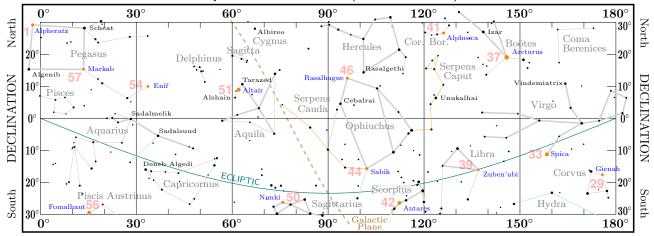
### GENERATED USING SKYFIELD

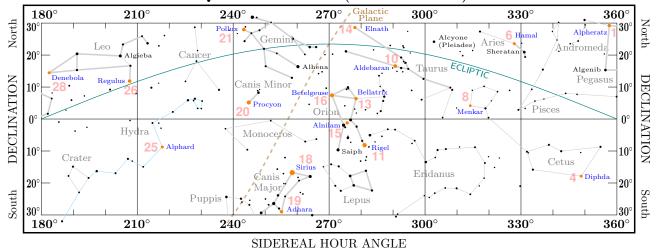
http://rhodesmill.org/skyfield/

#### EQUATORIAL STARS (SHA $0^{\circ}$ to $180^{\circ}$ )



SIDEREAL HOUR ANGLE

#### EQUATORIAL STARS (SHA 180° to 360°)



THE NAUTICAL ALMANAC

# 2025

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.<sup>1</sup> 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.<sup>2</sup>) 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  $\Delta T$  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 <a href="http://thenauticalalmanac.com">http://thenauticalalmanac.com</a> has been publishing Celestial Navigation related material with software provided here.

<sup>&</sup>lt;sup>1</sup>https://en.wikipedia.org/wiki/Day\_length\_fluctuations

<sup>&</sup>lt;sup>2</sup>https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html

### January 01, 02, 03 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
0	100°53.98	130°30.29 \$13°35.		29°1.04 N21°47.24	114°22.99 S07°55.01	A l l	357°34.85	29°13.85
1	115°56.44	145°30.22 34.		44°3.79 47.22	129°25.28 54.93	Alpheratz Ankaa	357°34.85 353°7.17	-42°10.45
2	130°58.90	160°30.16 33.		59°6.54 47.19	144°27.57 54.85	Schedar	349°31.08	56°40.74
3	146°1.37	175°30.10 · · 31.		74°9.29 · · 47.17	159°29.86 · · 54.77	Diphda	348° 47.30	-17°51.09
4 5	161°3.83 176°6.30	190°30.04 30. 205°29.98 29.		89°12.04 47.14 104°14.79 47.12	174°32.15 54.69 189°34.44 54.61	Achernar	$335^{\circ}20.02$	-57° 6.86
6	191°8.76	220°29.92 \$13°28.		119°17.54 N21°47.09	204°36.73 S07°54.53		327°51.08	23°34.95
7	206°11.23	235°29.86 27.		134°20.28 47.07	219°39.02 54.46	Polaris Acamar	313°44.00 315°11.52	89°22.44
8	221°13.69	250°29.80 26.	45 96°12.95 34.91	149°23.03 47.05	234°41.31 54.38	Menkar	314°5.96	-40°12.44 4°11.28
9	236° 16.15	265°29.74 · · 25.		164°25.78 · · 47.02	249°43.60 · · 54.30	Mirfak	308° 27.93	49°57.18
10 11	251°18.62 266°21.08	280°29.69 24. 295°29.63 23.		179°28.53 47.00 194°31.27 46.97	264° 45.89 54.22 279° 48.18 54.14	Aldebaran	290°39.33	$16^{\circ}33.61$
12	281°23.55	310°29.58 \$13°22.		209°34.02 N21°46.95	294°50.47 <b>S</b> 07°54.06	Rigel	281°3.56	-8°10.38
13	296°26.01	325°29.53 20.		224°36.77 46.92	309°52.76 53.98	Capella	280°21.45	46°1.45
14	311°28.48	340°29.48 19.	88 186°32.89 36.57	239°39.51 46.90	324°55.05 53.90	Bellatrix Elnath	278°22.56 278°1.51	6°22.34 28°37.74
15	326°30.94	355°29.43 · · 18.		254°42.26 · · 46.87	339°57.33 · · 53.83	I	275°37.41	-1°11.16
16	341°33.40	10°29.38 17.		269°45.00 46.85	354°59.62 53.75	Betelgeuse	270°51.76	7°24.70
17 18	356° 35.87 11° 38.33	25°29.33 16. 40°29.28 \$13°15.		284°47.75 46.83 299°50.49 N21°46.80	10°1.91 53.67 25°4.20 \$07°53.59	Canopus	263°51.84	$-52^{\circ}42.51$
19	26° 40.80	55°29.23 14.		314°53.24 46.78	40°6.49 53.51	1	258° 25.89	-16°45.02
20	41°43.26	70°29.19 13.		329°55.98 46.75	55°8.78 53.43	Adhara Procyon	255°5.49 244°50.51	-29°0.33 5°9.63
21	56° 45.72	85°29.14 · · 12.		344°58.73 · · 46.73	70°11.06 · · 53.35	Pollux	244 50.51 243°16.95	5 9.03 27°57.88
22	71°48.19	100°29.10 11.		0°1.47 46.70	85°13.35 53.27	Avior	234° 14.15	-59°35.21
23	86°50.65	115°29.06 9.	99 322°2.88 39.05	15°4.22 46.68	100°15.64 53.19	Suhail	222°45.95	-43°31.85
Mer.	pass. 17:14	u-0.1 $'$ d-1.1 $'$ m-4.4	45 $\nu$ 3.3′ $d$ 0.3′ $m$ -1.21	$\nu$ 2.7′ <i>d</i> -0.0′ m-2.74	$ u 2.3' \ d  0.1' \ \text{m} 1.05$	Miaplacidus	221°37.53	-69°48.95
						Alphard	217°47.51	-8°46.00
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		207°34.24 193°40.70	11°50.62 61°36.68
0	101°53.12	130°29.01 <b>S</b> 13°8.		30°6.96 N21°46.66	115°17.93 <b>S</b> 07°53.11		182°24.88	14°25.83
1	116°55.58		79 352°9.55 39.60	45°9.70 46.63	130°20.21 53.03		175°43.56	-17°40.77
2 3	131°58.05 147°0.51		69 $7^{\circ}12.89$ 39.87 59 $22^{\circ}16.23$ · · 40.15	60°12.45 46.61	145°22.50 52.95	Acrux	$173^{\circ}0.10$	-63°13.97
3 4	147 0.51 162°2.97	175°28.89 · · 5. 190°28.85 4.	59 22°16.23 · · 40.15 48 37°19.58 40.43	75°15.19 · · 46.58 90°17.93 46.56	160°24.79 · · 52.87 175°27.07 52.79		171°51.65	-57°14.92
5	177°5.44		38 52°22.92 40.70	105°20.67 46.54	190°29.36 52.71		166°12.99	55°49.13
6	192°7.90	220°28.78 \$13°2.		120°23.41 N21°46.51	205°31.65 <b>S</b> 07°52.63		158° 22.38 152° 52.14	-11°17.48 49°11.01
7	207° 10.37		18 82°29.61 41.25	135°26.16 46.49	220° 33.93 52.55		148° 36.29	-60°29.35
8	222° 12.83	250°28.71 13°0.		150°28.90 46.46	235°36.22 52.47		147°57.79	-36°29.41
9 10	237° 15.29 252° 17.76	265°28.68 12°58. 280°28.64 57.		165°31.64 · · 46.44 180°34.38 46.42	250°38.51 · · 52.39 265°40.79 52.31	1	$145^{\circ}48.06$	19°2.98
11	267° 20.22	295°28.61 56.		195°37.12 46.39	280°43.08 52.23		139°40.66	-60°56.07
12	282°22.69	310°28.58 S12°55.		210°39.86 N21°46.37	295°45.37 S07°52.15		137°20.42 136°56.22	74°2.81 -16°8.70
13	$297^{\circ}25.15$	325°28.55 54.		225°42.60 46.35	310°47.65 52.07	Alphecca	126° 4.01	26°37.66
14	312°27.62	340°28.52 53.		240°45.34 46.32	325°49.94 51.99		112° 16.17	-26°29.19
15	327°30.08	355°28.50 · · 52.		255°48.08 · · 46.30	340°52.22 · · 51.91	Atria	$107^{\circ}10.94$	$-69^{\circ}4.18$
16 17	342°32.54 357°35.01	10°28.47 51. 25°28.44 50.		270°50.82 46.27 285°53.56 46.25	355°54.51 51.83 10°56.79 51.75	Sabik	102°3.12	-15°45.35
18	12° 37.47	40°28.42 \$12°49.		300°56.30 N21°46.23	25°59.08 S07°51.67	Shaula	96°10.79	-37°7.27
19	27°39.94	55°28.39 47.		315°59.03 46.20	41°1.36 51.59	Rasalhague	95°58.89 90°42.72	12°32.43 51°29.00
20	42°42.40	70°28.37 46.		331°1.77 46.18	56°3.65 51.51	Eltanin Kaus Aust.		-34°22.37
21	57° 44.86	85°28.35 · · 45.		346°4.51 · · 46.16	71°5.93 · · 51.43	Vega	80°33.67	38°48.33
22 23	72° 47.33 87° 49.79	100°28.33 44. 115°28.31 43.		1°7.25 46.13 16°9.99 46.11	86°8.22 51.35 101°10.50 51.27	Nunki	$75^{\circ}48.15$	$-26^{\circ}15.98$
				· -		Altair	62°0.30	8°56.02
Mer.	pass. 17:10	$\nu$ -0.0' d-1.1' m-4.4	46 $\nu 3.3' \ d0.3' \ \text{m-}1.24$	$\nu 2.7' \ d$ -0.0' m-2.74	$\nu 2.3' \ d$ -0.1' m1.06	Peacock	53°6.29	-56°39.41
						Deneb Enif	49°26.24 33°39.05	45°22.24 9°59.38
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir	27° 33.22	-46°50.61
0	102°52.26	130°28.29 \$12°42.		31°12.72 N21°46.09	116°12.79 S07°51.19	Fomalhaut	15° 14.69	-29°29.57
1 2	117°54.72 132°57.19	145°28.27 41. 160°28.25 40.		46°15.46 46.06 61°18.20 46.04	131°15.07 51.11 146°17.35 51.03	Scheat	13°45.38	28°13.22
3	132 57.19 147°59.65	175°28.24 · · 39.		76°20.93 · · 46.02	161°19.64 · · 50.95	Markab	13°30.06	15°20.44
4	163°2.11	190°28.22 37.		91°23.67 45.99	176°21.92 50.87	Jan 01 Wed	SHA	Mer.pass
5	178°4.58	205°28.21 36.		106°26.40 45.97	191°24.21 50.79	Venus	29°36.31	15:18
6	193°7.04	220°28.19 \$12°35.		121°29.14 N21°45.95	206°26.49 <b>S</b> 07°50.70		234°52.45	01:37
7	208°9.51	235°28.18 34.		136°31.87 45.92	221°28.77 50.62	Jupiter Saturn	288°7.07	22:00
8 9	223°11.97 238°14.43	250°28.17 33. 265°28.16 · · 32.		151°34.61 45.90 166°37.34 • 45.88	236°31.06 50.54 251°33.34 • 50.46	Saturn	13°29.02	16:20
10	253° 16.90	280°28.15 31.		181°40.08 45.85	266°35.62 50.38	Jan 02 Thu	SHA	Mer.pass
11	268° 19.36	295°28.14 30.		196°42.81 45.83	281°37.91 50.30	Venus	28°35.90	15:18
12	283°21.83	310°28.13 \$12°29.		211°45.54 N21°45.81	296°40.19 <b>S</b> 07°50.22		235°13.10 288°13.84	01:31 21:56
13	298°24.29	325°28.13 27.		226°48.28 45.78	311°42.47 50.14	Saturn	13°24.81	16:16
14 15	313°26.75	340°28.12 26. 355°28.11 · · 25.		241°51.01 45.76	326°44.75 50.05 341°47.04 • 49.97			
15 16	328° 29.22 343° 31.68	355°28.11 · · · 25. 10°28.11 24.		256°53.74 · · 45.74 271°56.48 45.71	341°47.04 · · 49.97 356°49.32 49.89	Jan 03 Fri Venus	<b>SHA</b> 27° 36.03	Mer.pass 15:18
17	358° 34.15	25°28.11 23.		286°59.21 45.69	11°51.60 49.81		27 30.03 235°34.39	01:26
18	13°36.61	40°28.11 \$12°22.		302°1.94 N21°45.67	26°53.88 S07°49.73	1	288° 20.47	21:51
19	28°39.08	55°28.10 21.		317°4.67 45.65	41°56.16 49.65	Saturn	13°20.53	16:13
20	43°41.54	70°28.10 20.		332°7.40 45.62	56°58.45 49.57	Horizont	tal parallax	
21 22	58° 44.00 73° 46.47	85°28.11 · · 18. 100°28.11 17.	_	347°10.13 · · 45.60 2°12.86 45.58	72°0.73 · · 49.48 87°3.01 49.40	1101120111	Venus:	0.2
23	88° 48.93	115°28.11 16.		17°15.60 45.55	102°5.29 49.32		Mars:	0.2
ivier.	pass. 17:06	ν-0.0′ d-1.1′ m-4.4	+1 ν3.4° α0.3° m-1.26	ν2.7' d-0.0' m-2.73	ν2.3' d-0.1' m1.06			

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°8.37	S22°59.89	164°13.16	7.1'	\$25°51.63	-7.2'	57.4'
1	194°8.07	59.69	178°39.25	7.1'	25°44.42	-7.4'	57.4'
2	209°7.78	59.48	193°5.38	7.2'	25°37.06	-7.5'	57.4'
3	224°7.48	• • 59.27	207°31.57	7.2'	25°29.54	-7.7'	57.4'
4 5	239°7.19 254°6.89	59.06 58.85	221°57.81 236°24.10	7.3' 7.3'	25°21.87 25°14.04	-7.8' -8.0'	57.5' 57.5'
6	269° 6.60	\$22°58.64	250°50.45	7.4	S25°6.06	-8.1'	57.5'
7	284° 6.30	58.43	265°16.85	7.5	24°57.93	-8.3	57.5'
8	299°6.01	58.21	279°43.31	7.5'	24°49.65	-8.4'	57.5'
9	314°5.71	• • 58.00	294°9.82	7.6'	24°41.22	-8.6'	57.6'
10	329°5.42	57.79	308°36.39	7.6'	24°32.64	-8.7'	57.6'
11	344°5.12	57.57	323°3.02	7.7'	24°23.92	-8.9'	57.6'
12 13	359° 4.83 14° 4.54	\$22°57.36 57.14	337°29.71 351°56.46	7.8' 7.8'	\$24°15.05 24°6.03	-9.0' -9.2'	57.6' 57.6'
14	29° 4.24	56.92	6°23.27	7.8 7.9'	24 0.03 23°56.87	-9.2 -9.3'	57.0° 57.7°
15	44°3.95	56.70	20°50.15	7.9'	23°47.56	-9.4'	57.7'
16	59° 3.65	56.48	35°17.09	8.0'	23°38.11	-9.6'	57.7'
17	74°3.36	56.26	49°44.09	8.1'	23°28.52	-9.7'	57.7'
18	89°3.07	S22°56.04	64°11.16	8.1'	S23°18.80	-9.9'	57.7'
19	104°2.77	55.82	78°38.29	8.2'	23°8.93	-10.0'	57.8'
20	119°2.48	55.60	93°5.49	8.3'	22°58.93	-10.1'	57.8'
21 22	134°2.19 149°1.90	· · 55.38 55.15	107°32.75 122°0.09	8.3' 8.4'	22°48.78 22°38.51	-10.3' -10.4'	57.8' 57.8'
23	149 1.90 164° 1.60	55.15 54.93	122 0.09 136°27.49	8.5'	22°28.10	-10.4 -10.5'	57.8'
	SD = 16.3'	d = -0.2'			D = 15.6'		
	JD — 10.3	u — -U.Z		31	J — 13.0		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 1.31	\$22°54.70	150°54.95	8.5'	\$22°17.56	-10.7'	57.8'
1 2	194°1.02 209°0.73	54.48 54.25	165°22.49 179°50.09	8.6' 8.7'	22°6.88 21°56.08	-10.8' -10.9'	57.9' 57.9'
3	209 0.73 224° 0.43	• • 54.02	179 50.09 194°17.77	8.7'	21°45.15	-10.9	57.9'
4	239° 0.14	53.79	208°45.51	8.8'	21°34.09	-11.2'	57.9'
5	253°59.85	53.56	223°13.32	8.9'	21°22.90	-11.3'	57.9'
6	268°59.56	S22°53.33	237°41.20	9.0'	S21°11.59	-11.4'	58.0'
7	283°59.27	53.10	252°9.16	9.0'	21°0.16	-11.6'	58.0'
8	298°58.98	52.87	266°37.18	9.1'	20°48.60	-11.7'	58.0'
9 10	313°58.69 328°58.39	· · 52.64 52.41	281°5.27 295°33.43	9.2' 9.2'	20°36.92 20°25.12	-11.8' -11.9'	58.0' 58.0'
11	328 58.39 343°58.10	52.41 52.17	295 33.43 310°1.67	9.2 9.3'	20°25.12	-11.9 -12.0'	58.0'
12	358° 57.81	522°51.94	324°29.97	9.4	520°1.18	-12.1'	58.1'
13	13°57.52	51.70	338°58.34	9.4	19°49.03	-12.3'	58.1'
14	28°57.23	51.47	353°26.79	9.5'	19°36.77	-12.4'	58.1'
15	43°56.94	•• 51.23	7°55.30	9.6'	19°24.39	-12.5'	58.1'
16	58°56.65	50.99	22°23.88	9.7'	19°11.90	-12.6'	58.1'
17 18	73°56.36 88°56.07	50.75 \$22°50.51	36°52.53 51°21.26	9.7' 9.8'	18° 59.31 \$18° 46.60	-12.7'	58.1' 58.2'
19	103°55.78	50.27	65°50.05	9.6 9.9'	18° 33.79	-12.8' -12.9'	58.2'
20	118°55.50	50.03	80°18.91	9.9'	18° 20.87	-13.0'	58.2'
21	133°55.21	• • 49.79	94°47.83	10.0'	18°7.85	-13.1'	58.2'
22	148°54.92	49.55	109°16.83	10.1'	17°54.72	-13.2'	58.2'
23	163°54.63	49.30	123°45.89	10.1'	17°41.50	-13.3'	58.2'
	SD = 16.3'	d = -0.2'		SI	O = 15.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.34	S22°49.06	$138^{\circ}15.02$	10.2'	<b>S</b> 17°28.17	-13.4'	58.3'
1	193°54.05	48.81	152°44.22	10.3'	17° 14.74	-13.5'	58.3'
2	208°53.76	48.57	167°13.49	10.3	17°1.22	-13.6'	58.3'
3 4	223°53.48 238°53.19	· · 48.32 48.07	181°42.81 196°12.21	10.4' 10.5'	16°47.60 16°33.89	-13.7' -13.8'	58.3' 58.3'
4 5	253°52.90	48.07 47.82	210°41.67	10.5	16° 33.89	-13.8 -13.9'	58.3'
6	268°52.61	\$22°47.58	225°11.19	10.6'	\$16°6.18	-14.0'	58.3'
7	283°52.33	47.33	239°40.78	10.7'	15°52.19	-14.1'	58.4'
8	298°52.04	47.07	254°10.43	10.7'	$15^{\circ}38.12$	-14.2'	58.4'
9	313°51.75	• • 46.82	268°40.14	10.8'	15°23.95	-14.2'	58.4'
10	328°51.46	46.57	283°9.92	10.8'	15°9.70	-14.3'	58.4'
11 12	343°51.18 358°50.89	46.32 \$22°46.06	297°39.75 312°9.65	10.9' 11.0'	14°55.37 \$14°40.95	-14.4' -14.5'	58.4' 58.4'
13	358 50.89 13°50.61	45.81	312°9.65 326°39.60	11.0'	14° 26.45	-14.5' -14.6'	58.4' 58.4'
14	28°50.32	45.55	341°9.61	11.1'	14°20.45	-14.0 -14.7'	58.5'
15	43°50.03	• • 45.30	355°39.68	11.1'	13°57.22	-14.7'	58.5'
16	58°49.75	45.04	$10^{\circ}9.81$	11.2'	13°42.49	-14.8'	58.5'
17	73°49.46	44.78	24°39.99	11.2'	13°27.68	-14.9'	58.5'
18	88°49.18	\$22°44.53	39°10.23	11.3'	\$13°12.79	-15.0'	58.5'
19 20	103°48.89 118°48.61	44.27 44.01	53°40.52 68°10.87	11.3' 11.4'	12°57.84 12°42.81	-15.0'	58.5' 58.5'
20	118 48.61 133 48.32	44.01	82°41.26	11.4	12° 42.81 12° 27.71	-15.1' -15.2'	58.5'
22	148°48.04	43.48	97°11.71	11.5	12°12.54	-15.2'	58.6'
23	163°47.75	43.22	111°42.21	11.5'	11°57.31	-15.3'	58.6'
	SD = 16.3'	d = -0.2'		SI	D = 15.9'		
		_					

