55	04:57	13:24	13:57	14:37
30°	02:45	03:43	04:43	13:35	14:10	14:52
20°	02:29	03:22	04:18	13:53	14:33	15:18
N 10°	02:15	03:04	03:56	14:09	14:52	15:41
0°	02:02	02:47	03:37	14:23	15:11	16:02
S 10°	01:49	02:31	03:17	14:38	15:29	16:23
20°	01:35	02:13	02:56	14:54	15:49	16:45
30°	01:20	01:53	02:31	15:13	16:12	17:12
35°	01:11	01:41	02:17	15:24	16:25	17:27
40°	01:00	01:28	02:01	15:36	16:41	17:46
45°	00:49	01:12	01:41	15:51	16:59	18:07
S 50°	00:34	00:52	01:17	16:09	17:23	18:35
52°	00:27	00:43	01:05	16:18	17:34	18:49
54°	00:20	00:33	00:52	16:27	17:47	19:05
56°	00:12	00:21	00:37	16:38	18:02	19:24
58°	00:02	00:08	00:19	16:51	18:19	19:47
S 60°	23:53	23:57		17:05	18:41	20:18

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	23-9%	
26	00:32	00:46	12:01	08:13	20:35		
27	01:01	01:16	12:01	08:59	21:23		
28	01:31	01:45	12:02	09:49	22:16		

December 29, 30, 31 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	97° 56.55	130°37.35 S 14°52.47	331°51.28 N23°13.14	25°42.41 N21°49.08	111°37.73 \$08°0.50	
1	$112^{\circ}59.02$	145°37.22 51.42	346°54.50 13.41	40°45.17 49.06	126°40.03 0.43	Alpheratz 357°34.84 29°13.85 Ankaa 353°7.17 -42°10.45
2	128°1.48	160°37.09 50.36	1°57.73 13.68	55°47.94 49.03	141°42.33 0.35	Schedar 349°31.06 56°40.74
3	143°3.94	175°36.96 · · 49.31	17°0.95 · · 13.94	70°50.71 · · 49.01	156°44.63 · · 0.28	Diphda 348°47.30 -17°51.09
4	158°6.41	190°36.83 48.25	32°4.17 14.21	85°53.48 48.98	171°46.93 0.20	Achernar 335°20.00 -57°6.86
5 6	173°8.87 188°11.34	205°36.70 47.19 220°36.57 \$14°46.13	47°7.40 14.48 62°10.63 N23°14.75	100°56.24 48.95 115°59.01 N21°48.93	186°49.23 0.13 201°51.53 S08°0.06	Hamal 327°51.07 23°34.95
7	203° 13.80	235°36.45 45.07	77°13.85 15.02	131°1.77 48.90	216°53.83 07°59.98	Polaris 313°43.02 89°22.43
8	218° 16.27	250°36.32 44.01	92°17.08 15.29	146°4.54 48.87	231°56.13 07°59.91	Acamar 315°11.51 -40°12.43
9	233°18.73	265°36.20 · · 42.95	107°20.31 · · 15.56	161°7.31 · · 48.85	246° 58.43 · · 59.83	Menkar 314°5.96 4°11.28 Mirfak 308°27.92 49°57.17
10	$248^{\circ}21.19$	280°36.08 41.89	122°23.55 15.83	176°10.07 48.82	262°0.73 59.76	Aldebaran 290°39.33 16°33.61
11	263°23.66	295°35.96 40.83	137°26.78 16.10	191°12.84 48.80	277°3.02 59.68	Rigel 281°3.56 -8°10.37