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-11%	
01	03:27	03:41	12:04	13:33	01:06		
02	03:55	04:09	12:04	14:27	02:01		
03	04:23	04:36	12:05	15:18	02:53		

#### January 04, 05, 06 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	103°51.40	130°28.11 \$12°15.60	339°47.68 N23°52.57	32°18.33 N21°45.53	117°7.57 \$07°49.24	
1	118° 53.86	145°28.12 14.48	354°51.07 52.85	47°21.06 45.51	132°9.85 49.16	Alpheratz 357°34.86 29°13.85
2	133°56.32	160°28.12 13.36	9°54.46 53.12	62°23.79 45.49	147°12.13 49.07	Ankaa 353°7.19 -42°10.45   Schedar 349°31.10 56°40.74
3	148°58.79	175°28.13 · · 12.24	24°57.85 · · 53.40	77°26.51 · · 45.46	162°14.42 · · 48.99	Diphda 348°47.31 -17°51.09
4	164°1.25	190°28.14 11.12	40° 1.25 53.67	92°29.24 45.44	177°16.70 48.91	Achernar 335°20.04 -57°6.86
5	179°3.72	205°28.15 10.00	55° 4.64 53.95	107°31.97 45.42	192°18.98 48.83	Hamal 327°51.09 23°34.95
6 7	194°6.18 209°8.64	220°28.16 \$12°8.88 235°28.17 7.75	70°8.03 N23°54.22 85°11.43 54.50	122°34.70 N21°45.39 137°37.43 45.37	207°21.26 \$07°48.75 222°23.54 48.66	Polaris 313°45.29 89°22.46
8	209 8.04 224° 11.11	235°28.17 7.75 250°28.18 6.63	100°14.82 54.77	137°37.43 45.37 152°40.16 45.35	222°23.54 48.66 237°25.82 48.58	Acamar 315°11.53 -40°12.44
9	239°13.57	265°28.19 · · 5.51	115°18.22 · · 55.05	167°42.88 · · 45.33	252°28.10 · · 48.50	Menkar 314°5.97 4°11.27
10	254° 16.04	280°28.21 4.39	130°21.62 55.33	182°45.61 45.30	267°30.38 48.42	Mirfak 308°27.94 49°57.18
11	269° 18.50	295°28.22 3.26	145°25.02 55.60	197°48.34 45.28	282°32.66 48.33	Aldebaran 290°39.33 16°33.61 Rigel 281°3.56 -8°10.39
12	284°20.97	310°28.24 \$12°2.14	160°28.42 N23°55.88	212°51.07 N21°45.26	297°34.94 \$07°48.25	Rigel 281°3.56 -8°10.39 Capella 280°21.45 46°1.46
13	299°23.43	325°28.25 12°1.01	175°31.82 56.15	227°53.79 45.24	312°37.22 48.17	Bellatrix 278°22.56 6°22.34
14	314°25.89	340°28.27 11°59.89	190°35.22 56.43	242°56.52 45.21	327°39.50 48.09	Elnath 278°1.51 28°37.74
15	329°28.36	355°28.29 · · 58.77	205°38.62 · · 56.70	257°59.24 · · 45.19	342°41.78 · · 48.00	Alnilam 275°37.41 -1°11.17
16 17	344° 30.82 359° 33.29	10°28.31 57.64 25°28.33 56.52	220°42.03 56.98 235°45.43 57.25	273°1.97 45.17 288°4.70 45.15	357°44.06 47.92 12°46.34 47.84	Betelgeuse 270°51.76 7°24.70
18	14°35.75	40°28.35 \$11°55.39	250°48.84 N23°57.53	303°7.42 N21°45.13	27°48.61 S07°47.76	Canopus 263°51.84 -52°42.53
19	29°38.21	55°28.37 54.26	265°52.24 57.80	318°10.15 45.10	42°50.89 47.67	Sirius 258°25.89 -16°45.03
20	44° 40.68	70°28.39 53.14	280°55.65 58.08	333°12.87 45.08	57°53.17 47.59	Adhara 255°5.48 -29°0.34
21	59°43.14	85°28.42 · · 52.01	295°59.06 · · 58.35	348°15.59 · · 45.06	72°55.45 · · 47.51	Procyon 244°50.50 5°9.63
22	74°45.61	100°28.44 50.88	311°2.47 58.63	3°18.32 45.04	87°57.73 47.42	Pollux 243°16.93 27°57.88 Avior 234°14.14 -59°35.22
23	89°48.07	115°28.47 49.76	326° 5.88 58.90	18°21.04 45.01	103°0.01 47.34	Suhail 222°45.94 -43°31.87
Mer	pass. 17:02	ν0.0' d-1.1' m-4.48	ν3.4' d0.3' m-1.28	ν2.7' d-0.0' m-2.72	ν2.3' d-0.1' m1.06	Miaplacidus 221°37.51 -69°48.96
	Puss. 17.02					Alphard 217°47.49 -8°46.01
•	6114	GUA B	G.1.4 B	CUA D	6114	Regulus 207°34.21 11°50.62
Sun	GHA	GHA Dec	GHA Dec	GHA Dec 33°23.77 N21°44.99	GHA Dec	Dubhe 193°40.65 61°36.68
0 1	104° 50.53 119° 53.00	130°28.50 \$11°48.63 145°28.53 47.50	341° 9.29 N23° 59.18 356° 12.70 59.45	33°23.77 N21°44.99 48°26.49 44.97	118°2.29 S07°47.26 133°4.56 47.17	Denebola 182°24.85 14°25.82
2	134° 55.46	160°28.55 46.37	11°16.12 23°59.73	63°29.21 44.95	148°6.84 47.09	Gienah 175°43.54 -17°40.78
3	149°57.93	175°28.58 · · 45.24	26°19.53 24°0.00	78°31.93 · · 44.93	163°9.12 · · 47.01	Acrux 173°0.06 -63°13.98
4	165°0.39	190°28.62 44.11	41°22.94 0.28	93°34.66 44.90	178°11.40 46.92	Gacrux 171°51.62 -57°14.93
5	180°2.85	205°28.65 42.98	56°26.36 0.55	108°37.38 44.88	193°13.68 46.84	Alioth 166°12.95 55°49.12 Spica 158°22.36 -11°17.49
6	195°5.32	220°28.68 \$11°41.85	71°29.78 N24°0.82	123°40.10 N21°44.86	208°15.95 S07°46.76	Spica 158°22.36 -11°17.49   Alkaid 152°52.11 49°11.00
7	$210^{\circ}7.78$	235°28.71 40.72	86°33.19 1.10	138°42.82 44.84	223°18.23 46.67	Hadar 148°36.25 -60°29.35
8	225° 10.25	250°28.75 39.59	101°36.61 1.37	153°45.54 44.82	238°20.51 46.59	Menkent 147°57.77 -36°29.42
9	240°12.71	265°28.78 · · 38.46	116°40.03 · · 1.65	168°48.26 · · 44.79	253°22.79 · · 46.51	Arcturus 145°48.04 19°2.97
10	255° 15.18	280°28.82 37.33	131°43.45 1.92	183°50.98 44.77	268°25.06 46.42	Rigil Kent. 139°40.62 -60°56.07
11 12	270° 17.64 285° 20.10	295°28.86 36.20 310°28.90 \$11°35.07	146°46.87 2.19 161°50.30 N24°2.47	198°53.70 44.75 213°56.42 N21°44.73	283°27.34 46.34 298°29.62 \$07°46.26	Kochab 137°20.36 74°2.79
13	300°22.57	325°28.94 33.94	176°53.72 2.74	228°59.14 44.71	313°31.89 46.17	Zuben'ubi 136°56.20 -16°8.71
14	315°25.03	340°28.98 32.80	191°57.14 3.02	244°1.86 44.69	328°34.17 46.09	Alphecca 126°3.99 26°37.64
15	330° 27.50	355°29.02 · · 31.67	207° 0.57 · · 3.29	259° 4.58 · · 44.66	343°36.45 · · 46.01	Antares 112°16.15 -26°29.20 Atria 107°10.90 -69°4.18
16	345°29.96	10°29.06 30.54	222°3.99 3.56	274°7.30 44.64	358°38.72 45.92	Atria 107°10.90 -69°4.18 Sabik 102°3.11 -15°45.36
17	0°32.42	25°29.11 29.40	237°7.42 3.84	289°10.02 44.62	13°41.00 45.84	Shaula 96°10.78 -37°7.27
18	15°34.89	40°29.15 \$11°28.27	252°10.85 N24°4.11	304°12.73 N21°44.60	28°43.27 <b>S</b> 07°45.75	Rasalhague 95°58.88 12°32.41
19	30° 37.35	55°29.20 27.14	267°14.27 4.38	319°15.45 44.58	43°45.55 45.67	Eltanin 90°42.71 51°28.98
20	45°39.82	70°29.24 26.00	282°17.70 4.66	334°18.17 44.56	58°47.83 45.59	Kaus Aust. 83°32.93 -34°22.37
21 22	60° 42.28 75° 44.74	85°29.29 · · 24.87 100°29.34 23.73	297°21.13 · · 4.93 312°24.56 5.20	349°20.89 · · 44.53 4°23.60 44.51	73°50.10 · · 45.50 88°52.38 45.42	Vega 80°33.66 38°48.31
23	90° 47.21	115° 29.39 22.60	327°28.00 5.48	19°26.32 44.49	103°54.65 45.33	Nunki 75°48.14 -26°15.98
						Altair 62°0.30 8°56.01
Mer.	pass. 16:58	$ u 0.0' \ d$ -1.1' m-4.48	$\nu$ 3.4′ $d$ 0.3′ $m$ -1.30	$\nu 2.7' \ d$ -0.0' m-2.72	$\nu 2.3' \ d$ -0.1' m1.06	Peacock 53°6.29 -56°39.40
						Deneb 49°26.25 45°22.22 Enif 33°39.06 9°59.37
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.06 9°59.37 Al Na'ir 27°33.23 -46°50.61
0	105°49.67	130°29.44 <b>S</b> 11°21.46	342°31.43 N24°5.75	34°29.04 N21°44.47	118°56.93 <b>S</b> 07°45.25	Fomalhaut 15°14.70 -29°29.56
1	120°52.14	145°29.49 20.33	357°34.86 6.02	49°31.75 44.45	133°59.20 45.16	Scheat 13°45.39 28°13.22
2	135°54.60	160°29.54 19.19	12°38.29 6.30	64°34.47 44.43	149°1.48 45.08	Markab 13°30.07 15°20.43
3	150° 57.06	175°29.60 · · 18.05 190°29.65 16.92	27°41.73 · · 6.57	79°37.18 · · 44.41	164°3.75 · · 45.00	Jan 04 Sat SHA Mer.pass
4 5	165°59.53 181°1.99	190°29.65 16.92 205°29.71 15.78	42°45.17 6.84 57°48.60 7.11	94°39.90 44.38 109°42.61 44.36	179°6.03 44.91 194°8.30 44.83	Jan 04 Sat         SHA         Mer.pass           Venus         26°36.72         15:18
6	181 1.99 196°4.46	205 29.71 15.78 220°29.77 \$11°14.64	72°52.04 N24°7.39	124°45.33 N21°44.34	209°10.58 S07°44.74	Mars 235°56.29 01:21
7	211°6.92	235°29.82 13.50	87°55.48 7.66	139°48.04 44.32	224°12.85 44.66	Jupiter 288°26.93 21:47
8	226°9.38	250°29.88 12.37	102°58.92 7.93	154°50.76 44.30	239°15.13 44.57	Saturn 13°16.18 16:09
9	241°11.85	265°29.94 · · 11.23	118°2.36 · · 8.20	169°53.47 · · 44.28	254°17.40 · · 44.49	
10	256° 14.31	280° 30.00 10.09	133° 5.80 8.48	184°56.18 44.26	269°19.68 44.40	Jan 05 Sun         SHA         Mer.pass           Venus         25°37.96         15:18
11	271° 16.78	295°30.06 8.95	148° 9.24 8.75	199°58.90 44.24	284°21.95 44.32	Mars 236°18.76 01:15
12	286° 19.24	310°30.12 \$11°7.81	163°12.68 N24°9.02	215°1.61 N21°44.22	299°24.22	Jupiter 288°33.23 21:42
13	301°21.71	325°30.19 6.67	178°16.12 9.29	230° 4.32 44.19	314°26.50 44.15	Saturn 13°11.75 16:05
14 15	316°24.17 331°26.63	340°30.25 5.53 355°30.32 · · 4.39	193°19.57 9.56 208°23.01 • 9.84	245°7.03 44.17 260°9.74 •• 44.15	329°28.77 44.06 344°31.05 • 43.98	
16	346°29.10	10°30.38 3.25	208 23.01 · · 9.84 223°26.46 10.11	275°12.46 44.13	359°33.32 43.89	Jan 06 Mon         SHA         Mer.pass           Venus         24°39.77         15:18
17	1°31.56	25° 30.45 2.11	238°29.90 10.38	290°15.17 44.11	14°35.59 43.81	Venus 24-39.77 15:18   Mars 236°41.76 01:10
18	16°34.03	40°30.52 S11°0.97	253°33.35 N24°10.65	305°17.88 N21°44.09	29°37.87 S07°43.72	Jupiter 288°39.36 21:38
19	31°36.49	55°30.59 10°59.83	268°36.80 10.92	320°20.59 44.07	44°40.14 43.64	Saturn 13°7.26 16:02
20	46°38.95	70°30.66 58.68	283°40.25 11.19	335°23.30 44.05	59°42.41 43.55	
21	61°41.42	85° 30.73 · · 57.54	298°43.70 · · 11.46	350°26.01 · · 44.03	74°44.68 · · 43.47	Horizontal parallax
22	76° 43.88	100°30.80 56.40	313°47.15 11.73	5°28.72 44.01	89°46.96 43.38	Venus: 0.2 Mars: 0.2
23	91°46.35	115°30.88 55.26	328°50.60 12.00	20°31.43 43.99	104°49.23 43.30	Mars: 0.2
Mer.	pass. 16:54	u0.1′ $d$ -1.1′ m-4.49	$\nu 3.4' \ d0.3' \ \text{m-}1.32$	$\nu 2.7' \ d\text{-}0.0' \ \text{m-}2.71$	$\nu 2.3'~\textit{d}0.1'~\text{m}1.07$	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.47	S22°42.96	$126^{\circ}12.76$	11.6'	<b>S</b> 11°42.01	-15.4'	58.6'
1	193°47.18	42.69	140°43.36	11.6'	11°26.65	-15.4'	58.6'
2	208°46.90 223°46.62	42.43 •• 42.16	155° 14.00 169° 44.69	11.7' 11.7'	11°11.22 10°55.74	-15.5' -15.5'	58.6' 58.6'
4	238°46.33	41.90	184° 15.43	11.8'	10° 40.19	-15.6'	58.6'
5	253°46.05	41.63	$198^{\circ}46.21$	11.8'	$10^{\circ}24.59$	-15.7'	58.6'
6	268°45.77	S22°41.36	213° 17.04	11.9'	\$10°8.92	-15.7'	58.7'
7 8	283°45.48 298°45.20	41.09 40.82	227° 47.90 242° 18.81	11.9' 11.9'	09°53.21 09°37.43	-15.8' -15.8'	58.7' 58.7'
9	313°44.92	40.55	256° 49.76	12.0'	09°21.61	-15.9'	58.7'
10	328°44.64	40.28	$271^{\circ}20.74$	12.0'	$09^{\circ}5.74$	-15.9'	58.7'
11	343°44.35 358°44.07	40.01 \$22°39.74	285°51.76 300°22.82	12.1'	08°49.81 \$08°33.84	-16.0'	58.7'
12 13	13°43.79	39.47	300 22.82 314°53.92	12.1' 12.1'	08° 17.82	-16.0' -16.1'	58.7' 58.7'
14	28°43.51	39.19	329°25.05	12.2'	08°1.75	-16.1	58.7'
15	43°43.23	• • 38.92	343°56.21	12.2'	07°45.64	-16.2'	58.7'
16 17	58°42.95 73°42.66	38.64 38.36	358° 27.40 12° 58.63	12.2' 12.3'	07°29.49 07°13.29	-16.2' -16.2'	58.8' 58.8'
18	88°42.38	\$22°38.09	27° 29.88	12.3'	S06° 57.06	-16.3	58.8'
19	103°42.10	37.81	42°1.16	12.3'	$06^{\circ}40.79$	-16.3'	58.8'
20	118°41.82	37.53	56° 32.47	12.3'	06°24.48	-16.3'	58.8'
21 22	133°41.54 148°41.26	· · 37.25 36.97	71°3.80 85°35.16	12.4' 12.4'	06°8.13 05°51.75	-16.4' -16.4'	58.8' 58.8'
23	163°40.98	36.69	100°6.54	12.4'	05°35.34	-16.4	58.8'
	SD = 16.3'	d = -0.3'		SI	D = 16.0'		
_					-		
Sun 0	<b>GHA</b> 178°40.70	<b>Dec</b> \$22°36.41	<b>GHA</b> 114°37.94	u 12.4'	Dec \$05° 18.90	d -16.5'	<b>HP</b> 58.8'
1	176 40.70 193°40.42	36.13	129°9.36	12.4'	05°2.42	-16.5'	58.8'
2	208°40.14	35.84	143°40.80	12.5'	04°45.92	-16.5'	58.8'
3	223°39.87	• • 35.56	158° 12.26	12.5'	04°29.39	-16.6'	58.9'
4 5	238°39.59 253°39.31	35.27 34.99	172° 43.73 187° 15.22	12.5' 12.5'	04° 12.84 03° 56.26	-16.6' -16.6'	58.9' 58.9'
6	268°39.03	\$22°34.70	201° 46.73	12.5'	S03°39.66	-16.6'	58.9'
7	283°38.75	34.41	216°18.24	12.5'	03°23.03	-16.6'	58.9'
8	298°38.47	34.13	230°49.77	12.5'	03°6.39	-16.7'	58.9'
9 10	313°38.20 328°37.92	· · 33.84 33.55	245°21.31 259°52.85	12.5' 12.6'	02°49.72 02°33.04	-16.7' -16.7'	58.9' 58.9'
11	343°37.64	33.26	274° 24.40	12.6'	02° 16.35	-16.7'	58.9'
12	358°37.36	\$22°32.97	288°55.96	12.6'	S01°59.64	-16.7'	58.9'
13	13°37.09	32.67	303°27.52 317°59.09	12.6'	01°42.91 01°26.18	-16.7'	58.9'
14 15	28°36.81 43°36.53	32.38 •• 32.09	317°59.09 332°30.66	12.6' 12.6'	01°26.18 01°9.43	-16.7' -16.8'	58.9' 58.9'
16	58°36.26	31.79	347°2.22	12.6'	00°52.67	-16.8'	59.0'
17	73°35.98	31.50	1°33.79	12.6'	00°35.91	-16.8'	59.0'
18 19	88°35.70 103°35.43	\$22°31.20 30.91	16°5.35 30°36.91	12.6' 12.6'	\$00°19.14 \$00°2.37	-16.8' -16.8'	59.0' 59.0'
20	118°35.15	30.61	45°8.46		N00° 14.41		59.0'
21	133°34.88	• • 30.31	59°40.01	12.5'	00°31.19	16.8'	59.0'
22	148°34.60	30.01	74° 11.55	12.5'	00°47.97	16.8'	59.0'
23	163°34.33	29.71	88°43.08	12.5'	01°4.75	16.8'	59.0'
	SD = 16.3'	d = -0.3'		51	D = 16.0'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°34.05 193°33.78	\$22°29.41 29.11	103°14.60 117°46.10	12.5' 12.5'	N01°21.52 01°38.30	16.8' 16.8'	59.0' 59.0'
2	208°33.50	28.81	117 40.10 132° 17.60	12.5'	01°55.06	16.8	59.0'
3	223°33.23	• • 28.50	146°49.07	12.5'	$02^{\circ}11.82$	16.8'	59.0'
4	238°32.96	28.20	161°20.53	12.4'	02°28.58 02°45.32	16.7'	59.0'
5 6	253°32.68 268°32.41	27.90 \$22°27.59	175°51.98 190°23.40	12.4' 12.4'	02°45.32 N03°2.05	16.7' 16.7'	59.0' 59.0'
7	283°32.14	27.29	204°54.80	12.4'	03° 18.78	16.7	59.0'
8	298°31.86	26.98	219°26.18	12.4'	03°35.48	16.7'	59.1'
9	313°31.59 328°31.32	• • 26.67	233°57.54 248°28.87	12.3' 12.3'	03°52.17 04°8.85	16.7'	59.1' 59.1'
10 11	328°31.32 343°31.04	26.36 26.05	248°28.87 263°0.18	12.3'	04°8.85 04°25.51	16.7' 16.6'	59.1' 59.1'
12	358°30.77	\$22°25.75	277°31.46	12.2'	N04° 42.15	16.6	59.1
13	13°30.50	25.43	292°2.71	12.2'	04°58.76	16.6'	59.1'
14 15	28°30.23 43°29.96	25.12 •• 24.81	306°33.92 321°5.11	12.2' 12.2'	05° 15.36 05° 31.93	16.6' 16.5'	59.1' 59.1'
15 16	43°29.96 58°29.69	24.81	321 5.11 335°36.27	12.1'	05° 48.48	16.5'	59.1' 59.1'
17	73°29.41	24.19	350°7.38	12.1'	06°5.00	16.5	59.1'
18	88°29.14	S22°23.87	4°38.47	12.0'	N06°21.49	16.5	59.1'
19 20	103°28.87 118°28.60	23.56 23.24	19°9.51 33°40.52	12.0' 12.0'	06°37.95 06°54.38	16.4' 16.4'	59.1' 59.1'
20	118°28.60 133°28.33	23.24	48° 11.49	12.0	06°54.38 07°10.78	16.4	59.1' 59.1'
22	148°28.06	22.61	$62^{\circ}42.41$	11.9'	$07^{\circ}27.15$	16.3	59.1
23	163°27.79	22.29	77°13.30	11.8'	07°43.47	16.3'	59.1'
	SD = 16.3'	d = -0.3'		SI	O = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	19-39%	
04	04:50	05:04	12:05	16:06	03:42		
05	05:17	05:31	12:06	16:54	04:30		
06	05:44	05:57	12:06	17:41	05:17		

### January 07, 08, 09 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	106°48.81	130°30.95 \$10°54.11	343°54.05 N24°12.28	35°34.14 N21°43.97	119°51.50 <b>S</b> 07°43.21	Alpheratz 357°34.88 29°13.84
1	121°51.27	145°31.03 52.97	358°57.50 12.55	50°36.84 43.94	134°53.77 43.13	Ankaa 353°7.21 -42°10.45
2	136°53.74	160°31.10 51.83	14° 0.96 12.82	65°39.55 43.92	149°56.05 43.04 164°58.32 · · 42.96	Schedar 349°31.13 56°40.74
3 4	151°56.20 166°58.67	175°31.18 · · 50.68 190°31.26 49.54	29°4.41 · · 13.09 44°7.87 13.36	80°42.26 · · 43.90 95°44.97 43.88	164°58.32 · · 42.96 180°0.59 42.87	Diphda 348°47.32 -17°51.10
5	182°1.13	205°31.34 48.40	59°11.32 13.63	110°47.68 43.86	195°2.86 42.78	Achernar 335°20.07 -57°6.87
6	197°3.59	220°31.42 \$10°47.25	74°14.78 N24°13.90	125°50.38 N21°43.84	210°5.13 S07°42.70	Hamal 327°51.10 23°34.95
7	$212^{\circ}6.06$	235°31.50 46.11	89°18.23 14.17	140°53.09 43.82	225°7.41 42.61	Polaris 313°46.51 89°22.47 Acamar 315°11.55 -40°12.45
8	227°8.52	250°31.58 44.96	104°21.69 14.44	155°55.80 43.80	240°9.68 42.53	Menkar 314°5.98 4°11.27
9	242°10.99	265°31.66 · · 43.82	119°25.15 · · 14.71	170°58.50 · · 43.78 186°1.21 43.76	255°11.95 · · 42.44 270°14.22 42.36	Mirfak 308°27.96 49°57.19
10 11	257° 13.45 272° 15.92	280°31.75 42.67 295°31.83 41.52	134°28.61 14.98 149°32.07 15.25	186°1.21 43.76 201°3.91 43.74	270°14.22 42.36 285°16.49 42.27	Aldebaran 290°39.34 16°33.61
12	287° 18.38	310°31.92 \$10°40.38	164°35.53 N24°15.51	216°6.62 N21°43.72	300°18.76 S07°42.18	Rigel 281°3.56 -8°10.40
13	$302^{\circ}20.84$	325°32.01 39.23	179°38.99 15.78	231°9.32 43.70	315°21.03 42.10	Capella 280°21.45 46°1.46 Bellatrix 278°22.57 6°22.34
14	317°23.31	340°32.10 38.08	194°42.45 16.05	246°12.03 43.68	330°23.30 42.01	Elnath 278°1.51 28°37.75
15 16	332°25.77 347°28.24	355°32.18 · · 36.94 10°32.28 35.79	209°45.92 · · 16.32 224°49.38 16.59	261°14.73 · · 43.66 276°17.44 43.64	345°25.57 · · 41.93 0°27.85 41.84	Alnilam 275°37.41 -1°11.17
17	2°30.70	25°32.37 34.64	239°52.84 16.86	291°20.14 43.62	15°30.12 41.75	Betelgeuse 270°51.76 7°24.70
18	17° 33.16	40°32.46 \$10°33.49	254°56.31 N24°17.13	306°22.84 N21°43.60	30°32.39 <b>S</b> 07°41.67	Canopus 263°51.84 -52°42.54
19	32° 35.63	55° 32.55 32.34	269°59.78 17.40	321°25.55 43.58	45°34.66 41.58	Sirius 258°25.89 -16°45.04 Adhara 255°5.48 -29°0.36
20	47°38.09	70°32.65 31.20	285° 3.24 17.66	336°28.25 43.56	60°36.93 41.49	Procyon 244°50.50 5°9.62
21 22	62° 40.56 77° 43.02	85°32.74 · · 30.05 100°32.84 28.90	300°6.71 ·· 17.93 315°10.18 18.20	351°30.95 · · 43.54 6°33.66 43.52	75°39.20 · · 41.41 90°41.47 41.32	Pollux 243°16.93 27°57.88
23	92° 45.48	115° 32.93 27.75	330°13.65 18.47	21°36.36 43.50	105°43.74 41.23	Avior 234°14.12 -59°35.24
			$\nu$ 3.5' d0.3' m-1.34	$\frac{21 \text{ coise}}{\nu 2.7' \text{ d-0.0' m-2.71}}$	$\nu 2.3' \ d$ -0.1' m1.07	Suhail 222°45.92 -43°31.88
ivier.p	bass. 16:50	ν0.1' d-1.1' m-4.50	ν3.5' d0.3' m-1.34	ν2.7 d-0.0 m-2.71	ν2.3 d-0.1 m1.07	Miaplacidus 221°37.48 -69°48.98 Alphard 217°47.48 -8°46.02
						Regulus 207°34.20 11°50.61
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.62 61°36.69
0 1	107° 47.95 122° 50.41	130°33.03 \$10°26.60 145°33.13 25.45	345°17.12 N24°18.74 0°20.58 19.00	36°39.06 N21°43.48 51°41.76 43.46	120°46.01 S07°41.15 135°48.28 41.06	Denebola 182°24.83 14°25.81
2	137°52.88	160°33.23 24.30	15°24.06 19.27	66°44.46 43.44	150°50.54 40.97	Gienah 175°43.52 -17°40.79
3	152°55.34	175°33.33 · · 23.15	30°27.53 ·· 19.54	81°47.16 · · 43.42	165°52.81 · · 40.89	Acrux 173°0.02 -63°13.98 Gacrux 171°51.58 -57°14.94
4	$167^{\circ}57.81$	190°33.44 22.00	45°31.00 19.81	96°49.86 43.40	180°55.08 40.80	Alioth 166°12.92 55°49.12
5	183°0.27	205°33.54 20.85	60°34.47 20.07	111°52.56 43.38	195°57.35 40.71	Spica 158°22.34 -11°17.50
6 7	198°2.73 213°5.20	220°33.64 \$10°19.70 235°33.75 18.55	75°37.94 N24°20.34 90°41.42 20.61	126°55.26 N21°43.36 141°57.96 43.34	210°59.62 \$07°40.63 226°1.89 40.54	Alkaid 152°52.08 49°10.99
8	213 5.20 228°7.66	235°33.75 18.55 250°33.85 17.39	90°41.42 20.61 105°44.89 20.87	141°57.96 43.34 157°0.66 43.32	226°1.89 40.54 241°4.16 40.45	Hadar 148°36.21 -60°29.35
9	243°10.13	265°33.96 · · 16.24	120°48.37 · · 21.14	172° 3.36 · · 43.30	256°6.43 · · 40.37	Menkent 147°57.74 -36°29.43 Arcturus 145°48.02 19°2.96
10	$258^{\circ}12.59$	280°34.07 15.09	135°51.84 21.40	187°6.06 43.28	271°8.70 40.28	Rigil Kent. 139°40.58 -60°56.07
11	273°15.05	295°34.18 13.94	150°55.32 21.67	202°8.76 43.26	286°10.96 40.19	Kochab 137°20.30 74°2.78
12	288° 17.52 303° 19.98	310°34.29 \$10°12.78	165°58.80 N24°21.94	217°11.45 N21°43.24	301°13.23 \$07°40.11 316°15.50 40.02	Zuben'ubi 136°56.18 -16°8.71
13 14	303 19.98 318°22.45	325°34.40 11.63 340°34.51 10.48	181°2.28 22.20 196°5.76 22.47	232°14.15 43.22 247°16.85 43.20	316°15.50 40.02 331°17.77 39.93	Alphecca 126°3.97 26°37.63
15	333°24.91	355°34.63 · · 9.33	211°9.23 · · 22.73	262°19.55 · · 43.19	346°20.04 · · 39.84	Antares 112°16.13 -26°29.20
16	348°27.37	10°34.74 8.17	226°12.71 23.00	277°22.24 43.17	1°22.30 39.76	Atria 107°10.86 -69°4.17 Sabik 102°3.09 -15°45.36
17	3°29.84	25°34.86 7.02	241°16.19 23.26	292°24.94 43.15	16°24.57 39.67	Shaula 96°10.76 -37°7.27
18 19	18° 32.30 33° 34.77	40°34.97 \$10°5.86 55°35.09 4.71	256°19.68 N24°23.53 271°23.16 23.79	307°27.63 N21°43.13 322°30.33 43.11	31°26.84 \$07°39.58 46°29.11 39.49	Rasalhague 95°58.87 12°32.40
20	48° 37.23	55°35.09 4.71 70°35.21 3.55	271°23.16 23.79 286°26.64 24.06	322°30.33 43.11 337°33.03 43.09	46°29.11 39.49 61°31.37 39.41	Eltanin 90°42.70 51°28.96
21	63°39.70	85°35.33 · · 2.40	301°30.12 · · 24.32	352°35.72 · · 43.07	76°33.64 · · 39.32	Kaus Aust. 83°32.92 -34°22.36 Vega 80°33.66 38°48.29
22	$78^{\circ}42.16$	100°35.45 1.24	316°33.61 24.59	7°38.42 43.05	91°35.91 39.23	Nunki 75°48.14 -26°15.98
23	93°44.62	115°35.57 0.09	331°37.09 24.85	22°41.11 43.03	106°38.17 39.14	Altair 62°0.30 8°56.00
Mer.p	pass. 16:46	$\nu$ 0.1' d-1.1' m-4.51	ν3.5' d0.3' m-1.36	$\nu 2.7' \ d$ -0.0' m-2.70	ν2.3' d-0.1' m1.07	Peacock 53°6.29 -56°39.39
						Deneb 49°26.26 45°22.21
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.06 9°59.36
0	108° 47.09	130°35.69 <b>S</b> 09°58.93	346°40.58 N24°25.12	37°43.80 N21°43.01	121°40.44 \$07°39.06	Al Na'ir 27°33.24 -46°50.60 Fomalhaut 15°14.71 -29°29.56
1	123°49.55	145° 35.82 57.78	1°44.06 25.38	52°46.50 42.99	136°42.71 38.97	Scheat 13°45.41 28°13.21
2	138° 52.02	160°35.94 56.62	16°47.55 25.64	67°49.19 42.97	151°44.97 38.88	Markab 13°30.08 15°20.42
3 4	153° 54.48 168° 56.94	175°36.07 · · 55.47 190°36.19 54.31	31°51.03 · · 25.91 46°54.52 26.17	82°51.88 · · 42.96 97°54.58	166°47.24 · · 38.79 181°49.51 38.70	Jan 07 Tue SHA Mer.pass
5	183°59.41	205°36.32 53.15	61°58.01 26.43	112°57.27 42.92	196°51.77 38.62	Venus 23°42.14 15:18
6	199°1.87	220°36.45 \$09°51.99	77°1.50 N24°26.70	127°59.96 N21°42.90	211°54.04 <b>S</b> 07°38.53	Mars 237°5.24 01:04
7	214°4.34	235° 36.58 50.84	92°4.99 26.96	143° 2.65 42.88	226°56.31 38.44	Jupiter 288°45.33 21:34
8	229°6.80	250°36.71 49.68	107°8.48 27.22	158° 5.34 42.86	241°58.57 38.35	Saturn 13°2.69 15:58
9 10	244°9.27 259°11.73	265°36.84 · · 48.52 280°36.97 47.36	122°11.97 · · 27.49 137°15.46 27.75	173°8.04 · · 42.84 188°10.73 42.82	257°0.84 · · 38.26 272°3.10 38.18	Jan 08 Wed SHA Mer.pass
11	274° 14.19	295°37.11 46.21	152°18.95 28.01	203°13.42 42.80	287°5.37 38.09	Venus 22°45.08 15:18
12	289° 16.66	310°37.24 <b>S</b> 09°45.05	167°22.44 N24°28.27	218°16.11 N21°42.79	302°7.63 <b>S</b> 07°38.00	Mars 237°29.17 00:59
13	304°19.12	325° 37.38 43.89	182°25.93 28.53	233°18.80 42.77	317°9.90 37.91	Jupiter 288°51.11 21:30 Saturn 12°58.06 15:55
14	319°21.59	340°37.51 42.73	197°29.43 28.80	248°21.49 42.75	332°12.16 37.82	
15 16	334°24.05 349°26.51	355°37.65 · · 41.57 10°37.79 40.41	212°32.92 · · 29.06 227°36.41 29.32	263°24.18 · · 42.73 278°26.87 42.71	347°14.43 · · 37.74 2°16.69 37.65	Jan 09 Thu         SHA         Mer.pass           Venus         21°48.60         15:17
17	4° 28.98	25°37.93 39.25	242°39.91 29.58	293°29.55 42.69	17°18.96 37.56	Venus 21°48.60 15:17 Mars 237°53.49 00:53
18	19° 31.44	40°38.07 <b>S</b> 09°38.09	257°43.40 N24°29.84	308°32.24 N21°42.68	32°21.22 <b>S</b> 07°37.47	Jupiter 288°56.72 21:25
19	34°33.91	55° 38.21 36.93	272°46.90 30.10	323°34.93 42.66	47°23.49 37.38	Saturn 12°53.35 15:51
20	49°36.37	70°38.35 35.77	287°50.40 30.36	338°37.62 42.64	62°25.75 37.29	Horizontal parallax
21 22	64°38.84 79°41.30	85°38.50 · · 34.61 100°38.64 33.45	302°53.89 · · 30.62 317°57.39 30.88	353°40.31 · · 42.62 8°42.99 42.60	77°28.02 · · 37.20 92°30.28	Venus: 0.2
23	94° 43.76	115°38.79 32.29	333°0.89 31.14	23°45.68 42.58	107°32.55 37.12	Mars: 0.2
		$\frac{10^{\circ} \text{ co.n.s}}{\nu 0.1' \text{ d-}1.2' \text{ m-}4.52}$	$\nu$ 3.5' d0.3' m-1.37	$\frac{20.000}{\nu 2.7' \text{ d-0.0' m-2.69}}$	$\nu 2.3' \ d$ -0.1' m1.07	
ivier.	pass. 16:42	νυ.1 u-1.2 III-4.32	νο.ο αυ.ο III-1.οι	ν2.1 u-0.0 III-2.09	ν2.3 U-U.1 IIII.UI	

Tue 0 1 2	<b>GHA</b> 178°27.52 193°27.25	<b>Dec</b> \$22°21.97	GHA	ν	Dec	d	HP
1 2		\$22°21.07					
2	103°27 25		91°44.14	11.8'	N07°59.77	16.3'	59.1'
		21.65	106°14.93	11.7'	08°16.02	16.2	59.1'
3	208°26.99 223°26.72	21.33 · · 21.01	120°45.68 135°16.37	11.7' 11.6'	08°32.23 08°48.41	16.2' 16.1'	59.1' 59.1'
4	238°26.45	20.69	149°47.02	11.6'	09°4.54	16.1	59.1'
5	$253^{\circ}26.18$	20.36	$164^{\circ}17.62$	11.5'	$09^{\circ}20.62$	16.0'	59.1'
6	268°25.91	\$22°20.04	178°48.17	11.5'	N09°36.66	16.0'	59.1'
7 8	283°25.64 298°25.38	19.72 19.39	193°18.66 207°49.10	11.4' 11.4'	09°52.65 10°8.60	15.9' 15.9'	59.1' 59.1'
9	313°25.11	19.07	222°19.48	11.3'	10° 24.49	15.8'	59.1
10	328°24.84	18.74	$236^{\circ}49.81$	11.3'	10°40.33	15.8'	59.1'
11	343°24.57 358°24.31	18.41 \$22°18.08	251°20.08 265°50.29	11.2'	10°56.12	15.7'	59.1'
12 13	13°24.04	17.75	280°20.43	11.1' 11.1'	N11°11.85 11°27.52	15.7' 15.6'	59.1' 59.1'
14	28°23.77	17.42	294°50.52	11.0'	11°43.14	15.6'	59.1'
15	43°23.51	•• 17.09	309°20.54	11.0'	11°58.69	15.5'	59.1'
16	58°23.24 73°22.98	16.76	323°50.50 338°20.39	10.9'	12°14.19 12°29.62	15.4'	59.2'
17 18	73°22.98 88°22.71	16.43 \$22°16.10	352°50.22	10.8' 10.8'	N12°44.99	15.4' 15.3'	59.2' 59.2'
19	103°22.45	15.77	7°19.98	10.7'	13°0.29	15.2'	59.2'
20	118°22.18	15.43	21°49.67	10.6'	13°15.53	15.2'	59.2'
21	133°21.92	• • 15.10	36°19.29	10.5'	13°30.69	15.1'	59.2'
22 23	148°21.65 163°21.39	14.76 14.43	50°48.83 65°18.31	10.5' 10.4'	13°45.79 14°0.81	15.0' 14.9'	59.2' 59.2'
_	5D = 16.3'	d = -0.3'			0 = 16.1'		
	עי – דעי	u — -0.3		JL	· — 10.1		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°21.12	S22°14.09	79°47.71	10.3'	N14°15.76	14.9'	59.2'
1 2	193°20.86 208°20.60	13.75 13.41	94°17.04 108°46.30	10.3' 10.2'	14°30.63 14°45.42	14.8' 14.7'	59.2' 59.2'
3	223°20.33	13.07	123°15.47	10.2	15°0.14	14.6'	59.2'
4	238°20.07	12.73	$137^{\circ}44.57$	10.0'	$15^{\circ}14.77$	14.6'	59.2'
5	253°19.81	12.39	152°13.60	9.9'	15°29.33	14.5'	59.2
6 7	268°19.54 283°19.28	\$22°12.05 11.71	166°42.54 181°11.40	9.9' 9.8'	N15°43.80 15°58.18	14.4' 14.3'	59.2' 59.2'
8	298°19.02	11.36	195°40.19	9.7'	16°12.48	14.2'	59.2'
9	$313^{\circ}18.76$	•• 11.02	$210^{\circ}8.89$	9.6'	$16^{\circ}26.69$	14.1'	59.1'
10	328°18.50	10.68	224°37.51	9.5'	16°40.80	14.0'	59.1'
11 12	343°18.23 358°17.97	10.33 \$22°9.98	239°6.04 253°34.49	9.5' 9.4'	16°54.83 N17°8.76	13.9' 13.8'	59.1' 59.1'
13	13°17.71	9.64	268°2.86	9.3'	17°22.60	13.7'	59.1
14	$28^{\circ}17.45$	9.29	282°31.14	9.2'	$17^{\circ}36.34$	13.6'	59.1'
15	43°17.19 58°16.93	• • 8.94	296°59.34 311°27.45	9.1' 9.0'	17°49.98 18°3.52	13.5'	59.1' 59.1'
16 17	73°16.67	8.59 8.24	311 27.45 325°55.47	9.0 8.9'	18° 16.96	13.4' 13.3'	59.1 59.1'
18	88°16.41	\$22°7.89	340°23.40	8.8'	N18°30.30	13.2'	59.1'
19	103°16.15	7.54	354°51.25	8.8'	18°43.53	13.1'	59.1'
20 21	118°15.89 133°15.63	7.19 · · 6.83	9°19.00 23°46.67	8.7' 8.6'	18°56.65 19°9.66	13.0' 12.9'	59.1' 59.1'
22	133 15.03 148°15.37	6.48	38°14.25	8.5'	19 9.00 19°22.57	12.8'	59.1'
23	163°15.12	6.13	52°41.74	8.4'	19°35.36	12.7'	59.1'
S	5D = 16.3'	d = -0.3'		SE	0 = 16.1'		
—							
Thu 0	<b>GHA</b> 178°14.86	<b>Dec</b> \$22°5.77	<b>GHA</b> 67°9.13	ν 8.3'	<b>Dec</b> N19°48.04	<i>d</i> 12.6'	<b>HP</b> 59.1'
1	176 14.60 193°14.60	5.41	81°36.44	8.2'	20°0.61	12.4'	59.1'
2	208°14.34	5.06	96°3.65	8.1'	$20^{\circ}13.05$	12.3'	59.1'
3 4	223°14.08 238°13.83	· · 4.70	110°30.78 124°57.81	8.0' 7.9'	20°25.38 20°37.59	12.2' 12.1'	59.1' 59.1'
4 5	253° 13.83 253° 13.57	4.34 3.98	124°57.81 139°24.75	7.9 7.8'	20° 37.59 20° 49.68	12.1	59.1' 59.1'
6	268°13.31	\$22°3.62	153°51.60	7.8'	N21°1.64	11.8'	59.1'
7	283°13.06	3.26	168°18.36	7.7'	21°13.48	11.7'	59.1'
8 9	298°12.80 313°12.54	2.90 •• 2.54	182°45.02 197°11.59	7.6' 7.5'	21°25.19 21°36.77	11.6' 11.5'	59.1' 59.1'
9 10	313°12.54 328°12.29	2.18	197°11.59 211°38.07	7.5° 7.4'	21°36.77 21°48.22	11.5'	59.1' 59.1'
11	343°12.03	1.81	226°4.46	7.3'	21°59.54	11.2'	59.1
12	358°11.78	S22°1.45	240°30.76	7.2'	N22°10.73	11.1'	59.1'
13 14	13°11.52 28°11.27	1.09 0.72	254°56.97 269°23.08	7.1' 7.0'	22°21.78 22°32.70	10.9' 10.8'	59.1' 59.0'
14 15	43°11.27	· · 0.35	269°23.08 283°49.11	7.0 6.9'	22° 43.48	10.8	59.0° 59.0°
16	58°10.76	21°59.99	298°15.04	6.8'	$22^{\circ}54.12$	10.5'	59.0'
17	73°10.50	21°59.62	312°40.89	6.8'	23°4.61	10.4	59.0'
18 19	88°10.25 103°10.00	\$21°59.25 58.88	327°6.64 341°32.31	6.7' 6.6'	N23°14.97 23°25.18	10.2' 10.1'	59.0' 59.0'
20	103° 10.00 118° 9.74	58.88 58.51	341 32.31 355°57.88	6.5	23°25.18 23°35.24	9.9'	59.0° 59.0°
21	133°9.49	• • 58.14	$10^{\circ}23.37$	6.4'	23°45.16	9.8'	59.0'
22	148°9.24	57.77	24°48.77	6.3'	23°54.93	9.6'	59.0'
23	163°8.98	57.40	39°14.09	6.2'	24°4.54	9.5'	59.0'
S	5D = 16.3'	d = -0.4'		SE	0 = 16.1'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	50-72%
07	06:10	06:23	12:06	18:30	06:05	
08	06:36	06:48	12:07	19:21	06:55	
09	07:01	07:13	12:07	20:17	07:49	