12 13	278°26.12 293°28.59	310°35.83 \$14°39.77 325°35.71 38.71	152°30.02 N23°16.36 167°33.25 16.63	206°15.60 N21°48.77 221°18.37 48.74	292°5.32 \$07°59.61 307°7.62 59.53	Capella 280°21.46 46°1.44
14	308° 31.05	340°35.60 37.64	182°36.49 16.90	236°21.13 48.72	307 7.02 59.55 322°9.92 59.46	Bellatrix 278°22.57 6°22.35
15	323°33.52	355°35.48 · · 36.58	197°39.73 ·· 17.17	251°23.89 · · 48.69	337°12.22 · · 59.38	Elnath 278°1.52 28°37.74
16	338°35.98	10°35.36 35.52	212°42.97 17.44	266°26.66 48.66	352°14.52 59.31	Alnilam 275° 37.42 -1° 11.16 Betelgeuse 270° 51.77 7° 24.71
17	353°38.44	25°35.24 34.45	227°46.21 17.71	281°29.42 48.64	7°16.81 59.23	Betelgeuse 270°51.77 7°24.71 Canopus 263°51.84 -52°42.49
18	8°40.91	40°35.13 \$14°33.39	242°49.45 N23°17.98	296°32.19 N21°48.61	22°19.11 S 07°59.15	Sirius 258°25.90 -16°45.01
19	23° 43.37	55°35.01 32.32	257°52.70 18.25	311°34.95 48.59	37°21.41 59.08	Adhara 255°5.50 -29°0.32
20 21	38° 45.84 53° 48.30	70°34.90 31.26 85°34.79 · · · 30.19	272°55.94 18.52 287°59.19 •• 18.80	326°37.71 48.56 341°40.47 • 48.53	52°23.71 59.00 67°26.00 • 58.93	Procyon 244°50.53 5°9.64
22	68° 50.76	100°34.68 29.12	303°2.44 19.07	356°43.24 48.51	82°28.30 58.85	Pollux 243°16.97 27°57.88
23	83°53.23	115°34.57 28.06	318° 5.68 19.34	11°46.00 48.48	97°30.60 58.78	Avior 234°14.16 -59°35.19
Marr		ν-0.1' d-1.1' m-4.42	ν3.2′ d0.3′ m-1.15	ν2.8' d-0.0' m-2.76	ν2.3' d-0.1' m1.05	Suhail 222°45.98 -43°31.84 Miaplacidus 221°37.56 -69°48.93
ivier.p	pass. 17:25	ν-0.1 α-1.1 m-4.42	ν _{3.2} α _{0.3} m-1.15	ν2.ο α-0.0 m-2.70	ν2.3 <i>a</i> -0.1 m1.05	Alphard 217°47.53 -8°45.98
						Regulus 207°34.26 11°50.63
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.75 61°36.68
0 1	98°55.69 113°58.16	130°34.46 \$14°26.99 145°34.35 25.92	333°8.94 N23°19.61 348°12.19 19.88	26°48.76 N21°48.46 41°51.52 48.43	112°32.90 S07°58.70 127°35.19 58.63	Denebola 182°24.91 14°25.84
2	129°0.62	160°34.24 24.85	3°15.44 20.15	56°54.28 48.41	142°37.49 58.55	Gienah 175°43.59 -17°40.76
3	144°3.09	175°34.13 · · 23.78	18°18.69 · · 20.42	71°57.04 · · 48.38	157°39.79 · · 58.47	Acrux 173°0.15 -63°13.96
4	159°5.55	190°34.03 22.71	33°21.95 20.69	86°59.81 48.35	172°42.08 58.40	Gacrux 171°51.70 -57°14.91 Alioth 166°13.03 55°49.14
5	174°8.01	205°33.92 21.64	48°25.21 20.96	102°2.57 48.33	187°44.38 58.32	Spica 158°22.41 -11°17.47
6	189° 10.48	220°33.82 \$14°20.57	63°28.46 N23°21.23	117°5.33 N21°48.30	202°46.67 S07°58.25	Alkaid 152°52.18 49°11.03