# January 10, 11, 12 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	109° 46.23	130°38.93	348°4.39 N24°31.40	38°48.37 N21°42.57	122°34.81 \$07°36.94	
1	124°48.69	145°39.08 29.97	3°7.89 31.66	53°51.05 42.55	137°37.07 36.85	Alpheratz 357°34.88 29°13.84
2	$139^{\circ}51.16$	160°39.23 28.81	18°11.38 31.92	68°53.74 42.53	152°39.34 36.76	Ankaa 353°7.22 -42°10.45 Schedar 349°31.14 56°40.74
3	$154^{\circ}53.62$	175°39.38 · · 27.65	33°14.88 · · 32.18	83°56.42 · · 42.51	167°41.60 · · 36.67	Diphda 348°47.33 -17°51.10
4	169°56.09	190°39.53 26.48	48°18.39 32.44	98°59.11 42.49	182°43.87 36.58	Achernar 335°20.10 -57°6.87
5	184° 58.55	205°39.68 25.32 220°39.84 \$09°24.16	63°21.89 32.70	114°1.79 42.47 129°4.48 N21°42.46	197°46.13 36.49	Hamal 327°51.11 23°34.94
6 7	200°1.01 215°3.48	220°39.84 \$09°24.16 235°39.99 23.00	78°25.39 N24°32.96 93°28.89 33.22	129° 4.48 N21° 42.46 144° 7.16 42.44	212°48.39 S07°36.40 227°50.66 36.31	Polaris 313°47.46 89°22.48
8	230°5.94	250°40.15 21.83	108°32.39 33.47	159° 9.85 42.42	242°52.92 36.23	Acamar 315°11.56 -40°12.46
9	245°8.41	265°40.30 · · 20.67	123°35.90 · · 33.73	174°12.53 · · 42.40	257°55.18 · · 36.14	Menkar 314°5.98 4°11.26
10	$260^{\circ}10.87$	280°40.46 19.51	138°39.40 33.99	189°15.21 42.39	272°57.44 36.05	Mirfak 308°27.96 49°57.19 Aldebaran 290°39.34 16°33.60
11	275° 13.33	295°40.62 18.34	153°42.90 34.25	204°17.90 42.37	287°59.71 35.96	Rigel 281°3.56 -8°10.41
12	290° 15.80	310°40.78 S09°17.18	168°46.41 N24°34.51	219°20.58 N21°42.35	303°1.97 S07°35.87	Capella 280°21.45 46°1.47
13 14	305°18.26 320°20.73	325°40.94 16.02 340°41.10 14.85	183°49.91 34.76 198°53.42 35.02	234°23.26 42.33 249°25.94 42.31	318° 4.23 35.78 333° 6.50 35.69	Bellatrix 278°22.56 6°22.33
15	335°23.19	355°41.26 · · 13.69	213°56.92 · · 35.28	264°28.62 · · 42.30	348°8.76 · · 35.60	Elnath 278°1.51 28°37.75
16	350° 25.66	10°41.42 12.53	229°0.43 35.53	279°31.30 42.28	3°11.02 35.51	Alnilam 275°37.41 -1°11.18
17	5°28.12	25°41.59 11.36	244°3.94 35.79	294°33.99 42.26	18°13.28 35.42	Betelgeuse 270°51.75 7°24.69
18	$20^{\circ}30.58$	40°41.75 <b>S</b> 09°10.20	259°7.44 N24°36.05	309°36.67 N21°42.24	33°15.54 <b>S</b> 07°35.33	Canopus 263°51.85 -52°42.56 Sirius 258°25.88 -16°45.06
19	35°33.05	55°41.92 9.03	274°10.95 36.30	324°39.35 42.23	48°17.81 35.24	Adhara 255°5.47 -29°0.38
20	50° 35.51	70°42.09 7.87	289°14.46 36.56	339°42.03 42.21	63°20.07 35.15	Procyon 244°50.48 5°9.61
21 22	65° 37.98 80° 40.44	85° 42.25 · · · 6.70 100° 42.42 5.54	304°17.97 · · · 36.81 319°21.48	354°44.71 · · 42.19 9°47.39 42.17	78°22.33 · · 35.06 93°24.59 34.97	Pollux 243°16.91 27°57.88
23	95° 42.91	115° 42.59 4.37	334°24.99 37.32	24°50.06 42.16	108°26.85 34.88	Avior 234°14.11 -59°35.26
					_	Suhail 222°45.90 -43°31.90
Mer.	pass. 16:38	ν0.1' d-1.2' m-4.53	ν3.5′ d0.3′ m-1.39	ν2.7' d-0.0' m-2.69	ν2.3′ d-0.1′ m1.08	Miaplacidus 221°37.45 -69°49.00
						Alphard 217°47.46 -8°46.03 Regulus 207°34.18 11°50.60
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.58 61°36.69
0	110°45.37	130°42.76 S09°3.20	349°28.50 N24°37.58	39°52.74 N21°42.14	123°29.11 S07°34.79	Denebola 182°24.81 14°25.80
1	125° 47.83	145°42.94 2.04	4°32.01 37.83	54°55.42 42.12	138°31.38 34.70	Gienah 175°43.49 -17°40.80
2	140° 50.30 155° 52.76	160°43.11 09°0.87 175°43.29 08°59.71	19°35.52 38.09 34°39.03 · · 38.34	69°58.10 42.10 85°0.78 •• 42.09	153°33.64 34.61 168°35.90 · · 34.52	Acrux 172°59.96 -63°14.00
4	170° 55.23	190°43.46 58.54	49°42.54 38.60	100° 3.45 42.07	183°38.16 34.43	Gacrux 171°51.54 -57°14.95
5	185°57.69	205°43.64 57.37	64°46.06 38.85	115° 6.13 42.05	198°40.42 34.34	Alioth 166°12.88 55°49.11
6	201°0.16	220°43.82 \$08°56.21	79°49.57 N24°39.11	130°8.81 N21°42.04	213°42.68 <b>S</b> 07°34.25	Spica 158°22.31 -11°17.51 Alkaid 152°52.05 49°10.98
7	$216^{\circ}2.62$	235°43.99 55.04	94°53.08 39.36	145°11.48 42.02	228°44.94 34.16	Hadar 148°36.16 -60°29.35
8	231°5.08	250°44.17 53.87	109°56.60 39.61	160°14.16 42.00	243°47.20 34.07	Menkent 147°57.71 -36°29.43
9	246°7.55	265°44.35 · · 52.70	125°0.11 · · 39.87	175°16.84 · · 41.98	258°49.46 · · 33.98	Arcturus 145°47.99 19°2.95
10 11	261° 10.01 276° 12.48	280° 44.54 51.54 295° 44.72 50.37	140° 3.62 40.12 155° 7.14 40.37	190°19.51 41.97 205°22.19 41.95	273°51.72 33.89 288°53.98 33.80	Rigil Kent. 139°40.53 -60°56.07
12	291° 14.94	310°44.90 \$08°49.20	170°10.65 N24°40.62	220°24.86 N21°41.93	303°56.24 S07°33.71	Kochab 137°20.25 74°2.77
13	306° 17.40	325°45.09 48.03	185°14.17 40.88	235°27.54 41.92	318°58.50 33.62	Zuben'ubi 136°56.15 -16°8.72 Alphecca 126°3.94 26°37.62
14	$321^{\circ}19.87$	340°45.27 46.86	200°17.69 41.13	250°30.21 41.90	334°0.76 33.53	Alphecca 126°3.94 26°37.62 Antares 112°16.11 -26°29.20
15	$336^{\circ}22.33$	355°45.46 · · 45.70	215°21.20 · · 41.38	265°32.88 · · 41.88	349°3.02 · · 33.44	Arria 107°10.81 -69°4.15
16	351°24.80	10°45.65 44.53	230°24.72 41.63	280°35.56 41.87	4°5.28 33.35	Sabik 102°3.07 -15°45.36
17	6° 27.26	25° 45.84 43.36	245°28.24 41.88	295°38.23 41.85 310°40.90 N21°41.83	19°7.54 33.26	Shaula 96°10.74 -37°7.26
18 19	21°29.73 36°32.19	40°46.03 \$08°42.19 55°46.22 41.02	260°31.75 N24°42.13 275°35.27 42.39	310°40.90 N21°41.83 325°43.57 41.82	34°9.80 S07°33.17 49°12.06 33.08	Rasalhague 95°58.85 12°32.39
20	51° 34.65	70°46.41 39.85	290°38.79 42.64	340°46.25 41.80	64°14.32 32.99	Eltanin 90°42.69 51°28.94
21	66°37.12	85°46.60 · · 38.68	305°42.31 · · 42.89	355°48.92 · · 41.78	79°16.58 · · 32.89	Kaus Aust. 83°32.90 -34°22.36 Vega 80°33.65 38°48.28
22	81°39.58	100°46.80 37.51	320°45.83 43.14	10°51.59 41.77	94°18.83 32.80	Nunki 75°48.12 -26°15.97
23	96°42.05	115°46.99 36.34	335°49.35 43.39	25°54.26 41.75	109°21.09 32.71	Altair 62°0.29 8°56.00
Mer.	pass. 16:34	ν0.2' d-1.2' m-4.54	ν3.5' d0.3' m-1.41	ν2.7' d-0.0' m-2.68	ν2.3' d-0.1' m1.08	Peacock 53°6.29 -56°39.38
			<u></u>			Deneb 49°26.26 45°22.19
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.06 9°59.36
0	111° 44.51	130°47.19 \$08°35.17	350°52.87 N24°43.64	40°56.93 N21°41.73	124°23.35	Al Na'ir 27°33.25 -46°50.59 Fomalhaut 15°14.72 -29°29.56
1	126° 46.98	145°47.39 34.00	5°56.39 43.89	55°59.60 41.72	139°25.61 32.53	Scheat 13°45.41 28°13.20
2	141°49.44	160°47.59 32.83	20°59.91 44.14	71°2.27 41.70	154°27.87 32.44	Markab 13°30.08 15°20.42
3	156° 51.90	175°47.79 · · 31.66	36°3.43 · · 44.38	86°4.94 · · 41.69	169°30.13 · · 32.35	
4 5	171°54.37 186°56.83	190° 47.99 30.49 205° 48.19 29.32	51°6.95 44.63 66°10.47 44.88	101°7.61 41.67 116°10.28 41.65	184°32.39 32.26 199°34.64 32.17	Jan 10 Fri SHA Mer.pass Venus 20°52.71 15:17
6	201°59.30	205°48.19 29.32 220°48.39 \$08°28.15	81°13.99 N24°45.13	131°12.95 N21°41.64	199°34.64 32.17 214°36.90 \$07°32.08	Mars 238°18.16 00:48
7	217°1.76	235°48.59 26.98	96°17.51 45.38	146°15.62 41.62	229°39.16 31.98	Jupiter 289°2.14 21:21
8	232°4.23	250°48.80 25.81	111°21.04 45.63	161°18.29 41.60	244°41.42 31.89	Saturn 12°48.58 15:47
9	247°6.69	265°49.00 · · 24.63	126°24.56 · · 45.87	176°20.95 · · 41.59	259°43.68 · · 31.80	Jan 11 Sat SHA Mer.pass
10	262°9.15	280°49.21 23.46	141°28.08 46.12	191°23.62 41.57	274°45.93 31.71	Venus 19°57.40 15:17
11	277° 11.62 292° 14.08	295°49.42 22.29 310°49.63 \$08°21.12	156°31.61 46.37 171°35.13 N24°46.61	206°26.29 41.56 221°28.96 N21°41.54	289°48.19 31.62 304°50.45 \$07°31.53	Mars 238°43.13 00:42
12 13	292° 14.08 307° 16.55	310°49.63 \$08°21.12 325°49.84 19.95	171°35.13 N24°46.61 186°38.65 46.86	236°31.62 41.52	319°52.70 31.44	Jupiter 289°7.37 21:17
14	322° 19.01	340°50.05 18.77	201°42.18 47.11	251°34.29 41.51	334°54.96 31.34	Saturn 12°43.74 15:44
15	337° 21.47	355°50.26 · · 17.60	216°45.70 · · 47.35	266°36.95 · · 41.49	349°57.22 · · 31.25	Jan 12 Sun SHA Mer.pass
16	$352^{\circ}23.94$	10°50.47 16.43	231°49.23 47.60	281°39.62 41.48	4°59.48 31.16	Venus 19°2.68 15:17
17	7°26.40	25°50.69 15.26	246°52.75 47.85	296°42.28 41.46	20°1.73 31.07	Mars 239°8.35 00:36
18	22°28.87	40°50.90 S08°14.08	261°56.28 N24°48.09	311°44.95 N21°41.45	35°3.99 \$07°30.98	Jupiter 289°12.42 21:12
19 20	37° 31.33 52° 33.80	55°51.12 12.91 70°51.34 11.74	276°59.80 48.34 292°3.33 48.58	326°47.61 41.43 341°50.28 41.41	50°6.25 30.89 65°8.50 30.79	Saturn 12°38.84 15:40
21	67°36.26	85°51.55 · · 10.57	307°6.86 · · 48.83	356°52.94 · · 41.40	80°10.76 · · 30.70	Horizontal parallax
22	82° 38.72	100°51.77 9.39	322°10.38 49.07	11°55.61 41.38	95°13.02 30.61	Venus: 0.2
23	$97^{\circ}41.19$	115°51.99 8.22	337°13.91 49.31	26°58.27 41.37	110°15.27 30.52	Mars: 0.2
Mer	pass. 16:30	ν0.2' d-1.2' m-4.55	ν3.5′ d0.2′ m-1.42	ν2.7' d-0.0' m-2.67	ν2.3' d-0.1' m1.08	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°8.73	S21°57.02	53°39.32	6.1'	N24°14.01	9.3'	59.0'
1	193°8.48	56.65	68° 4.47	6.1'	24°23.32	9.2'	59.0'
2	208°8.23	56.27	82°29.53	6.0'	24°32.48	9.0'	59.0'
3	223°7.98	• • 55.90	96°54.50	5.9'	24°41.48	8.8'	59.0'
4	238°7.72 253°7.47	55.52	111°19.40 125°44.22	5.8' 5.7'	24°50.33 24°59.01	8.7'	58.9'
5 6	253 7.47 268°7.22	55.15 \$21°54.77	125 44.22 140°8.95	5.7'	N25°7.54	8.5' 8.4'	58.9' 58.9'
7	283°6.97	54.39	154° 33.61	5.6'	25°15.90	8.2	58.9'
8	298°6.72	54.01	168°58.19	5.5'	25°24.10	8.0'	58.9'
9	313°6.47	• • 53.63	183°22.69	5.4'	25°32.13	7.9'	58.9'
10	328°6.22	53.25	197°47.12	5.4'	25°40.00	7.7'	58.9'
11	343°5.97	52.87	212°11.47	5.3'	25°47.71	7.5'	58.9'
12	358°5.72 13°5.47	\$21°52.49 52.11	226°35.75 240°59.97	5.2' 5.1'	N25°55.24 26°2.61	7.4' 7.2'	58.9'
13 14	28°5.23	52.11 51.72	240 59.97 255°24.11	5.1'	26°9.80	7.2 7.0'	58.9' 58.9'
15	43°4.98	51.34	269°48.18	5.0'	26°16.83	6.9	58.8'
16	58°4.73	50.95	284°12.19	4.9'	26°23.68	6.7'	58.8'
17	73°4.48	50.57	298°36.14	4.9'	26°30.36	6.5'	58.8'
18	88°4.23	S21°50.18	313°0.02	4.8'	N26°36.86	6.3'	58.8'
19	103°3.99	49.79	327°23.84	4.8'	26°43.18	6.1'	58.8'
20	118°3.74	49.41	341°47.61	4.7'	26°49.33	6.0'	58.8'
21 22	133°3.49 148°3.24	· · 49.02 48.63	356°11.31 10°34.96	4.7' 4.6'	26°55.31 27°1.10	5.8' 5.6'	58.8' 58.8'
22	148° 3.24 163° 3.00	48.63 48.24	10°34.96 24°58.56	4.6° 4.5°	27°1.10 27°6.71	5.6° 5.4°	58.8' 58.8'
23						Э.Т	30.0
	SD = 16.3'	d = -0.4'		SI	D = 16.1'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°2.75 193°2.51	\$21°47.85 47.46	39°22.11 53°45.61	4.5' 4.5'	N27°12.14 27°17.39	5.3' 5.1'	58.7'
1 2	193°2.51 208°2.26	47.46 47.06	68° 9.06	4.5° 4.4°	27°17.39 27°22.46	5.1 4.9'	58.7' 58.7'
3	223°2.01	• • 46.67	82°32.47	4.4'	27°27.35	4.7'	58.7'
4	238°1.77	46.28	96°55.83	4.3'	27°32.05	4.5'	58.7'
5	253°1.52	45.88	$111^{\circ}19.16$	4.3'	27°36.56	4.3'	58.7'
6	268°1.28	S21°45.49	125°42.45	4.3'	N27°40.89	4.1'	58.7'
7	283°1.04	45.09	140°5.70 154°28.92	4.2'	27°45.04 27°49.00	4.0'	58.7'
8 9	298°0.79 313°0.55	44.69 •• 44.30	154°28.92 168°52.10	4.2' 4.2'	27°49.00 27°52.77	3.8' 3.6'	58.6' 58.6'
10	328° 0.30	43.90	183°15.26	4.1'	27°56.36	3.4'	58.6'
11	343°0.06	43.50	197°38.39	4.1'	27°59.75	3.2'	58.6'
12	357°59.82	S21°43.10	212° 1.50	4.1'	N28°2.96	3.0'	58.6'
13	12°59.57	42.70	226°24.59	4.1'	28°5.98	2.8'	58.6'
14	27°59.33 42°59.09	42.30	240°47.66 255°10.72	4.1'	28°8.81	2.6'	58.6'
15 16	42°59.09 57°58.85	· · 41.90 41.50	269°33.76	4.0' 4.0'	28°11.45 28°13.90	2.5' 2.3'	58.5' 58.5'
17	72°58.61	41.09	283°56.79	4.0'	28°16.16	2.1'	58.5'
18	87°58.36	S21°40.69	298°19.81	4.0'	N28°18.23	1.9'	58.5'
19	102°58.12	40.28	312°42.82	4.0'	28°20.11	1.7'	58.5'
20	117°57.88	39.88	327° 5.84	4.0'	28°21.80	1.5'	58.5'
21	132°57.64	• • 39.47	341°28.85	4.0'	28°23.30 28°24.61	1.3'	58.4'
22 23	147°57.40 162°57.16	39.07 38.66	355°51.86 10°14.88	4.0' 4.0'	28°24.61 28°25.73	1.1' 0.9'	58.4' 58.4'
23	SD = 16.3'	d = -0.4'	10 14.00		D = 16.0'	0.9	30.4
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	177°56.92 192°56.68	\$21°38.25 37.84	24°37.91 39°0.95	4.0' 4.1'	N28°26.66 28°27.40	0.7' 0.5'	58.4' 58.4'
2	207° 56.44	37.64 37.43	59 0.95 53°24.00	4.1'	28°27.95	0.5	58.4'
3	222° 56.20	• • 37.02	67°47.06	4.1'	28°28.30	0.2'	58.3'
4	237°55.97	36.61	82°10.15	4.1'	28°28.47	-0.0'	58.3'
5	252°55.73	36.20	96°33.25	4.1'	28°28.45	-0.2'	58.3'
6	267°55.49	\$21°35.79	110°56.38	4.2'	N28°28.24	-0.4'	58.3'
7 8	282°55.25 297°55.01	35.37 34.96	125°19.54 139°42.72	4.2' 4.2'	28°27.84 28°27.26	-0.6' -0.8'	58.3' 58.2'
9	312° 54.78	34.96 •• 34.54	139°42.72 154°5.94	4.2'	28° 27.26 28° 26.48	-0.8 -1.0'	58.2' 58.2'
10	312 54.78 327°54.54	34.13	168°29.19	4.3'	28°25.52	-1.1'	58.2'
11	342°54.30	33.71	182°52.47	4.3'	28°24.37	-1.3'	58.2'
12	357° 54.06	S21°33.29	197°15.80	4.4'	N28°23.03	-1.5'	58.2'
13	12°53.83	32.88	211°39.16	4.4'	28°21.51	-1.7'	58.2'
14 15	27°53.59 42°53.36	32.46 •• 32.04	226°2.57 240°26.03	4.5' 4.5'	28°19.81 28°17.92	-1.9' -2.1'	58.1' 58.1'
15 16	42°53.36 57°53.12	31.62	240° 26.03 254° 49.54	4.5° 4.6°	28°17.92 28°15.84	-2.1 -2.3'	58.1'
17	72°52.89	31.20	269°13.09	4.6'	28°13.58	-2.4'	58.1'
18	87° 52.65	S21°30.78	283°36.70	4.7'	N28°11.14	-2.6'	58.1'
19	102°52.42	30.36	298°0.37	4.7'	28°8.52	-2.8'	58.0'
20	117°52.18	29.93	312°24.10	4.8'	28°5.72	-3.0'	58.0'
21 22	132°51.95 147°51.71	· · 29.51 29.09	326°47.89 341°11.74	4.9' 4.9'	28°2.74 27°59.58	-3.2' -3.3'	58.0' 58.0'
23	147°51.71 162°51.48	29.09	341°11.74 355°35.65	4.9° 5.0'	27°59.58 27°56.24	-3.5'	58.0'
23						5.5	30.0
	SD = 16.3'	d = -0.4'		51	D = 15.9'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	82-95%
10	07:25	07:37	12:08	21:16	08:46	
11	07:49	08:01	12:08	22:17	09:46	
12	08:12	08:24	12:08	23:18	10:48	

### January 13, 14, 15 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	112° 43.65	130°52.22 \$08°7.04	352°17.44 N24°49.56	42°0.93 N21°41.35	125°17.53 S07°30.43	
1	127° 46.12	145°52.44 5.87	7°20.97 49.80	57° 3.59 41.34	140°19.78 30.33	Alpheratz 357°34.89 29°13.84 Ankaa 353°7.23 -42°10.44
2	142°48.58	160°52.66 4.70	22°24.49 50.05	72°6.26 41.32	155°22.04 30.24	Ankaa 353°7.23 -42°10.44   Schedar 349°31.16 56°40.74
3	157°51.05	175°52.89 · · 3.52	37°28.02 · · 50.29	87°8.92 · · 41.31	170°24.29 · · 30.15	Diphda 348°47.33 -17°51.10
4 5	172°53.51 187°55.97	190°53.11 2.35 205°53.34 1.17	52°31.55 50.53 67°35.08 50.77	102°11.58 41.29 117°14.24 41.27	185°26.55 30.06 200°28.81 29.97	Achernar 335°20.12 -57°6.87
6	202°58.44	200° 53.57 \$08° 0.00	82°38.61 N24°51.02	117°14.24 41.27 132°16.90 N21°41.26	215°31.06 \$07°29.87	Hamal 327°51.11 23°34.94
7	218°0.90	235°53.80 07°58.83	97°42.14 51.26	147°19.56 41.24	230°33.32 29.78	Polaris 313°48.53 89°22.49
8	233°3.37	250°54.03 57.65	112°45.67 51.50	162°22.22 41.23	245°35.57 29.69	Acamar 315°11.57 -40°12.46 Menkar 314°5.98 4°11.26
9	248°5.83	265°54.26 · · 56.48	127°49.20 · · 51.74	177°24.88 · · 41.21	260°37.83 · · 29.60	Mirfak 308°27.97 49°57.20
10 11	263°8.30 278°10.76	280°54.49 55.30 295°54.72 54.13	142°52.73 51.98 157°56.26 52.22	192°27.54 41.20 207°30.20 41.18	275°40.08 29.50 290°42.34 29.41	Aldebaran 290°39.33 16°33.60
12	278 10.76 293°13.22	310°54.96 S07°52.95	172°59.79 N24°52.47	207 30.20 41.16 222°32.86 N21°41.17	305°44.59 \$07°29.32	Rigel 281°3.56 -8°10.41
13	308° 15.69	325°55.19 51.78	188°3.32 52.71	237°35.52 41.15	320°46.85 29.23	Capella 280°21.44 46°1.48 Bellatrix 278°22.56 6°22.33
14	323° 18.15	340°55.43 50.60	203° 6.85 52.95	252°38.18 41.14	335°49.10 29.13	Bellatrix 278°22.56 6°22.33 Elnath 278°1.50 28°37.75
15	338° 20.62	355°55.66 · · 49.43	218°10.38 · · 53.19	267°40.83 · · 41.12	350°51.35 · · 29.04	Alnilam 275°37.40 -1°11.19
16 17	353°23.08 8°25.54	10°55.90 48.25 25°56.14 47.07	233°13.91 53.43 248°17.44 53.67	282°43.49 41.11 297°46.15 41.09	5°53.61 28.95 20°55.86 28.86	Betelgeuse 270°51.74 7°24.69
18	23°28.01	40°56.38 S07°45.90	263°20.97 N24°53.90	312°48.80 N21°41.08	35°58.12 S07°28.76	Canopus 263°51.85 -52°42.58
19	38° 30.47	55°56.62 44.72	278°24.51 54.14	327°51.46 41.06	51°0.37 28.67	Sirius 258°25.87 -16°45.07 Adhara 255°5.46 -29°0.39
20	53° 32.94	70°56.87 43.55	293°28.04 54.38	342°54.12 41.05	66°2.62 28.58	Adhara 255°5.46 -29°0.39 Procyon 244°50.47 5°9.60
21	68°35.40	85°57.11 · · 42.37	308°31.57 · · 54.62	357°56.77 · · 41.03	81°4.88 · · 28.48	Pollux 243°16.89 27°57.88
22 23	83°37.87 98°40.33	100°57.35 41.19 115°57.60 40.02	323°35.10 54.86 338°38.63 55.10	12°59.43 41.02 28°2.08 41.01	96°7.13 28.39 111°9.39 28.30	Avior 234°14.10 -59°35.28
						Suhail 222°45.89 -43°31.92
Mer.	pass. 16:26	ν0.2′ d-1.2′ m-4.56	ν3.5′ d0.2′ m-1.43	ν2.7' d-0.0' m-2.67	ν2.3' d-0.1' m1.08	Miaplacidus 221°37.43 -69°49.02 Alphard 217°47.44 -8°46.04
						Alphard 217°47.44 -8°46.04 Regulus 207°34.15 11°50.59
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.53 61°36.69
0	113° 42.79	130°57.85 S07°38.84	353°42.17 N24°55.33	43°4.74 N21°40.99	126°11.64	Denebola 182°24.78 14°25.79
1 2	128° 45.26 143° 47.72	145°58.10 37.66 160°58.34 36.49	8°45.70 55.57 23°49.23 55.81	58°7.39 40.98 73°10.05 40.96	141°13.89 28.11 156°16.15 28.02	Gienah 175°43.46 -17°40.82
3	158° 50.19	175°58.59 · · 35.31	38°52.77 · · 56.05	88°12.70 · · 40.95	171°18.40 · · 27.93	Acrux 172°59.91 -63°14.01 Gacrux 171°51.49 -57°14.96
4	173°52.65	190°58.85 34.13	53°56.30 56.28	103°15.35 40.93	186°20.65 27.83	Gacrux 171°51.49 -57°14.96 Alioth 166°12.84 55°49.11
5	188°55.12	205°59.10 32.96	68°59.83 56.52	118°18.01 40.92	201°22.90 27.74	Spica 158°22.28 -11°17.52
6	203°57.58	220°59.35 \$07°31.78	84°3.37 N24°56.75	133°20.66 N21°40.90	216°25.16 \$07°27.65	Alkaid 152°52.01 49°10.97
7 8	219°0.04 234°2.51	235°59.61 30.60 250°59.86 29.42	99° 6.90 56.99 114° 10.44 57.22	148°23.31 40.89 163°25.96 40.88	231°27.41 27.55 246°29.66 27.46	Hadar 148°36.11 -60°29.36
9	249°4.97	266°0.12 · · 28.25	129°13.97 · · 57.46	178°28.61 · · 40.86	261°31.92 · · 27.37	Menkent 147°57.67 -36°29.44
10	264°7.44	281°0.38 27.07	144°17.51 57.69	193°31.27 40.85	276°34.17 27.27	Arcturus 145°47.96 19°2.93 Rigil Kent. 139°40.48 -60°56.07
11	279°9.90	296°0.63 25.89	159°21.04 57.93	208°33.92 40.83	291°36.42 27.18	Kochab 137°20.19 74°2.76
12	294° 12.36	311°0.89 S07°24.71	174°24.58 N24°58.16	223°36.57 N21°40.82	306°38.67 S07°27.09	Zuben'ubi 136°56.12 -16°8.73
13 14	309°14.83 324°17.29	326°1.15 23.53 341°1.42 22.36	189°28.11 58.40 204°31.65 58.63	238°39.22 40.81 253°41.87 40.79	321°40.92 26.99 336°43.18 26.90	Alphecca 126°3.92 26°37.60
15	339° 19.76	356°1.68 · · 21.18	219°35.18 · · 58.86	268°44.52 · · 40.78	351°45.43 · · 26.81	Antares 112°16.08 -26°29.20
16	354°22.22	11°1.94 20.00	234°38.72 59.10	283°47.17 40.76	6°47.68 26.71	Atria 107°10.75 -69°4.15 Sabik 102°3.04 -15°45.37
17	9°24.69	26°2.21 18.82	249°42.25 59.33	298°49.82 40.75	21°49.93 26.62	Shaula 96°10.71 -37°7.26
18	24°27.15 39°29.61	41°2.47 S07°17.64 56°2.74 16.47	264°45.79 N24°59.56 279°49.32 24°59.80	313°52.46 N21°40.74 328°55.11 40.72	36°52.18 S07°26.52 51°54.43 26.43	Rasalhague 95°58.83 12°32.38
19 20	59 29.01 54°32.08	56°2.74 16.47 71°3.01 15.29	279°49.32 24°59.80 294°52.86 25°0.03	328°55.11 40.72 343°57.76 40.71	51°54.43 26.43 66°56.69 26.34	Eltanin 90°42.67 51°28.93
21	69°34.54	86°3.28 · · 14.11	309°56.39 · · 0.26	359°0.41 · · 40.69	81°58.94 · · 26.24	Kaus Aust. 83°32.87 -34°22.35 Vega 80°33.63 38°48.27
22	84°37.01	101°3.55 12.93	324°59.93 0.49	14°3.06 40.68	97°1.19 26.15	Vega 80°33.63 38°48.27 Nunki 75°48.10 -26°15.97
23	99°39.47	116°3.82 11.75	340°3.47 0.72	29°5.70 40.67	112°3.44 26.05	Altair 62°0.28 8°55.99
Mer.	pass. 16:22	ν0.2' d-1.2' m-4.57	ν3.5' d0.2' m-1.44	ν2.7' d-0.0' m-2.66	$\nu 2.3' \ d$ -0.1' m1.09	Peacock 53°6.27 -56°39.36
						Deneb 49°26.25 45°22.18
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.06 9°59.35 Al Na'ir 27°33.24 -46°50.58
0	$114^{\circ}41.93$	131°4.09 <b>S</b> 07°10.57	355°7.00 N25°0.95	44°8.35 N21°40.65	127°5.69 \$07°25.96	Fomalhaut 15°14.72 -29°29.56
1	129° 44.40	146°4.37 9.39	10°10.54 1.18	59°10.99 40.64	142°7.94 25.87	Scheat 13°45.41 28°13.20
2	144° 46.86 159° 49.33	161°4.64 8.21 176°4.92 · · 7.03	25°14.08 1.41	74°13.64 40.63 89°16.29 · · 40.61	157°10.19 25.77 172°12.44 •• 25.68	Markab 13°30.08 15°20.42
3 4	159 49.55 174°51.79	176°4.92 · · 7.03 191°5.19 5.85	40°17.61 · · 1.64 55°21.15 1.87	89°16.29 · · 40.61 104°18.93 40.60	172°12.44 · · 25.68 187°14.69 25.58	Jan 13 Mon SHA Mer.pass
5	189°54.26	206°5.47 4.68	70°24.69 2.10	119°21.58 40.59	202°16.94 25.49	Venus 18°8.56 15:16
6	204°56.72	221°5.75 \$07°3.50	85°28.22 N25°2.33	134°24.22 N21°40.57	217°19.19 <b>S</b> 07°25.40	Mars 239°33.79 00:31
7	219°59.18	236°6.03 2.32	100°31.76 2.56	149°26.86 40.56	232°21.44 25.30	Jupiter 289°17.28 21:08
8	235°1.65	251°6.31 1.14	115°35.30 2.79	164°29.51 40.55	247°23.69 25.21	Saturn 12°33.87 15:36
9 10	250°4.11 265°6.58	266°6.60 06°59.96 281°6.88 06°58.78	130°38.83 · · 3.02 145°42.37 3.24	179°32.15 · · 40.53 194°34.80 40.52	262°25.94 · · 25.11 277°28.19 25.02	Jan 14 Tue SHA Mer.pass
11	280°9.04	296°7.16 57.60	160°45.91 3.47	209°37.44 40.51	292°30.44 24.92	Venus 17°15.05 15:16
12	295°11.50	311°7.45 <b>S</b> 06°56.42	175°49.45 N25°3.70	224°40.08 N21°40.49	307°32.69 <b>S</b> 07°24.83	Mars 239°59.37 00:25 Jupiter 289°21.94 21:04
13	310° 13.97	326°7.74 55.24	190°52.98 3.93	239°42.72 40.48	322°34.94 24.74	Saturn 12°28.85 15:33
14 15	325° 16.43 340° 18.90	341°8.02 54.06 356°8.31 · · 52.88	205°56.52 4.15 221°0.06 • 4.38	254°45.36 40.47 269°48.01 • 40.45	337°37.19 24.64 352°39.44 •• 24.55	
16	340 18.90 355°21.36	11°8.60 51.70	236°3.59 4.60	284°50.65 40.44	7°41.69 24.45	Jan 15 Wed         SHA         Mer.pass           Venus         16°22.16         15:15
17	10°23.83	26°8.89 50.52	251°7.13 4.83	299°53.29 40.43	22°43.94 24.36	Mars 240°25.07 00:19
18	25°26.29	41°9.18 <b>S</b> 06°49.34	266°10.67 N25°5.06	314°55.93 N21°40.41	37°46.19 <b>S</b> 07°24.26	Jupiter 289°26.41 21:00
19	40°28.75	56°9.48 48.16	281°14.21 5.28	329°58.57 40.40	52°48.44 24.17	Saturn 12°23.76 15:29
20 21	55°31.22 70°33.68	71°9.77 46.97 86°10.07 •• 45.79	296°17.74 5.51 311°21.28 • 5.73	345°1.21 40.39 0°3.85 · · 40.38	67°50.69 24.07 82°52.93 · · 23.98	Horizontal parallax
22	70 33.00 85°36.15	101°10.36 44.61	326°24.82 5.95	15° 6.49 40.36	97°55.18 23.88	Venus: 0.2
23	100°38.61	116°10.66 43.43	341°28.36 6.18	30°9.12 40.35	112°57.43 23.79	Mars: 0.2
Mer	pass. 16:19	ν0.3' d-1.2' m-4.58	ν3.5′ d0.2′ m-1.45	ν2.6' d-0.0' m-2.65	ν2.3' d-0.1' m1.09	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.25	S21°28.23	$9^{\circ}59.63$	5.1'	$N27^{\circ}52.73$	-3.7'	57.9'
1	192°51.01	27.81	24°23.69	5.1'	27°49.04	-3.9'	57.9'
2 3	207°50.78 222°50.55	27.38 •• 26.95	38° 47.81 53° 12.01	5.2' 5.3'	27° 45.18 27° 41.14	-4.0' -4.2'	57.9' 57.9'
4	237°50.32	26.53	67°36.28	5.4'	27°36.93	-4.4	57.8'
5	252°50.08	26.10	82°0.64	5.4'	27° 32.55	-4.6'	57.8'
6	267°49.85	S21°25.67	96°25.07	5.5'	N27°28.00	-4.7'	57.8'
7	282°49.62	25.24	110° 49.58 125° 14.18	5.6'	27°23.28 27°18.39	-4.9'	57.8'
8 9	297°49.39 312°49.16	24.80 •• 24.37	125° 14.18 139° 38.86	5.7' 5.8'	27° 18.39 27° 13.34	-5.1' -5.2'	57.8' 57.7'
10	327°48.93	23.94	154°3.63	5.9'	27°13.34	-5.4'	57.7'
11	342°48.70	23.51	168°28.49	5.9'	$27^{\circ}2.74$	-5.5'	57.7'
12	357°48.47	S21°23.07	182°53.43	6.0'	N26°57.19	-5.7'	57.7'
13 14	12°48.24 27°48.01	22.64 22.20	197°18.47 211°43.61	6.1' 6.2'	26°51.49 26°45.62	-5.9' -6.0'	57.6' 57.6'
15	42°47.78	21.77	211 43.01 226°8.83	6.3	26° 39.60	-6.0' -6.2'	57.6'
16	57°47.55	21.33	240°34.16	6.4'	26°33.42	-6.3'	57.6'
17	72°47.32	20.89	254°59.58	6.5'	26°27.08	-6.5'	57.5'
18	87°47.09	S21°20.45	269°25.10	6.6'	N26°20.59 26°13.95	-6.6'	57.5'
19 20	102°46.87 117°46.64	20.01 19.57	283°50.72 298°16.44	6.7' 6.8'	26°13.95 26°7.15	-6.8' -6.9'	57.5' 57.5'
21	132°46.41	19.13	312° 42.27	6.9'	26°0.21	-7.1'	57.5'
22	147°46.18	18.69	327°8.20	7.0'	$25^{\circ}53.12$	-7.2'	57.4'
23	162°45.96	18.25	341°34.23	7.1'	25°45.88	-7.4'	57.4'
	SD = 16.3'	d = -0.4'		SI	O = 15.8'		
-	CIIA					,	
Tue 0	<b>GHA</b> 177°45.73	<b>Dec</b> \$21° 17.81	<b>GHA</b> 356°0.37	ν 7.2'	<b>Dec</b> N25° 38.50	d -7.5'	<b>HP</b> 57.4'
1	192°45.50	17.36	10°26.61	7.4'	25°30.97	-7.3 -7.7'	57.4'
2	207°45.28	16.92	24°52.96	7.5'	25°23.31	-7.8'	57.3'
3	222°45.05	. 16.47	39° 19.43	7.6'	25° 15.50	-7.9'	57.3'
4 5	237°44.83 252°44.60	16.03 15.58	53°46.00 68°12.68	7.7' 7.8'	25°7.55 24°59.47	-8.1' -8.2'	57.3' 57.3'
6	267°44.38	521° 15.14	82°39.47	7.0 7.9'	N24°51.25	-8.4'	57.3'
7	282°44.15	14.69	97°6.37	8.0'	24° 42.90	-8.5	57.2'
8	297°43.93	14.24	111°33.38	8.1'	$24^{\circ}34.41$	-8.6'	57.2'
9	312°43.70	• • 13.79	126°0.51	8.2'	24°25.80	-8.7'	57.2
10 11	327°43.48 342°43.26	13.34 12.89	140°27.75 154°55.10	8.4' 8.5'	24°17.05 24°8.18	-8.9' -9.0'	57.1' 57.1'
12	357°43.03	521°12.44	169° 22.57	8.6'	N23°59.18	-9.0 -9.1	57.1
13	12°42.81	11.99	183°50.15	8.7'	23°50.06	-9.2	57.1'
14	27°42.59	11.53	198° 17.84	8.8'	23°40.82	-9.4'	57.0'
15	42°42.37 57°42.14	· · 11.08	212° 45.65 227° 13.57	8.9' 9.0'	23°31.45 23°21.97	-9.5'	57.0'
16 17	72°41.92	10.03	241°41.61	9.0 9.2'	23° 12.37	-9.6' -9.7'	57.0' 57.0'
18	87°41.70	S21°9.72	256°9.77	9.3'	N23°2.65	-9.8'	56.9'
19	102°41.48	9.26	270°38.04	9.4'	22°52.82	-9.9'	56.9'
20	117°41.26	8.80	285°6.42	9.5'	22° 42.88 22° 32.82		56.9'
21 22	132°41.04 147°40.82	· · 8.35 7.89	299°34.92 314°3.53	9.6' 9.7'	22°32.82 22°22.66	-10.2' -10.3'	56.8' 56.8'
23	162°40.60	7.43	328° 32.26	9.8'	22°12.39	-10.4	56.8'
	SD = 16.3'	d = -0.4'		SI	D = 15.6'		
\A/. I	CUA	D	CIIA		D	.1	LIP
Wed 0	<b>GHA</b> 177°40.38	<b>Dec</b> <b>S</b> 21°6.97	<b>GHA</b> 343°1.11	u 10.0'	<b>Dec</b> N22° 2.01	d -10.5'	<b>HP</b> 56.8'
1	192°40.16	6.51	357°30.07	10.1'	21°51.53	-10.6'	56.7'
2	207°39.94	6.05	11°59.14	10.2'	21°40.95	-10.7'	56.7'
3 4	222°39.72 237°39.50	· · 5.59	26°28.33 40°57.63	10.3' 10.4'	21°30.26 21°19.47	-10.8' -10.9'	56.7'
4 5	237°39.50 252°39.28	5.12 4.66	40°57.03 55°27.05	10.4	21°19.47 21°8.59	-10.9 -11.0'	56.7' 56.6'
6	267°39.07	\$21°4.20	69° 56.58	10.6'	N20°57.61	-11.1	56.6'
7	282°38.85	3.73	84°26.22	10.8'	20°46.54	-11.2'	56.6'
8	297°38.63	3.27	98°55.97	10.9'	20°35.37	-11.3'	56.6'
9 10	312°38.41 327°38.20	· · 2.80 2.33	113°25.84 127°55.82	11.0' 11.1'	20°24.11 20°12.76	-11.3' -11.4'	56.5' 56.5'
11	342°37.98	2.33 1.87	142° 25.91	11.1	20°1.33	-11.4	56.5
12	357°37.76	S21°1.40	156°56.11	11.3'	N19°49.80	-11.6'	56.5'
13	12°37.55	0.93	171°26.42	11.4'	19°38.19	-11.7'	56.4
14 15	27°37.33 42°37.12	0.46 20°59.99	185°56.84 200°27.36	11.5' 11.6'	19°26.50 19°14.73	-11.8' -11.9'	56.4' 56.4'
15 16	42°37.12 57°36.90	20°59.99 20°59.52	200° 27.36 214° 58.00	11.6	19° 14.73 19° 2.87	-11.9' -11.9'	56.4 56.3'
17	72°36.69	59.05	229°28.75	11.9'	18° 50.94	-12.0'	56.3
18	87°36.47	\$20°58.58	243°59.60	12.0'	N18°38.92	-12.1'	56.3'
19	102°36.26	58.10	258° 30.55	12.1'	18°26.83	-12.2'	56.3'
20 21	117°36.04 132°35.83	57.63 •• 57.16	273°1.62 287°32.78	12.2' 12.3'	18° 14.67 18° 2.43	-12.2' -12.3'	56.2' 56.2'
22	132 35.83 147°35.62	56.68	302°4.05	12.3 12.4'	18 2.43 17°50.13	-12.3 -12.4'	56.2'
23	162°35.40	56.21	316°35.43	12.5'	17°37.75	-12.4'	56.2'
	SD = 16.3'	d = -0.5'		SI	D = 15.5'		