7	204°12.94	235°33.71 19.50	78°31.72 21.51	132°8.09 48.28	217° 48.97 58.17	Hadar 148°36.34 -60°29.34
8 9	219° 15.41 234° 17.87	250°33.61 18.43 265°33.51 · · 17.36	93°34.98 21.78 108°38.25 •• 22.05	147°10.85 48.25 162°13.61 · · 48.23	232°51.27 58.09 247°53.56 • 58.02	Menkent 147°57.83 -36°29.41
10	249°20.34	280°33.41 16.29	123°41.51 22.32	177°16.37 48.20	262°55.86 57.94	Arcturus 145°48.09 19°2.99
11	264°22.80	295°33.31 15.21	138°44.77 22.59	192°19.13 48.17	277°58.15 57.87	Rigil Kent. 139°40.71 -60°56.07 Kochab 137°20.47 74°2.82
12	279°25.26	310°33.21 S 14°14.14	153°48.04 N23°22.87	207°21.88 N21°48.15	293°0.45 S 07°57.79	Kochab 137°20.47 74°2.82 Zuben'ubi 136°56.25 -16°8.69
13	294°27.73	325°33.11 13.07	168°51.31 23.14	222°24.64 48.12	308°2.74 57.71	Alphecca 126°4.03 26°37.67
14	309°30.19	340°33.02 11.99	183°54.58 23.41	237°27.40 48.10	323°5.04 57.64	Antares 112°16.20 -26°29.19
15	324°32.66 339°35.12	355°32.92 · · 10.92 10°32.83 9.84	198°57.85 · · 23.68 214°1.12 23.95	252°30.16 · · 48.07 267°32.92 48.05	338°7.33 · · 57.56 353°9.63 57.48	Atria 107°10.99 -69°4.19
16 17	354°37.59	10°32.83 9.84 25°32.73 8.77	214°1.12 23.95 229°4.39 24.23	267°32.92 48.05 282°35.68 48.02	353°9.63 57.48 8°11.92 57.41	Sabik 102°3.14 -15°45.35
18	9° 40.05	40°32.64 \$14°7.69	244°7.66 N23°24.50	297°38.43 N21°48.00	23°14.22 S07°57.33	Shaula 96°10.82 -37°7.28
19	24°42.51	55°32.55 6.61	259°10.94 24.77	312°41.19 47.97	38° 16.51 57.25	Rasalhague 95°58.91 12°32.44 Eltanin 90°42.74 51°29.02
20	39°44.98	70° 32.46 5.54	274°14.21 25.04	327°43.95 47.94	53°18.81 57.18	Eltanin 90°42.74 51°29.02 Kaus Aust. 83°32.96 -34°22.37
21	54° 47.44	85°32.37 · · 4.46	289°17.49 · · 25.32	342°46.70 · · 47.92	68°21.10 · · 57.10	Vega 80°33.68 38°48.34
22	69°49.91	100°32.28 3.38	304°20.77 25.59	357°49.46 47.89	83°23.39 57.02	Nunki 75°48.17 -26°15.98
23	84° 52.37	115°32.19 2.30	319°24.05 25.86	12°52.22 47.87	98°25.69 56.95	Altair 62°0.31 8°56.03
Mer.p	pass. 17:21	ν -0.1' d-1.1' m-4.43	$ u 3.3' \ d0.3' \ \text{m-}1.17$	ν 2.8′ <i>d</i> -0.0′ m-2.75	$ u 2.3' \ d ext{-}0.1' \ m 1.05$	Peacock 53°6.30 -56°39.42
						Deneb 49°26.24 45°22.25 Enif 33°39.05 9°59.38
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.22 -46°50.62
0	99°54.83	130°32.10 \$14°1.22	334°27.33 N23°26.14	27°54.97 N21°47.84	113°27.98 S 07°56.87	Fomalhaut 15°14.69 -29°29.57