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

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

# January 16, 17, 18 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	115° 41.07	131°10.96	356°31.89 N25°6.40	45°11.76 N21°40.34	127°59.68	
1	130°43.54	146°11.26 41.07	11°35.43 6.63	60°14.40 40.33	143°1.93 23.60	Alpheratz 357°34.90 29°13.83 Ankaa 353°7.24 -42°10.44
2	145°46.00	161°11.56 39.89	26°38.97 6.85	75°17.04 40.31	158°4.18 23.50	Ankaa 353°7.24 -42°10.44 Schedar 349°31.18 56°40.73
3	160° 48.47	176°11.86 · · 38.71	41°42.51 · · 7.07	90°19.68 · · 40.30	173°6.42 · · 23.41	Diphda 348°47.34 -17°51.10
4	175°50.93	191°12.16 37.53	56°46.04 7.29	105°22.31 40.29	188°8.67 23.31	Achernar 335°20.14 -57°6.86
5	190°53.39	206°12.47 36.35 221°12.77 \$06°35.17	71°49.58 7.52 86°53.12 N25°7.74	120°24.95 40.28 135°27.59 N21°40.26	203°10.92 23.22 218°13.17 S07°23.12	Hamal 327°51.12 23°34.94
6 7	205° 55.86 220° 58.32	236°13.08 33.99	101°56.66 7.96	135°27.59 N21°40.26 150°30.22 40.25	218°13.17 S07°23.12 233°15.42 23.03	Polaris 313°49.96 89°22.50
8	236°0.79	251°13.39 32.80	117°0.20 8.18	165°32.86 40.24	248°17.66 22.93	Acamar 315°11.58 -40°12.47
9	251°3.25	266°13.70 · · 31.62	132° 3.73 · · 8.40	180°35.49 · · 40.23	263°19.91 · · 22.84	Menkar 314°5.99 4°11.26
10	266°5.72	281°14.01 30.44	147°7.27 8.62	195°38.13 40.21	278°22.16 22.74	Mirfak 308°27.98 49°57.20 Aldebaran 290°39.34 16°33.61
11	281°8.18	296°14.32 29.26	162°10.81 8.84	210°40.76 40.20	293°24.40 22.65	Rigel 281°3.56 -8°10.42
12	296° 10.64	311°14.63 S06°28.08	177°14.35 N25°9.06	225°43.40 N21°40.19	308°26.65 S07°22.55	Capella 280°21.45 46°1.48
13	311° 13.11 326° 15.57	326°14.94 26.90 341°15.25 25.72	192°17.88 9.28 207°21.42 9.50	240°46.03 40.18	323°28.90 22.45 338°31.15 22.36	Bellatrix 278°22.56 6°22.33
14 15	341°18.04	341°15.25 25.72 356°15.57 •• 24.53	207 21.42 9.50 222°24.96 •• 9.72	255°48.66 40.17 270°51.30 · · 40.15	353°33.39 · · 22.26	Elnath 278°1.50 28°37.75
16	356° 20.50	11°15.89 23.35	237°28.49 9.94	285°53.93 40.14	8°35.64 22.17	Alnilam 275°37.40 -1°11.19
17	11°22.96	26°16.20 22.17	252°32.03 10.15	300°56.56 40.13	23°37.89 22.07	Betelgeuse 270°51.74 7°24.68
18	26°25.43	41°16.52 <b>S</b> 06°20.99	267°35.57 N25°10.37	315°59.19 N21°40.12	38°40.13 <b>S</b> 07°21.98	Canopus 263°51.86 -52°42.59 Sirius 258°25.87 -16°45.08
19	41°27.89	56°16.84 19.81	282°39.11 10.59	331°1.82 40.11	53°42.38 21.88	Adhara 255°5.46 -29°0.40
20	56° 30.36	71°17.16 18.62	297°42.64 10.81	346° 4.46 40.09	68°44.63 21.78	Procyon 244°50.46 5°9.60
21	71°32.82	86°17.48 · · 17.44 101°17.81 16.26	312°46.18 · · 11.02	1°7.09 · · 40.08	83°46.87 · · 21.69	Pollux 243°16.88 27°57.89
22 23	86° 35.28 101° 37.75	101°17.81 16.26 116°18.13 15.08	327°49.72 11.24 342°53.25 11.46	16° 9.72 40.07 31° 12.35 40.06	98°49.12 21.59 113°51.36 21.50	Avior 234°14.09 -59°35.30
						Suhail 222°45.87 -43°31.94
Mer.	pass. 16:15	ν0.3′ <i>d</i> -1.2′ m-4.59	ν3.5′ d0.2′ m-1.45	ν2.6′ d-0.0′ m-2.65	ν2.2′ d-0.1′ m1.09	Miaplacidus 221°37.42 -69°49.04
						Alphard 217°47.42 -8°46.05 Regulus 207°34.13 11°50.59
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.49 61°36.69
0	116°40.21	131°18.45 <b>S</b> 06°13.90	357°56.79 N25°11.67	46°14.98 N21°40.05	128°53.61 <b>S</b> 07°21.40	Denebola 182°24.75 14°25.78
1	131° 42.68	146°18.78 12.71	13°0.33 11.89	61°17.61 40.04	143°55.86 21.31	Gienah 175°43.44 -17°40.83
2	146° 45.14	161°19.11 11.53	28°3.86 12.10	76°20.24 40.02	158°58.10 21.21	Acrux 172°59.88 -63°14.02
3 4	161° 47.61 176° 50.07	176°19.44 · · 10.35 191°19.76 9.17	43°7.40 · · 12.32 58°10.94 12.53	91°22.86 ·· 40.01 106°25.49     40.00	174°0.35 · · 21.11 189°2.59 21.02	Gacrux 171°51.46 -57°14.98
5	191°52.53	206°20.09 7.99	73°14.47 12.75	121°28.12 39.99	204°4.84 20.92	Alioth 166°12.79 55°49.10
6	206° 55.00	221°20.43	88°18.01 N25°12.96	136°30.75 N21°39.98	219°7.08 S07°20.82	Spica 158°22.25 -11°17.53
7	221°57.46	236°20.76 5.62	103°21.55 13.18	151°33.38 39.97	234°9.33 20.73	Alkaid 152°51.98 49°10.96 Hadar 148°36.06 -60°29.37
8	236°59.93	251°21.09 4.44	118°25.08 13.39	166°36.00 39.95	249°11.57 20.63	Menkent 147°57.64 -36°29.45
9	252°2.39	266°21.43 · · 3.26	133°28.62 · · 13.60	181°38.63 · · 39.94	264°13.82 · · 20.54	Arcturus 145°47.93 19°2.92
10	267°4.85	281°21.76 2.07	148°32.15 13.81	196°41.26 39.93	279°16.06 20.44	Rigil Kent. 139°40.44 -60°56.08
11	282°7.32 297°9.78	296°22.10 06°0.89	163°35.69 14.03 178°39.22 N25°14.24	211°43.88 39.92	294°18.31 20.34 309°20.55 <b>S</b> 07°20.25	Kochab 137°20.12 74°2.75
12 13	297 9.78 312° 12.25	311°22.44 S05°59.71 326°22.78 58.53	178 39.22 N25 14.24 193°42.76 14.45	226°46.51 N21°39.91 241°49.13 39.90	309°20.55	Zuben'ubi 136°56.09 -16°8.74
14	327° 14.71	341°23.12 57.35	208°46.30 14.66	256°51.76 39.89	339°25.04 20.05	Alphecca 126°3.89 26°37.59
15	342° 17.17	356°23.46 · · 56.16	223°49.83 · · 14.87	271°54.38 · · 39.88	354°27.29 · · 19.96	Antares 112°16.05 -26°29.21 Atria 107°10.70 -69°4.14
16	$357^{\circ}19.64$	11°23.80 54.98	238°53.37 15.08	286°57.01 39.87	9°29.53 19.86	Atria 107°10.70 -69°4.14 Sabik 102°3.02 -15°45.38
17	12°22.10	26°24.15 53.80	253°56.90 15.29	301°59.63 39.85	24°31.77 19.76	Shaula 96°10.69 -37°7.26
18	27°24.57	41°24.49 S05°52.62	269°0.43 N25°15.50	317°2.26 N21°39.84	39°34.02 <b>S</b> 07°19.67	Rasalhague 95°58.81 12°32.37
19	42°27.03	56°24.84 51.43	284°3.97 15.71	332° 4.88 39.83	54°36.26 19.57	Eltanin 90°42.65 51°28.91
20 21	57° 29.49 72° 31.96	71°25.18 50.25 86°25.53 • 49.07	299° 7.50 15.92 314° 11.04 · · · 16.13	347°7.50 39.82 2°10.12 · · 39.81	69°38.51 19.47 84°40.75 · · 19.38	Kaus Aust. 83°32.86 -34°22.35
22	87°34.42	101°25.88 47.88	329°14.57 16.34	17°12.75 39.80	99°42.99 19.28	Vega 80°33.62 38°48.25
23	102°36.89	116°26.23 46.70	344°18.11 16.55	32°15.37 39.79	114°45.24 19.18	Nunki 75°48.09 -26°15.97
				ν2.6' d-0.0' m-2.64		Altair 62°0.27 8°55.98 Peacock 53°6.26 -56°39.35
ivier.	pass. 16:11	ν0.3′ d-1.2′ m-4.60	$\nu$ 3.5′ $d$ 0.2′ $m$ -1.44	ν2.0 <i>a</i> -0.0 m-2.04	ν2.2' d-0.1' m1.09	Deneb 49°26.26 45°22.16
						Enif 33°39.06 9°59.35
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.25 -46°50.57
0	117°39.35 132°41.82	131°26.58 S05°45.52 146°26.94 44.34	359°21.64 N25°16.76 14°25.17 16.96	47°17.99 N21°39.78 62°20.61 39.77	129°47.48 <b>S</b> 07°19.09 144°49.72 18.99	Fomalhaut 15°14.72 -29°29.55
1 2	132 41.82 147°44.28	140 20.94 44.34 161°27.29 43.15	29°28.71 17.17	77°23.23 39.76	159°51.97 18.89	Scheat 13°45.42 28°13.19
3	162° 46.74	176°27.65 · · 41.97	44°32.24 · · 17.38	92°25.85 · · 39.75	174°54.21 · · 18.80	Markab 13°30.09 15°20.41
4	177° 49.21	191°28.00 40.79	59°35.77 17.59	107°28.47 39.74	189°56.45 18.70	Jan 16 Thu SHA Mer.pass
5	192°51.67	206°28.36 39.61	74°39.31 17.79	122°31.09 39.73	204°58.70 18.60	Venus 15°29.89 15:15
6	207°54.14	221°28.72 \$05°38.42	89°42.84 N25°18.00	137°33.71 N21°39.72	220°0.94 <b>S</b> 07°18.50	Mars 240°50.82 00:14
7	222°56.60	236°29.08 37.24	104°46.37 18.20	152°36.33 39.71	235°3.18 18.41	Jupiter 289°30.69 20:56
8 9	237°59.06 253°1.53	251°29.44 36.06 266°29.80 · · 34.88	119°49.90 18.41 134°53.44 · · 18.61	167°38.95 39.70 182°41.57 · · 39.68	250°5.42 18.31 265°7.67 · · 18.21	Saturn 12°18.61 15:26
10	268°3.99	281°30.16 33.69	149°56.97 18.82	197°44.19 39.67	280°9.91 18.12	Jan 17 Fri SHA Mer.pass
11	283°6.46	296°30.53 32.51	165° 0.50 19.02	212°46.80 39.66	295°12.15 18.02	Venus 14°38.24 15:14
12	298°8.92	311°30.89 S05°31.33	180°4.03 N25°19.23	227°49.42 N21°39.65	310°14.39 S07°17.92	Mars 241°16.58 00:08
13	313°11.38	326°31.26 30.14	195°7.56 19.43	242°52.04 39.64	325°16.64 17.82	Jupiter 289°34.76 20:51 Saturn 12°13.40 15:22
14	328° 13.85	341°31.63 28.96	210°11.09 19.63	257°54.65 39.63	340°18.88 17.73	
15	343° 16.31	356°31.99 · · 27.78	225°14.62 · · 19.83	272°57.27 · · 39.62	355°21.12 · · 17.63	Jan 18 Sat SHA Mer.pass
16	358° 18.78 13° 21.24	11°32.36 26.60 26°32.73 25.41	240°18.15 20.04 255°21.69 20.24	287°59.89 39.61 303°2.50 39.60	10°23.36 17.53 25°25.60 17.43	Venus 13°47.23 15:14
17 18	28°23.70	41°33.11 \$05°24.23	255°21.69 20.24 270°25.22 N25°20.44	303°2.50 39.60 318°5.12 N21°39.59	25°25.60 17.43 40°27.85 S07°17.34	Mars 241°42.29 00:03 Jupiter 289°38.64 20:47
19	43°26.17	56° 33.48 23.05	285°28.75 20.64	333°7.73 39.58	55°30.09 17.24	Saturn 12°8.13 15:19
20	58°28.63	71°33.85 21.86	300°32.27 20.84	348°10.35 39.57	70°32.33 17.14	
21	73°31.10	86°34.23 · · 20.68	315°35.80 · · 21.04	3°12.96 · · 39.56	85°34.57 · · 17.04	Horizontal parallax
22	88°33.56	101°34.60 19.50	330°39.33 21.24	18°15.57 39.55	100°36.81 16.95	Venus: 0.2
23	103°36.02	116°34.98 18.32	345°42.86 21.44	33°18.19 39.55	115°39.05 16.85	Mars: 0.2
Mer.	pass. 16:07	u0.4′ d-1.2′ m-4.61	u3.5′ $d$ 0.2′ $m$ -1.42	$\nu 2.6' \ d\text{-}0.0' \ \text{m-}2.63$	$\nu 2.2' \ d ext{-}0.1' \ m1.09$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°35.19	\$20°55.73	331°6.90	12.6'	N17°25.30	-12.5'	56.1'
1	192°34.98	55.25	345°38.48	12.7'	17° 12.78	-12.6'	56.1'
2	207°34.77	54.77	0°10.16	12.8'	17°0.20	-12.6'	56.1'
3	222°34.55	• • 54.30	14°41.94	12.9'	16° 47.55	-12.7'	56.1'
4	237°34.34	53.82	29° 13.81	13.0'	16°34.85	-12.8'	56.0'
5	252°34.13	53.34	43°45.79	13.1'	16°22.07	-12.8'	56.0'
6	267°33.92	\$20°52.86	58° 17.86	13.2'	N16°9.24	-12.9'	56.0'
7	282°33.71	52.38	72°50.02	13.3'	15°56.35	-12.9'	56.0'
8	297°33.50	51.89	87°22.29	13.4'	15°43.40	-13.0'	55.9'
9	312°33.29	• • 51.41	101°54.64	13.4'	15°30.40	-13.1'	55.9'
10	327°33.08	50.93	116°27.09	13.5'	15° 17.33	-13.1'	55.9'
11	342°32.87	50.44	130°59.63	13.6'	15°4.22	-13.2'	55.9'
12	357°32.66	S20°49.96	145°32.26	13.7'	N14°51.05	-13.2'	55.8'
13	12°32.45	49.47	160°4.99	13.8'	14°37.83	-13.3'	55.8'
14	27°32.24	48.99	174°37.80	13.9'	14°24.56	-13.3'	55.8'
15	42°32.03	• • 48.50	$189^{\circ}10.70$	14.0'	14° 11.25	-13.4'	55.8'
16	57°31.83	48.01	203°43.68	14.1'	13°57.88	-13.4'	55.7'
17	72°31.62	47.53	$218^{\circ}16.75$	14.2'	13°44.47	-13.5'	55.7'
18	87°31.41	\$20°47.04	232°49.91	14.2'	N13°31.01	-13.5'	55.7'
19	102°31.20	46.55	247° 23.15	14.3'	13° 17.51	-13.5'	55.7'
20	117°31.00	46.06	261°56.47	14.4'	13°3.97	-13.6'	55.6'
21	132°30.79	• • 45.57	276°29.87	14.5'	12°50.38	-13.6'	55.6'
22	147°30.58	45.07	291°3.36	14.6'	12°36.76	-13.7'	55.6'
23	162°30.38	44.58	305°36.92	14.6'	12°23.09	-13.7'	55.6'
	SD = 16.3'	d = -0.5'		SI	D = 15.3'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	$177^{\circ}30.17$	S20°44.09	$320^{\circ}10.56$	14.7'	$N12^{\circ}9.39$	-13.7'	55.5'
1	192°29.97	43.60	334°44.28	14.8'	11°55.65	-13.8'	55.5'
2	207°29.76	43.10	$349^{\circ}18.08$	14.9'	$11^{\circ}41.88$	-13.8'	55.5'
3	222°29.56	• • 42.61	3°51.94	14.9'	11°28.07	-13.8'	55.5'
4	237°29.35	42.11	$18^{\circ}25.89$	15.0'	$11^{\circ}14.22$	-13.9'	55.4'
5	252°29.15	41.61	$32^{\circ}59.90$	15.1'	11°0.35	-13.9'	55.4'
6	267°28.95	\$20°41.12	47°33.99	15.2'	N10°46.44	-13.9'	55.4'
7	282°28.74	40.62	62°8.14	15.2'	10°32.50	-14.0'	55.4'
8	297°28.54	40.12	76°42.37	15.3'	10° 18.53	-14.0'	55.4'
9	312°28.34	• • 39.62	$91^{\circ}16.66$	15.4'	10°4.54	-14.0'	55.3'
10	327°28.13	39.12	105°51.02	15.4'	09°50.52	-14.0'	55.3'
11	342°27.93	38.62	120°25.44	15.5'	09°36.47	-14.1'	55.3'
12	357°27.73	\$20°38.12	134°59.93	15.6'	N09°22.39	-14.1'	55.3'
13	12°27.53	37.62	149°34.48	15.6'	09°8.29	-14.1'	55.2'
14	27°27.33	37.12	164°9.09	15.7'	08°54.17	-14.1'	55.2'
15	42°27.13	• • 36.61	178°43.77	15.7'	08°40.03	-14.2'	55.2'
16	57°26.92 72°26.72	36.11	193° 18.50 207° 53.29	15.8'	08°25.86 08°11.68	-14.2'	55.2'
17 18	72 26.72 87°26.52	35.61 \$20°35.10	207 53.29 222°28.14	15.8' 15.9'	08 11.68 N07°57.47	-14.2' -14.2'	55.2' 55.1'
19	102°26.32	34.59	237°3.04	16.0'	07°43.25	-14.2'	55.1'
20	102 20.32 117°26.12	34.09	251° 38.00	16.0'	07° 43.23	-14.2	55.1'
21	132°25.93	• • 33.58	266° 13.01	16.1	07° 14.76	-14.3'	55.1'
22	147°25.73	33.07	280° 48.08	16.1	07°14.70	-14.3'	55.0'
23	162°25.53	32.56	295°23.19	16.2	06°46.20	-14.3'	55.0'
23						21.5	
	SD = 16.3'	d = -0.5'		SI	D = 15.1'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0 0	177°25.33	S20° 32.06	309°58.36	ν 16.2'	N06°31.89	a -14.3'	<b>пР</b> 55.0'
1	177 25.33 192°25.13	31.55	324°33.57	16.2	06° 17.58	-14.3'	55.0'
2	207°24.93	31.04	339°8.83	16.3	06°3.26	-14.3'	55.0'
3	222°24.74	• • 30.52	353°44.14	16.4	05°48.92	-14.3'	54.9'
4	237°24.54	30.01	8° 19.49	16.4	05°34.57	-14.4'	54.9'
5	252°24.34	29.50	22°54.89	16.4	05°20.21	-14.4'	54.9'
6	267°24.15	S20°28.99	37°30.33	16.5'	N05°5.85	-14.4'	54.9'
7	282°23.95	28.47	52°5.81	16.5'	04°51.48	-14.4'	54.9'
8	297°23.75	27.96	66°41.33	16.6'	04°37.10	-14.4'	54.9'
9	312°23.56	• • 27.44	81°16.89	16.6'	04°22.71	-14.4'	54.8'
10	327°23.36	26.93	95°52.48	16.6'	$04^{\circ}8.32$	-14.4'	54.8'
11	342°23.17	26.41	$110^{\circ}28.12$	16.7'	$03^{\circ}53.92$	-14.4'	54.8'
12	357°22.97	S20°25.89	125°3.78	16.7'	N03°39.52	-14.4'	54.8'
13	12°22.78	25.37	$139^{\circ}39.49$	16.7'	$03^{\circ}25.12$	-14.4'	54.8'
14	27°22.58	24.86	154° 15.22	16.8'	03°10.71	-14.4'	54.7'
15	42°22.39	• • 24.34	$168^{\circ}50.99$	16.8'	02°56.31	-14.4'	54.7'
16	57°22.20	23.82	183°26.79	16.8'	02°41.90	-14.4'	54.7'
17	72°22.00	23.30	198°2.62	16.9'	02°27.49	-14.4'	54.7'
18	87°21.81	S20°22.77	212°38.47	16.9'	N02°13.09	-14.4'	54.7'
19	102°21.62	22.25	227°14.35	16.9'	01°58.68	-14.4'	54.7'
20	117°21.43	21.73	241°50.26	16.9'	01°44.28	-14.4'	54.6'
21	132°21.24	• • 21.21	256°26.19	17.0'	01°29.88	-14.4'	54.6'
22	147°21.04	20.68	271°2.15	17.0'	01°15.49	-14.4'	54.6'
23	162°20.85	20.16	285°38.13	17.0'	01°1.10	-14.4'	54.6'
	SD = 16.2'	d = -0.5'		SI	D = 15.0'		

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

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

#### January 19, 20, 21 UT (Sun., Mon., Tue.)

Simple   CHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1   12   12   12   12   13   13   15   15   15   15   15   15	Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 1971-095   1467-374   15.56   17.74   20.75							
1	1		146°35.74 15.95	15°49.92 21.84		145°43.54 16.65	
1   10   10   10   10   10   10   10							
5 197 30.01 206 17.77 11.12 76.00 12.06 12.07 30.00 10							
5   2009/13.17   2017/15.6   3009/10.04   017/15.6   3009/12.07   2017/15.6   3009/13.01   3009/13.01   3							
7 293*55.74 290*56.04 8.86 10*11.08 29.08 19.37 20.37 39.08 9.9.47 237*59.89 1.0.00							
	7		236°38.04 8.86			235°56.98 16.06	
10 290-031 000-036.0 d. 1.0 360-03.0 d. 1.0 36							
14   2084   5.0   2016   5.0   2016   2.0   2.							
12   1998   30   1311   3998   5952   12   1312   1312   1314   1315   1314							
1.5   1.5							
1.5   1.5	13				243°54.73 39.41		
19							
14   14   15   16   16   17   17   18   18   18   18   18   18							Alnilam 275°37.41 -1°11.20
38 29*22.94 41*42.97 50*93.85 271*49.80 N2*2*9.18 319*7.17 N21*9.93 41*2*1.02 50*7*1.98 10*4*2*5.15 50*4*2.75 10*3*1.05*1.05*1.05*1.05*1.05*1.05*1.05*1.05							
20							
22 9673.70 10743.06 1312 33174.05 26.56 136.70 10743.06 1312 33174.05 26.56 1374.06 130.33 1075.06 14.65 14.							
Mer   pass   16.03   10 <sup>14</sup> 43.0   49.94   347°7.47   26.14   34°20.80   39.33   116°32.81   14.49   Mer   20°4 d-1.2" m-4.62   27.5° d-0.2" m-1.62   27.2" d-0.1" m-1.09   Mer   27.6° d-0.2" m-2.62   27.2" d-0.2" m-2.62   27.2							
Mon   CHA   CHA   Dec							
Mary   Character	Morr	16:02					
More   GHA	ivier.p	Dass. 10:05	νυ.4 α-1.2 m-4.02	ν <sub>3.5</sub> αυ.2 m-1.41	ν2.0 α-0.0 m-2.02	ν2.2 α-0.1 m1.09	
10   1973 76.3   131"4479   504"48,75   2"19.09   185"26.33   49"23.40   121"36.22   131"35.05   507"14.39   121"36.12   121"4.51   122"2.17   121"3.10   132"3.10		6114	GU4 B	GUA D	CUA D	GUA D	
1 134°4009 146°45.20 47.77 11°14.51 26.52 66°26.01 39.30 146°37.29 14.29   2 149°42.55 161°45.61 46.39 32°18.03 26.71 79°26.61 39.30 161°39.55 14.10   3 164°45.02 176°46.02 · 45.21 47°21.55 · 26.90 94°31.21 · 39.29 176°41.77 · 14.09   5 194°49.95 26°46.48 4 403 62°52.67 27.09 109°33.28 39.28 101°44.00 13.99   5 194°49.95 26°46.48 4 403 62°52.67 27.09 109°33.20 39.28 101°44.00 13.99   6 200°52.41 222°47.25 504°41.66 92°52.11 N25°27.47 139°39.00 N21°32.77 201°46.22 11.30   7 224°54.87 266°47.67 40.48 107°35.63 27.65 154°41.62 39.25 26°50.72 13.70   8 229°5.73 25°49.09 1 197°5.00 1 197°5.0							
2 149°42.55 161°45.61 46.39 32°18.03 26.71 79°28.61 39.30 161°39.53 14.19 3 164°45.07 176°46.07 14.09 13.99 4 179°47.48 191°46.73 44.03 62°25.07 27.09 109°33.82 191°46.00 13.99 5 194°49.57 200°46.24 42.24 77.725.59 27.20 124°36.42 39.27 200°46.24 13.90 6 209°32.41 236°47.75 504°41.66 92°33.11 122°57.47 139°39.02 N21°39.27 221°44.85 13.10 6 209°32.41 236°47.75 504°41.66 92°33.11 122°57.47 139°39.02 N21°39.27 221°44.85 13.10 6 209°32.41 236°47.75 504°41.66 92°33.11 122°57.47 139°39.02 N21°39.27 221°44.85 13.10 6 209°32.41 236°47.75 504°41.66 92°33.11 122°47.75 504°41.66 92°33.11 122°47.75 130°41.69 130°30 506°30.10 130°30 506°30 50							
3 164°4502 176°4602 4521 47°21.55 · 2.600 94°31.21 39.29 176°41.77 · 14.09							
4 179-474.8 19-95 206"46.8 4 42.94 77726.5 27.99 109"33.8 2 39.28 1914.4.0 13.99 Ailoth 166-12.76 55"49.10 200"52.41 3.90 20"52.	3	$164^{\circ}45.02$		47°21.55 · · 26.90			
Section   Sect							
8 239°57.34 231°48.08 39.30 12°39.15 27.84 169°44.22 39.26 230°59.72 13.70							
8 229°57.34 221°48.08 0.361°48.0 0.38.12 12°19.15 27.64 160°44.22 39.25 221°8.206 11.50   Membert 147°57.62 36°20 46   9 256°59.80 266°48.50 0.361.26 137°42.67 0.280 31 184°64.83 0.39.25 251°8.206 11.50   11 268°47.37 266°49.34 35.75 167°49.70 28.22 199°49.43 39.23 281°87.43 13.40   12 300°7.20 311°49.76 504°34.57 182°53.22 1825°8.59 129°46.83 1821°9.22 281°9.20 27°15.20 13.00   13 315°96 326°551.83 33.99 197°55.74 287.89 242°7.23 39.21 327°4.15 507°13.20   14 330°12.12 341°50.60 326°551.03 31.03 221 213°0.25 28.96 299°9.83 39.20 342°6.38 13.00   15 345°14.59 386°51.03 31.03 221 213°0.25 28.96 299°9.83 39.20 342°6.38 13.00   16 0°17.05 11°51.45 366°51.03 31.03 222 328°37.7 0.291.5 275°2.42 39.19 357°8.62 12.90   17 15°19.52 26°51.88 28.66 286°81.08 0.295.2 305°7.62 39.18 12°10.86 12.80   18 39°21.98 41°52.30 504°7.48 273°14.31 1025°2.97 320°10.22 12°10.27   18 39°21.98 41°52.30 504°7.48 273°14.31 1025°2.97 320°10.22 12°19.17 42°15.33 507°12.61   19 45°24.44 56°52.37 26.30 388°17.83 20.99 335°15.41 39.15 72°19.81 12.41   21 75°29.37 86°55.59 2.394 318°24.85 30.05 58°15.80 12°2.23 22 290°31.84 101°54.02 22.76 333°28.37 30.44 20°20.61 39.14 102°24.28 12.21   19 45°24.44 56°52.39 340°1.38 38°24.85 30.05 58°25.80 12°2.39 31.11°26.51 12.11   18 510°41.69 11°55.76 11.35°5.46 21.88 38°3.88 30.62 38°23.20 39.13 117°26.51 12.11   18 510°41.69 11°55.76 11.35°4.69 20 16.85 333°24.37 30.44 20°20.61 39.14 102°24.28 12.21   18 510°41.69 11°55.76 11.35°3.39 102°3.31 10°3.51 10°3.51 11°50.40 11.91   18 18 18 18 18 18 18 18 18 18 18 18 18 1							
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9 255°58.94 266°58.85 · · 9.77 139°6.98 · · 32.42 185°49.14 · · 39.06 267°48.88 · · 11.11 10 271°1.41 281°59.30 8.59 154°10.49 32.60 200°51.73 39.05 282°51.11 11.01 11 286°3.87 296°59.75 7.41 169°13.99 32.78 215°54.33 39.04 297°53.35 10.91 12 301°6.33 312°0.19 S04°6.23 184°17.50 N25°32.96 230°56.92 N21°39.04 312°55.58 S07°10.81 13 316°8.80 327°0.64 5.05 199°21.01 33.14 245°59.51 39.03 327°57.82 10.71 14 331°11.26 342°1.10 3.87 214°24.51 33.31 261°2.10 39.02 343°0.05 10.61 15 346°13.73 357°1.55 · · 2.69 229°28.02 · · 33.49 276°4.69 · · 39.01 358°2.29 · · 10.51 16 1°16.19 12°2.00 1.51 244°31.52 33.67 291°7.28 39.01 13°4.52 10.41 17 16°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 18 31°21.12 42°2.91 S03°59.15 274°38.53 N25°34.02 321°12.46 N21°38.99 43°8.99 S07°10.21 19 46°23.58 57°3.37 57.97 289°42.03 34.19 336°15.05 38.99 58°11.23 10.11 20 61°26.05 72°3.83 56.79 304°45.53 34.37 351°17.63 38.99 78°11.23 10.11 21 76°28.51 87°4.28 · · 55.61 319°49.04 · · 34.54 6°20.22 · · 38.97 88°15.69 · · 9.91 22 91°30.97 102°4.74 54.43 334°52.54 34.71 21°22.81 38.97 103°17.93 9.81 23 106°33.44 117°5.21 53.25 349°56.04 34.89 36°25.40 38.96 118°20.16 9.70							
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11 286°3.87 296°99.75 7.41 169°13.99 32.78 215°54.33 39.04 297°53.35 10.91 12 301°6.33 312°0.19 \$04°6.23 184°17.50 N25°32.96 230°56.92 N21°39.04 312°55.58 \$07°10.81 13 316°8.80 327°0.64 5.05 199°21.01 33.14 245°59.51 39.03 327°57.82 10.71 14 331°11.26 342°1.10 3.87 214°24.51 33.31 261°2.10 39.02 343°0.05 10.61 15 346°13.73 357°1.55 ··· 2.69 229°28.02 ··· 33.49 276°4.69 ··· 39.01 358°2.29 ··· 10.51 16 1°16.19 12°2.00 1.51 244°31.52 33.67 291°7.28 39.01 13°4.52 10.41 17 16°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 18 31°21.12 42°2.91 \$03°59.15 274°38.53 N25°34.02 321°12.46 N21°38.99 43°8.99 \$07°10.21 19 46°23.58 57°3.37 57.97 289°42.03 34.19 336°15.05 38.99 58°11.23 10.11 20 61°26.05 72°3.83 56.79 304°45.53 34.37 351°17.63 38.98 73°13.46 10.01 21 76°28.51 87°4.28 ··· 55.61 319°49.04 ··· 34.54 6°20.22 ··· 38.97 88°15.69 ··· 9.91 22 91°30.97 102°4.74 54.43 334°52.54 34.71 21°22.81 38.97 103°17.93 9.81 23 106°33.44 117°5.21 53.25 349°56.04 34.89 36°25.40 38.96 118°20.16 9.70  Mars 242°33.37 23:46 Jupiter 289°45.78 20:39 Saturn 11°57.42 15:11  Mars 242°33.37 23:46 Jupiter 289°45.78 20:39 Saturn 11°57.42 15:11  Jan 21 Tue SHA Mer.pass Ner.pass Ner.pass Ner.pass Ner.pass Ner.pass Saturn 11°57.42 15:11  Jan 21 Tue SHA Mer.pass Ner.pass Ner.pass Ner.pass Ner.pass Saturn 11°57.42 15:11  Jan 21 Tue SHA Mer.pass Ner.pass Ner.pas		271°1.41	281°59.30 8.59	154°10.49 32.60	200°51.73 39.05	282°51.11 11.01	
12 301°6.33 312°0.19 504°6.23 184°17.30 N25°32.96 230°56.92 N21°39.04 312°55.88 S07°10.81 13 316°8.80 327°0.64 5.05 199°21.01 33.14 245°59.51 39.03 327°57.82 10.71 14 331°11.26 342°1.10 3.87 214°24.51 33.31 261°2.10 39.02 343°0.05 10.61 15 346°13.73 357°1.55 ··· 2.69 229°28.02 ··· 33.49 276°4.69 ··· 39.01 358°2.29 ··· 10.51 16 19 12°2.00 1.51 244°31.52 33.67 291°7.28 39.01 13°4.52 10.41 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.13 15:12 10°18 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.13 15:12 10°18							
14 331°11.26 342°1.10 3.87 214°24.51 33.31 261°2.10 39.02 343°0.05 10.61 15 346°13.73 357°1.55 ··· 2.69 229°28.02 ··· 33.49 276°4.69 ··· 39.01 358°2.29 ··· 10.51 16 1°16.19 12°2.00 1.51 244°31.52 33.67 291°7.28 39.01 13°4.52 10.41 17 16°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 18 31°21.12 42°2.91 S03°59.15 274°38.53 N25°34.02 321°12.46 N21°38.99 43°8.99 S07°10.21 19 46°23.58 57°3.37 57.97 289°42.03 34.19 336°15.05 38.99 58°11.23 10.11 20 61°26.05 72°3.83 56.79 304°45.53 34.37 351°17.63 38.99 58°11.23 10.11 21 76°28.51 87°4.28 ·· 55.61 319°49.04 ·· 34.54 6°20.22 ·· 38.97 88°15.69 ·· 9.91 22 91°30.97 102°4.74 54.43 334°52.54 34.71 21°22.81 38.97 103°17.93 9.81 23 106°33.44 117°5.21 53.25 349°56.04 34.89 36°25.40 38.96 118°20.16 9.70    Saturn 11°5/.42 15:11     Jan 21 Tue SHA   Mer.pass     Venus 11°18.13 15:12     Mars 242°58.63 23:40     Jupiter 289°49.03 20:35     Saturn 11°51.99 15:08     Horizontal parallax     Venus: 0.2     Mars: 0.2							
15 346°13.73 357°1.55 ··· 2.69 229°28.02 ··· 33.49 276°4.69 ··· 39.01 358°2.29 ··· 10.51 1 2°2.00 1.51 244°31.52 33.67 291°7.28 39.01 13°4.52 10.41 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.65 27°2.45 04°0.33 259°35.02 33.84 306°9.87 39.00 28°6.76 10.31 10°18.75 242°58.63 23:40 10°19 46°23.58 57°3.37 57.97 289°42.03 34.19 336°15.05 38.99 58°11.23 10.11 10°19 1							Saturn 11°57.42 15:11
16       1°16.19       12°2.00       1.51       244°31.52       33.67       291°7.28       39.01       13°4.52       10.41       Venus       11°18.13       15:12         17       16°18.65       27°2.45       04°0.33       259°35.02       33.84       306°9.87       39.00       28°6.76       10.31       Mars       242°58.63       23:40         18       31°21.12       42°2.91       S03°59.15       274°38.53       N25°34.02       321°12.46       N21°38.99       43°8.99       S07°10.21       Jupiter       289°49.03       20:35         19       46°23.58       57°3.37       57.97       289°42.03       34.19       336°15.05       38.99       58°11.23       10.11       5aturn       11°51.99       15:08         20       61°26.05       72°3.83       56.79       304°45.53       34.37       351°17.63       38.98       73°13.46       10.01 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>Jan 21 Tue SHA Mer.pass</td></td<>							Jan 21 Tue SHA Mer.pass
18  31°21.12						13°4.52 10.41	Venus 11°18.13 15:12
19 46°23.58 57°3.37 57.97 289°42.03 34.19 336°15.05 38.99 58°11.23 10.11 20 61°26.05 72°3.83 56.79 304°45.53 34.37 351°17.63 38.98 73°13.46 10.01 21 76°28.51 87°4.28 · 55.61 319°49.04 · 34.54 6°20.22 · 38.97 88°15.69 · 9.91 22 91°30.97 102°4.74 54.43 334°52.54 34.71 21°22.81 38.97 103°17.93 9.81 23 106°33.44 117°5.21 53.25 349°56.04 34.89 36°25.40 38.96 118°20.16 9.70 Mars: 0.2							
20 61°26.05 72°3.83 56.79 304°45.53 34.37 351°17.63 38.98 73°13.46 10.01 21 76°28.51 87°4.28 · · 55.61 319°49.04 · · 34.54 6°20.22 · · 38.97 88°15.69 · · 9.91 22 91°30.97 102°4.74 54.43 334°52.54 34.71 21°22.81 38.97 103°17.93 9.81 23 106°33.44 117°5.21 53.25 349°56.04 34.89 36°25.40 38.96 118°20.16 9.70  Horizontal parallax Venus: 0.2 Mars: 0.2							
21       76°28.51       87°4.28       • 55.61       319°49.04       • 34.54       6°20.22       • 38.97       88°15.69       • 9.91       Horizontal parallax         22       91°30.97       102°4.74       54.43       334°52.54       34.71       21°22.81       38.97       103°17.93       9.81       Venus:       0.2         23       106°33.44       117°5.21       53.25       349°56.04       34.89       36°25.40       38.96       118°20.16       9.70       Mars:       0.2							Saturn 11 51.99 15:08
23 106°33.44 117°5.21 53.25 349°56.04 34.89 36°25.40 38.96 118°20.16 9.70 Mars: 0.2	21	$76^{\circ}28.51$	87°4.28 · · 55.61	319°49.04 · · 34.54	6°20.22 · · 38.97	88°15.69 · · 9.91	
25 100 55.11 111 5.21 55.25 515 50.01 51.05 50.50 110 20.10 51.05							
Mer.pass. 15:55 $\nu 0.4' \ d$ -1.2' m-4.64 $\nu 3.5' \ d$ 0.2' m-1.36 $\nu 2.6' \ d$ -0.0' m-2.61 $\nu 2.2' \ d$ -0.1' m1.10	23	106°33.44					iviars: U.Z
	Mer.p	pass. 15:55	ν0.4' d-1.2' m-4.64	ν3.5′ d0.2′ m-1.36	ν2.6′ d-0.0′ m-2.61	ν2.2′ d-0.1′ m1.10	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°20.66	\$20° 19.63	$300^{\circ}14.13$	17.0'	N00°46.71	-14.4'	54.6'
1	192°20.47	19.11	314°50.14	17.0'	00°32.33	-14.4'	54.6'
2	207°20.28 222°20.09	18.58 •• 18.05	329°26.18 344°2.24	17.1' 17.1'	00°17.96 N00°3.60	-14.4' -14.4'	54.6' 54.5'
4	237°19.90	17.52	358° 38.31	17.1'	S00° 10.76	14.3	54.5'
5	252°19.71	17.00	$13^{\circ}14.39$	17.1'	$00^{\circ}25.11$	14.3'	54.5'
6	267°19.52 282°19.33	\$20° 16.47	27°50.49	17.1'	500°39.44	14.3'	54.5'
7 8	282°19.33 297°19.15	15.94 15.41	42°26.60 57°2.73	17.1' 17.1'	00°53.77 01°8.09	14.3' 14.3'	54.5' 54.5'
9	312°18.96	• • 14.88	71°38.86	17.1'	01°22.39	14.3'	54.5'
10	327°18.77	14.34	86° 15.00	17.2'	01°36.68	14.3'	54.4'
11 12	342°18.58 357°18.39	13.81 \$20°13.28	100°51.15 115°27.31	17.2' 17.2'	01°50.96 \$02°5.23	14.3' 14.3'	54.4' 54.4'
13	12°18.21	12.74	130°3.47	17.2'	02° 19.48	14.2'	54.4
14	27°18.02	12.21	144°39.64	17.2'	02°33.72	14.2'	54.4'
15	42°17.83	• • 11.67	159° 15.81	17.2'	02°47.94	14.2	54.4'
16 17	57°17.65 72°17.46	11.14 10.60	173°51.98 188°28.15	17.2' 17.2'	03°2.14 03°16.33	14.2' 14.2'	54.4' 54.4'
18	87°17.28	\$20°10.06	203°4.33	17.2'	S03°30.50	14.2'	54.4'
19	102°17.09	9.53	217°40.50	17.2'	03°44.65	14.1'	54.3'
20	117°16.91	8.99	232° 16.67 246° 52.83	17.2'	03°58.78	14.1'	54.3'
21 22	132°16.72 147°16.54	· · 8.45 7.91	246°52.83 261°28.99	17.2' 17.2'	04°12.89 04°26.98	14.1' 14.1'	54.3' 54.3'
23	162°16.36	7.37	276°5.14	17.2 17.1'	04° 20.98	14.1	54.3'
	SD = 16.2'	d = -0.5'		SI	D = 14.9'		
Mon	GHA	Dec	GHA	ν 17.1'	Dec	d 14.0'	HP
0 1	177°16.17 192°15.99	\$20°6.83 6.28	290°41.29 305°17.42	17.1' 17.1'	\$04°55.10 05°9.13	14.0' 14.0'	54.3' 54.3'
2	207°15.81	5.74	319°53.55	17.1	05°23.13	14.0'	54.3'
3	222°15.62	• • 5.20	334°29.67	17.1'	05°37.11	14.0'	54.3'
4	237°15.44	4.66	349°5.77 3°41.86	17.1'	05°51.06 06°5.00	13.9'	54.3'
5 6	252°15.26 267°15.08	4.11 \$20°3.57	3°41.86 18°17.94	17.1' 17.1'	506° 18.90	13.9' 13.9'	54.3' 54.3'
7	282°14.90	3.02	32°54.00	17.0'	06° 32.78	13.9'	54.2'
8	297°14.72	2.47	47° 30.05	17.0'	06°46.63	13.8'	54.2'
9 10	312°14.54 327°14.36	· · 1.93 1.38	62°6.07 76°42.08	17.0' 17.0'	07°0.45 07°14.25	13.8' 13.8'	54.2' 54.2'
11	342°14.18	0.83	91° 18.07	17.0'	07 14.25 07°28.02	13.7	54.2'
12	357°14.00	<b>S</b> 20°0.28	105°54.04	16.9'	S07°41.75	13.7'	54.2'
13	12°13.82	19°59.73	120°29.98	16.9'	07°55.46	13.7'	54.2'
14 15	27°13.64 42°13.46	59.18 •• 58.63	135°5.90 149°41.80	16.9' 16.9'	08°9.14 08°22.78	13.6' 13.6'	54.2' 54.2'
16	57°13.28	58.08	164° 17.67	16.8'	08°36.39	13.6'	54.2'
17	72°13.10	57.53	$178^{\circ}53.51$	16.8'	$08^{\circ}49.97$	13.5'	54.2'
18	87°12.93 102°12.75	\$19°56.97	193°29.33 208°5.12	16.8'	\$09°3.52 09°17.03	13.5'	54.2' 54.2'
19 20	102 12.75 117°12.57	56.42 55.87	200 5.12 222°40.87	16.8' 16.7'	09 17.03 09°30.51	13.5' 13.4'	54.2'
21	132°12.40	• • 55.31	237° 16.60	16.7'	09°43.95	13.4	54.2'
22	147°12.22	54.75	251°52.29	16.7'	09°57.35	13.4'	54.2'
23	162°12.04	54.20	266°27.95	16.6'	10° 10.72	13.3'	54.2'
	SD = 16.2'	d = -0.5'		SI	D = 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	$177^{\circ}11.87$	S19°53.64	281°3.57	16.6'	<b>S</b> 10°24.05	13.3'	54.2'
1	192°11.69	53.08	295°39.16 310°14.71	16.6'	10°37.34	13.3'	54.2'
2	207°11.52 222°11.34	52.53 •• 51.97	310° 14.71 324° 50.23	16.5' 16.5'	10°50.59 11°3.81	13.2' 13.2'	54.2' 54.2'
4	237°11.17	51.41	339°25.70	16.4	11°16.98	13.1'	54.2'
5	252°10.99	50.85	354°1.13	16.4	11°30.11	13.1'	54.2'
6 7	267°10.82 282°10.65	\$19°50.29 49.73	8° 36.53 23° 11.88	16.3' 16.3'	\$11°43.20 11°56.25	13.0' 13.0'	54.2' 54.2'
8	282°10.65 297°10.47	49.73 49.16	23°11.88 37°47.18	16.3'	11°56.25 12°9.25	13.0'	54.2' 54.2'
9	312°10.30	• • 48.60	$52^{\circ}22.44$	16.2'	12°22.21	12.9'	54.2'
10	327°10.13	48.04	66° 57.66	16.2'	12°35.13	12.9'	54.2'
11 12	342°9.96 357°9.78	47.47 \$19°46.91	81°32.83 96°7.95	16.1' 16.1'	12°48.00 \$13°0.82	12.8' 12.8'	54.2' 54.2'
13	12°9.61	46.34	90 7.95 110°43.02	16.1	13° 13.60	12.7	54.2'
14	27°9.44	45.78	$125^{\circ}18.04$	16.0'	13°26.32	12.7'	54.2'
15	42°9.27	• • 45.21	139°53.02	15.9'	13°39.01	12.6'	54.2'
16 17	57°9.10 72°8.93	44.64 44.08	154°27.93 169°2.80	15.9' 15.8'	13°51.64 14°4.22	12.6' 12.5'	54.2' 54.2'
18	87°8.76	\$19°43.51	183° 37.61	15.8'	\$14° 16.75	12.5'	54.2'
19	102°8.59	42.94	198° 12.37	15.7'	14°29.23	12.4'	54.2'
20	117°8.42 132°8.25	42.37	212° 47.07 227° 21.71	15.6'	14°41.66 14°54.03	12.4'	54.2' 54.2'
21 22	132°8.25 147°8.08	· · 41.80 41.23	227°21.71 241°56.30	15.6' 15.5'	14°54.03 15°6.35	12.3' 12.3'	54.2' 54.2'
23	162°7.91	40.66	256° 30.82	15.5'	15° 18.62	12.2'	54.2'
	SD = 16.2'	d = -0.6'		SI	D = 14.8'		