1	114°57.30	145°32.01 14°0.14	349°30.61 26.41	42°57.73 47.82	128°30.28 56.79	Scheat 13°45.38 28°13.23
2 3	129°59.76 145°2.23	160°31.93 13°59.06 175°31.84 · · 57.98	4°33.89 26.68 19°37.18 · · 26.96	58°0.48 47.79 73°3.24 • 47.77	143°32.57 56.71 158°34.86 • 56.64	Markab 13°30.06 15°20.44
4	160°4.69	190°31.76 56.90	34°40.46 27.23	88°6.00 47.74	173° 37.16 56.56	Dec 29 Sun SHA Mer.pass
5	175°7.16	205°31.68 55.82	49°43.75 27.50	103°8.75 47.72	188°39.45 56.48	Venus 32°40.79 15:18
6	190°9.62	220°31.60 \$13°54.74	64°47.04 N23°27.78	118°11.50 N21°47.69	203°41.74 S07°56.41	Mars 233° 54.73 01:52
7	205° 12.08	235°31.52 53.65	79°50.33 28.05	133°14.26 47.67	218° 44.03 56.33	Jupiter 287° 45.86 22:13
8 9	220° 14.55 235° 17.01	250°31.44 52.57 265°31.36 •• 51.49	94°53.62 28.32 109°56.91 · · 28.60	148°17.01 47.64 163°19.77 • 47.62	233°46.33 56.25 248°48.62 • 56.17	Saturn 13°41.18 16:31
10	250°19.48	280°31.28 50.40	125° 0.20 28.87	178°22.52 47.59	263° 50.91 56.10	Dec 30 Mon SHA Mer.pass
11	265°21.94	295°31.20 49.32	140° 3.50 29.15	193°25.27 47.57	278° 53.20 56.02	Venus 31°38.76 15:18
12	280°24.41	310°31.13 S 13°48.24	155°6.79 N23°29.42	208°28.03 N21°47.54	293°55.50 S 07°55.94	Mars 234°13.24 01:47
13	295°26.87	325°31.05 47.15	170°10.09 29.69	223°30.78 47.52	308°57.79 55.86	Jupiter 287° 53.07 22:09 Saturn 13° 37.20 16:27
14	310°29.33	340°30.98 46.06	185°13.39 29.97	238°33.53 47.49	324°0.08 55.79	
15 16	325°31.80	355°30.90 · · 44.98	200°16.69 · · 30.24	253°36.28 · · 47.47	339°2.37 · · 55.71	Dec 31 Tue SHA Mer.pass
16 17	340°34.26 355°36.73	10°30.83 43.89 25°30.76 42.80	215°19.99 30.52 230°23.29 30.79	268°39.04 47.44 283°41.79 47.42	354°4.66 55.63 9°6.96 55.55	Venus 30° 37.27 15:18 Mars 234° 32.49 01:42
18	10°39.19	40°30.69 \$13°41.72	245°26.59 N23°31.07	298°44.54 N21°47.39	24°9.25 S07°55.47	Jupiter 288°0.14 22:04
19	$25^{\circ}41.66$	55°30.62 40.63	260°29.89 31.34	313°47.29 47.37	39°11.54 55.40	Saturn 13°33.15 16:24
20	40°44.12	70°30.55 39.54	275°33.20 31.61	328°50.04 47.34	54°13.83 55.32	
21	55° 46.58	85°30.48 · · 38.45	290°36.50 · · 31.89	343°52.79 · · 47.32	69°16.12 · · 55.24	Horizontal parallax Venus: 0.2
22 23	70° 49.05 85° 51.51	100°30.42 37.36 115°30.35 36.27	305°39.81 32.16 320°43.12 32.44	358°55.54 47.29 13°58.29 47.27	84°18.41 55.16 99°20.70 55.08	Mars: 0.2
Mer.p	pass. 17:18	ν-0.1' d-1.1' m-4.44	ν3.3' d0.3' m-1.19	ν2.8' d-0.0' m-2.75	ν2.3' d-0.1' m1.05	

h	Su	Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°30.00	\$23°12.70	205°9.54	8.3'	S27°19.15	4.4'	55.7'
1	194° 29.69	12.55	219°36.81	8.2'	27°23.60	4.3'	55.7'
2	209° 29.39 224° 29.08	12.40 •• 12.25	234°4.01 248°31.13	8.1' 8.0'	27°27.90 27°32.06	4.2' 4.0'	55.7' 55.8'
4	239° 28.78	12.09	262°58.18	8.0'	27°36.07	3.9'	55.8'
5	254°28.48	11.94	277°25.15	7.9'	27°39.94	3.7'	55.8'
6	269°28.17	\$23°11.79	291°52.05	7.8'	\$27°43.66	3.6'	55.8'
7 8	284°27.87 299°27.57	11.63 11.48	306°18.87 320°45.63	7.8' 7.7'	27°47.22 27°50.64	3.4' 3.3'	55.9' 55.9'
9	314° 27.26	. 11.32	335°12.32	7.6'	27°53.91	3.1'	55.9'
10	329°26.96	11.17	349°38.94	7.6'	27°57.02	3.0'	55.9'
11	344°26.66	11.01	4°5.49	7.5'	27°59.99	2.8'	56.0'
12 13	359°26.35 14°26.05	\$23°10.85 10.69	18°31.98 32°58.41	7.4' 7.4'	\$28°2.80 28°5.45	2.7' 2.5'	56.0' 56.0'
14	29° 25.75	10.09	47°24.77	7.3'	28°7.95	2.3'	56.0'
15	44° 25.44	. 10.37	61°51.08	7.2'	28°10.29	2.2'	56.0'
16	59° 25.14	10.21	76°17.33	7.2'	28°12.48	2.0'	56.1'
17	74°24.84 89°24.54	10.05 \$23° 9.89	90°43.52 105°9.65	7.1' 7.1'	28°14.51 \$28°16.38	1.9'	56.1'
18 19	89°24.54 104°24.23	9.72	105 9.65 119°35.74	7.1° 7.0'	28° 18.09	1.7' 1.6'	56.1' 56.1'
20	119° 23.93	9.56	134°1.77	7.0'	28°19.64	1.4'	56.2
21	134°23.63	• • 9.39	148°27.75	6.9'	28°21.03	1.2'	56.2'
22	149°23.33	9.23	162°53.69	6.9'	28°22.25	1.1'	56.2'
23	164°23.02	9.06	177°19.58	6.8'	28°23.32	0.9'	56.2'
	SD = 16.3'	d = -0.1'		SI	O = 15.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°22.72	\$23°8.89	191°45.43	6.8'	S28°24.23	0.7'	56.3
1	194°22.42	8.72	206°11.23	6.8'	28°24.97	0.6'	56.3'
2	209°22.12	8.55	220°36.99	6.7'	28°25.54	0.4'	56.3'
3 4	224° 21.82 239° 21.52	· · 8.38 8.21	235°2.72 249°28.41	6.7' 6.7'	28°25.96 28°26.20	0.2' 0.1'	56.3' 56.4'
5	254°21.21	8.04	263°54.06	6.6'	28°26.29	-0.1	56.4
6	269°20.91	\$23°7.87	278°19.69	6.6'	S28°26.21	-0.2'	56.4'
7	284°20.61	7.69	292°45.28	6.6'	28°25.96	-0.4'	56.4'
8 9	299°20.31 314°20.01	7.52 · · 7.34	307°10.85 321°36.38	6.5' 6.5'	28°25.54 28°24.96	-0.6' -0.7'	56.5' 56.5'
10	329° 19.71	7.17	336°1.90	6.5	28°24.21	-0.7	56.5
11	344° 19.41	6.99	350°27.39	6.5'	28°23.29	-1.1'	56.5
12	359° 19.11	\$23°6.81	4°52.86	6.5'	S28°22.21	-1.3'	56.5'
13 14	14° 18.81 29° 18.51	6.64	19°18.31 33°43.75	6.4'	28°20.96 28°19.54	-1.4' -1.6'	56.6' 56.6'
14 15	29 18.51 44°18.21	6.46 •• 6.28	33 43.75 48°9.17	6.4' 6.4'	28 19.54 28°17.95	-1.0 -1.8'	56.6'
16	59° 17.91	6.10	62°34.59	6.4'	28°16.19	-1.9'	56.6'
17	74° 17.61	5.92	$76^{\circ}59.99$	6.4'	$28^{\circ}14.26$	-2.1'	56.7'
18	89° 17.31	\$23° 5.73	91°25.38	6.4'	\$28°12.17	-2.3'	56.7'
19 20	104° 17.01 119° 16.71	5.55 5.37	105°50.77 120°16.15	6.4' 6.4'	28°9.90 28°7.47	-2.4' -2.6'	56.7' 56.7'
21	134° 16.41	. 5.18	134°41.53	6.4	28°4.87	-2.8'	56.8'
22	149°16.11	5.00	149°6.91	6.4'	28°2.10	-2.9'	56.8'
23	164° 15.81	4.81	163°32.30	6.4'	27°59.16	-3.1'	56.8'
	SD = 16.3'	d = -0.2'		SI	O = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 15.51	\$23°4.62	177°57.68	6.4'	\$27°56.05	-3.3'	56.8'
1	194° 15.21 209° 14.91	4.43 4.25	192°23.08 206°48.48	6.4' 6.4'	27°52.78 27°49.33	-3.4'	56.9'
2	209°14.91 224°14.61	4.25	206°48.48 221°13.89	6.4	27°49.33 27°45.72	-3.6' -3.8'	56.9' 56.9'
4	239° 14.31	3.87	235°39.32	6.4'	27°41.94	-3.9'	56.9'
5	254° 14.02	3.67	250°4.75	6.5'	27°37.99	-4.1'	56.9'
6	269° 13.72 284° 13.42	\$23° 3.48 3.29	264°30.21 278°55.68	6.5'	\$27°33.87 27°29.59	-4.3'	57.0'
7 8	284°13.42 299°13.12	3.29 3.10	278°55.68 293°21.17	6.5' 6.5'	27°29.59 27°25.14	-4.5' -4.6'	57.0' 57.0'
9	314° 12.82	• • 2.90	307°46.69	6.5	27°20.52	-4.8'	57.0'
10	329° 12.53	2.71	322°12.22	6.6'	27°15.74	-4.9'	57.1'
11	344°12.23	2.51	336°37.79	6.6'	27°10.79	-5.1'	57.1'
12 13	359°11.93 14°11.63	\$23°2.31 2.12	351°3.37 5°28.99	6.6' 6.6'	\$27°5.68 27°0.40	-5.3' -5.4'	57.1' 57.1'
14	29°11.34	1.92	19°54.64	6.7'	26°54.96	-5.6'	57.1'
15	44°11.04	• • 1.72	34°20.32	6.7'	$26^{\circ}49.35$	-5.8'	57.2'
16	59° 10.74	1.52	48°46.03	6.7'	26°43.58	-5.9'	57.2'
17 18	74° 10.44 89° 10.15	1.32 \$23° 1.12	63°11.78 77°37.57	6.8' 6.8'	26°37.65 \$26°31.55	-6.1' -6.3'	57.2' 57.2'
19	104°9.85	0.92	92°3.40	6.9	26°25.30	-6.4'	57.2 57.3'
20	119°9.55	0.71	106°29.26	6.9'	$26^{\circ}18.88$	-6.6'	57.3'
21	134°9.26	• • 0.51	120°55.17	7.0'	26°12.31	-6.7'	57.3'
22 23	149°8.96 164°8.67	0.30 0.10	135°21.12 149°47.12	7.0' 7.0'	26°5.57 25°58.68	-6.9' -7.1'	57.3' 57.3'
23	SD = 16.3'	d = -0.2'	179 41.12		0 = 15.5'	-1.1	51.5
	<u> </u>	<u>u — -0.2</u>		عد	J — 10.0		

Lat.	Twilight		Sunrise	Sunset	Twilight		
Lat.	Naut.	Civil	Juliuse	Junset	Civil	Naut.	
N 72°	08:25	10:47		_	13:19	15:41	
N 70°	08:06	09:52			14:14	16:00	
68°	07:51	09:18			14:47	16:15	
66°	07:38	08:54	10:30	13:35	15:12	16:28	
64°	07:27	08:35	09:51	14:15	15:31	16:39	
62°	07:18	08:19	09:24	14:42	15:46	16:48	
60°	07:10	08:06	09:03	15:03	16:00	16:56	
N 58°	07:02	07:55	08:46	15:20	16:11	17:03	
56°	06:56	07:45	08:32	15:34	16:21	17:10	
54°	06:50	07:36	08:19	15:46	16:30	17:16	
52°	06:44	07:28	80:80	15:57	16:38	17:22	
50°	06:39	07:20	07:59	16:07	16:45	17:27	
45°	06:27	07:04	07:38	16:27	17:01	17:38	
N 40°	06:17	06:51	07:22	16:44	17:14	17:48	
35°	06:08	06:40	07:08	16:58	17:26	17:58	
30°	05:59	06:29	06:55	17:10	17:36	18:06	
20°	05:43	06:11	06:35	17:31	17:55	18:22	
N 10°	05:27	05:53	06:16	17:49	18:12	18:38	
0°	05:10	05:37	05:59	18:06	18:29	18:55	
S 10°	04:52	05:19	05:42	18:24	18:47	19:14	
20°	04:29	04:58	05:23	18:42	19:07	19:36	
30°	04:01	04:34	05:01	19:04	19:32	20:05	
35°	03:42	04:19	04:48	19:17	19:47	20:23	
40°	03:19	04:01	04:33	19:32	20:04	20:46	
45°	02:49	03:38	04:16	19:50	20:27	21:16	
S 50°	02:05	03:09	03:54	20:12	20:56	22:00	
52°	01:38	02:54	03:43	20:22	21:10	22:26	
54°	00:56	02:37	03:31	20:34	21:28	23:08	
56°	////	02:15	03:17	20:48	21:49	////	
58°	////	01:47	03:00	21:04	22:18	////	
S 60°	////	01:01	02:40	21:24	23:02	////	

Lat.	Moonrise			Moonset			
Lat.	Sun	Mon	Tue	Sun	Mon	Tue	
N 72°							
N 70°							
68°							
66°							
64°							
62°			11:37			13:44	
60°	09:08	10:18	10:47	12:14	13:03	14:34	
N 58°	08:31	09:37	10:16	12:51	13:44	15:05	
56°	08:05	09:09	09:52	13:18	14:12	15:28	
54°	07:44	08:47	09:33	13:39	14:34	15:47	
52°	07:27	08:29	09:16	13:56	14:52	16:03	
50°	07:12	08:14	09:02	14:11	15:07	16:17	
45°	06:42	07:43	08:34	14:42	15:38	16:45	
N 40°	06:19	07:19	08:11	15:05	16:02	17:07	
35°	06:00	06:59	07:52	15:25	16:21	17:25	
30°	05:43	06:42	07:36	15:41	16:38	17:41	
20° N 10°	05:15 04:52	06:13 05:49	07:09 06:45	16:10 16:34	17:07 17:31	18:07 18:30	
0°	04:32	05:49	06:45	16:54	17:54	18:51	
S 10° 20°	04:08	05:03	06:01	17:19	18:16	19:12	
30°	03:44 03:17	04:39 04:10	05:38 05:10	17:43 18:12	18:40 19:08	19:34 20:00	
35°	03:17	03:53	04:54	18:28	19:06	20:00	
40°	03:01	03:34	04:35	18:48	19:25	20:13	
45°	02:42	03:10	04:12	19:12	20:07	20:53	
S 50°	01:51	02:39	03:43	19:42	20:37	21:19	
52°	01:31	02:39	03:43	19:42	20:57	21:19	
54°	01:37	02:24	03:20	20:15	21:09	21:47	
56°	01:02	01:45	02:51	20:36	21:30	22:03	
58°	00:39	01:18	02:26	21:03	21:55	22:24	
S 60°	00:08	00:39	01:51	21:42	22:30	22:49	