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

Lat.		Moonris	e		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	23:38		01:44	09:54	09:21	08:40
<b>N</b> 70°	23:31		01:25	09:56	09:31	09:01
68°	23:25		01:10	09:58	09:39	09:18
66°	23:20		00:58	10:00	09:46	09:31
64°	23:16		00:48	10:01	09:52	09:42
62°	23:13		00:40	10:02	09:57	09:52
60°	23:10		00:32	10:03	10:02	10:00
N 58°	23:07		00:26	10:04	10:06	10:08
56°	23:04		00:21	10:05	10:09	10:14
54°	23:02		00:16	10:06	10:12	10:20
52°	23:00		00:11	10:06	10:15	10:25
50°	22:59		00:07	10:07	10:18	10:30
45°	22:55	23:59		10:08	10:24	10:41
N 40°	22:52	23:51		10:09	10:29	10:49
35°	22:49	23:45		10:10	10:33	10:57
30°	22:46	23:40		10:11	10:37	11:03
20° N 10°	22:42	23:31	•• ••	10:13	10:43	11:15
0°	22:39 22:35	23:22 23:15	23:56	10:14 10:15	10:49 10:54	11:25 11:34
_						
S 10°	22:32	23:07	23:44	10:16	11:00	11:44
20° 30°	22:29	23:00	23:32	10:18	11:06	11:54
30°	22:25 22:22	22:51	23:18	10:19	11:12	12:06
40°	22:22	22:45 22:40	23:10 23:01	10:20 10:21	11:16 11:20	12:13 12:21
45°	22:20	22:40	22:51	10:21	11:25	12:21
<b>S</b> 50°	22:13	22:25	22:38	10:23	11:32	12:41
52° 54°	22:12 22:10	22:21 22:17	22:32 22:26	10:24 10:24	11:34 11:38	12:46 12:52
56°	22:10	22:17	22:20	10:24	11:38	12:52
58°	22:08	22:13	22:19	10:25	11:41	12:58
<b>S</b> 60°	22:00	22:06	22:11	10:20	11:45	13:05
3 00	22.04	22.02	22.02	10.27	11.49	15.15

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-58%	
19	10:37	10:46	12:11	04:06	16:25		
20	10:55	11:04	12:11	04:45	17:05		
21	11:13	11:21	12:11	05:25	17:45		

h	Aries	Ven	us	M	ars	Jup	oiter	Sat	urn		Stars	
\Mod	GHA	GHA		GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
Wed 0	121°35.90		<b>Dec</b> \$03°52.07	4°59.54	N25°35.06	51°27.98	N21°38.95	133°22.40	507° 9.60		ЗПА	
1	136° 38.37	132 5.07 147°6.13	50.89	20°3.04	35.23	66°30.57	38.95	148°24.63	9.50	Alpheratz	357°34.92	29°13.81
2	151° 40.83	162°6.60	49.71	35° 6.54	35.41	81°33.16	38.94	163°26.87	9.40	Ankaa	353°7.27	-42°10.43
3	166° 43.29	177°7.06	• • 48.53	50°10.04	• • 35.58	96°35.74	• • 38.94	178°29.10	9.30	Schedar	349°31.23	56°40.72
4	181° 45.76	192°7.53	47.36	65°13.54	35.75	111°38.33	38.93	193°31.33	9.20	Diphda	348°47.37	-17°51.10
5	196° 48.22	207°8.00	46.18	80°17.03	35.92	126°40.91	38.92	208°33.57	9.10	Achernar	335°20.19	-57°6.86
6	211°50.69		S03°45.00	95°20.53	N25°36.09	141°43.50	N21°38.92	223°35.80	S07°9.00	Hamal	327°51.15	23°34.94
7	226°53.15	237°8.94	43.82	110°24.03	36.26	156°46.08	38.91	238°38.03	8.90	Polaris	313°52.79	89°22.51
8	241°55.62	252°9.41	42.64	125°27.52	36.43	171°48.67	38.90	253°40.27	8.80	Acamar	315°11.62	-40°12.48
9	256° 58.08	267°9.89	• • 41.46	140°31.02	• • 36.60	186°51.25	• • 38.90	268°42.50	• • 8.70	Menkar	314°6.02	4°11.25
10	272°0.54	282°10.36	40.28	155°34.51	36.77	201°53.83	38.89	283°44.73	8.60	Mirfak	308°28.02 290°39.36	49°57.21
11	287°3.01	297°10.84	39.11	170°38.01	36.94	216°56.42	38.89	298°46.97	8.49	Aldebaran	290 39.30 281°3.57	16°33.60 -8°10.43
12	302°5.47	312°11.32	503°37.93	185°41.50	N25°37.11	231°59.00	N21°38.88	313°49.20	507°8.39	Rigel Capella	280°21.47	-6 10.43 46°1.50
13	317°7.94	$327^{\circ}11.79$	36.75	200°45.00	37.28	$247^{\circ}1.58$	38.87	328°51.43	8.29	Bellatrix	278°22.57	6°22.32
14	332°10.40	342°12.27	35.57	215°48.49	37.44	262°4.16	38.87	343°53.67	8.19	Elnath	278° 1.52	28°37.76
15	347° 12.86	357° 12.76	• • 34.39	230°51.98	• • 37.61	277° 6.74	• • 38.86	358°55.90	• • 8.09	Alnilam	275°37.42	-1°11.20
16	2°15.33	12°13.24	33.22	245°55.47	37.78	292° 9.32	38.86	13°58.13	7.99	Betelgeuse	270°51.75	7°24.68
17	17° 17.79	27°13.72	32.04	260°58.96	37.94	307°11.91	38.85	29°0.36	7.89	Canopus	263°51.88	-52°42.62
18	32°20.26		503°30.86	276°2.45	N25°38.11	322°14.49	N21°38.85	44°2.60	S07°7.79	Sirius	258°25.88	-16°45.10
19	47°22.72	57°14.69	29.68	291°5.94	38.28	337°17.07	38.84	59°4.83	7.69	Adhara	255° 5.47	-29°0.43
20	62°25.18	72°15.18	28.51	306° 9.43	38.44	352°19.65	38.83	74°7.06	7.58	Procyon	244°50.46	5°9.59
21	77°27.65	87° 15.67	• • 27.33	321°12.92	• • 38.61	7°22.22	• • 38.83	89°9.29	• • 7.48	Pollux	243°16.88	27°57.89
22	92°30.11	102°16.16	26.15	336°16.41	38.77	22°24.80	38.82	104°11.53	7.38	Avior	234°14.09	-59°35.34
23	107°32.58	117°16.65	24.97	351°19.90	38.94	37°27.38	38.82	119°13.76	7.28	Suhail	222°45.86	-43°31.97
Mer.	pass. 15:51	$\nu$ 0.5′ d-1.2	2′ m-4.65	$\nu$ 3.5′ d0.	2′ m-1.34	$\nu 2.6' \ d-0$	.0′ m-2.60	$\nu 2.2' \ d-0.0$	1' m1.10	Miaplacidus	221°37.39	-69°49.08
	<u> </u>			-		-		-		Alphard	$217^{\circ}47.40$	-8°46.07
ть	CHA	CHA	D	CIIA	D	CIIA	D	CIIA	D	Regulus	207°34.11	11°50.58
Thu	GHA	GHA	Dec	GHA	<b>Dec</b> N25°39.10	<b>GHA</b> 52°29.96	Dec	GHA	Dec	Dubhe	193°40.43	61°36.70
0 1	122°35.04 137°37.51	132° 17.14 147° 17.63	\$03°23.80 22.62	6°23.38 21°26.87	39.26	52 29.96 67°32.54	N21°38.81 38.81	134°15.99 149°18.22	\$07°7.18 7.08	Denebola	182°24.71	14°25.77
2	152° 39.97	162°18.13	21.44	36°30.36	39.43	82°35.11	38.80	164°20.45	6.98	Gienah	175°43.40	-17°40.85
3	167° 42.43	102 18.13 177°18.62	. 20.27	50°33.84	39.59	97°37.69	• • 38.80	179°22.68	• • 6.87		172°59.80	-63°14.04
4	182° 44.90	192°19.12	19.09	66°37.33	39.75	112°40.27	38.79	194°24.92	6.77	1	171°51.40	-57°15.00
5	197° 47.36	207° 19.62	17.91	81°40.81	39.91	127°42.84	38.79	209°27.15	6.67	Alioth	166°12.73	55°49.10
6	212° 49.83		S03°16.74	96°44.29	N25°40.07	142°45.42	N21°38.78	224°29.38	S07°6.57	Spica	158°22.21	-11°17.55
7	227°52.29	237°20.62	15.56	111°47.77	40.24	157°48.00	38.78	239°31.61	6.47	Alkaid	152°51.92	49°10.95
8	242°54.75	252°21.12	14.39	126°51.26	40.40	172°50.57	38.77	254°33.84	6.37	Hadar	148°35.99	-60°29.38
9	257° 57.22	267°21.62	· · 13.21	141°54.74	• • 40.56	187°53.15	• • 38.77	269°36.07	6.26		147°57.59	-36°29.47
10	272°59.68	282°22.12	12.03	156°58.22	40.72	202°55.72	38.76	284°38.30	6.16	Arcturus	145°47.89	19°2.90
11	288°2.15	297°22.63	10.86	172° 1.70	40.88	217°58.29	38.76	299°40.53	6.06	Rigil Kent.	139°40.36	-60°56.09
12	303°4.61	312°23.14	S03° 9.68	187°5.18	N25°41.04	233° 0.87	N21°38.75	314°42.77	<b>S</b> 07°5.96	Kochab Zuben'ubi	137°20.00 136°56.05	74°2.74 -16°8.75
13	318°7.08	327°23.64	8.51	202°8.66	41.19	248°3.44	38.75	329°45.00	5.86	Alphecca	126° 3.85	26°37.57
14	333°9.54	$342^{\circ}24.15$	7.33	217°12.13	41.35	$263^{\circ}6.01$	38.74	344°47.23	5.75	Antares	112° 16.01	-26°29.21
15	348°12.00	357°24.66	• • 6.16	232°15.61	• • 41.51	278° 8.59	• • 38.74	359°49.46	• • 5.65	Antares	107° 10.61	-69°4.13
16	3° 14.47	$12^{\circ}25.18$	4.98	247°19.09	41.67	293°11.16	38.73	14°51.69	5.55	Sabik	102°2.99	-15°45.38
17	18° 16.93	27°25.69	3.81	262°22.56	41.83	308°13.73	38.73	29°53.92	5.45	Shaula	96°10.65	-37°7.26
18	33° 19.40	42°26.20	S03°2.63	277°26.04	N25°41.98	323°16.30	N21°38.72	44°56.15	S07°5.35	Rasalhague	95°58.78	12°32.35
19	48°21.86	57°26.72	1.46	292°29.51	42.14	338°18.87	38.72	59°58.38	5.24	Eltanin	90°42.62	51°28.88
20	63°24.32	72°27.23	03°0.28	307°32.99	42.29	353°21.44	38.71	75°0.61	5.14	Kaus Aust.	83°32.83	-34°22.35
21	78° 26.79	87°27.75	02°59.11	322°36.46	• • 42.45	8°24.01	• • 38.71	90°2.84	• • 5.04	Vega	80°33.60	38°48.22
22	93°29.25	102°28.27	57.94	337°39.94	42.61	23°26.58	38.70	105°5.07	4.94	Nunki	75°48.06	-26°15.97
23	108°31.72	117°28.79	56.76	352°43.41	42.76	38°29.15	38.70	120°7.30	4.83	Altair	62°0.26	8°55.97
Mer.	pass. 15:47	$\nu$ 0.5′ d-1.2	2′ m-4.66	$\nu$ 3.5′ d0.	2′ m-1.32	$\nu 2.6' \ d-0$	.0′ m-2.59	$\nu 2.2' \ d-0.0$	1' m1.10	Peacock	53° 6.25	-56°39.33
										Deneb	49°26.26	45°22.13
E	C II A	CHA	Dec	CHV	Des	CHA	Des	CHA	Des	Enif	33°39.07	9°59.33
Fri 0	<b>GHA</b> 123°34.18	<b>GHA</b> 132°29.31	Dec \$02°55 50	<b>GHA</b> 7°46.88	<b>Dec</b> N25°42.91	<b>GHA</b> 53°31.72	<b>Dec</b> N21°38.70	<b>GHA</b> 135° 9.53	<b>Dec</b> \$07°4.73	Al Na'ir	27°33.26	-46°50.56
1	138° 36.65	132 29.31 147°29.84	54.41	22°50.35	43.07	68°34.29	38.69	150°11.76	4.63	Fomalhaut	15°14.74	-29°29.55
2	153° 39.11	162°30.36	53.24	37°53.82	43.07	83°36.86	38.69	165°13.99	4.03	Scheat	13°45.44	28°13.17
3	168° 41.57	177°30.89	• • 52.07	52°57.29	• • 43.38	98°39.43	• • 38.68	180°16.22	. 4.42	Markab	13°30.10	15°20.40
4	183° 44.04	192°31.41	50.89	68° 0.76	43.53	113°42.00	38.68	195°18.45	4.32	Jan 22 Wed	SHA	Mer.pass
5	198° 46.50	207°31.94	49.72	83°4.22	43.68	128°44.56	38.68	210°20.68	4.22	Venus	10°29.77	15:11
6	213° 48.97	222°32.47			N25°43.83	143°47.13	N21°38.67	225°22.91	S07°4.12	Mars		23:35
7	228°51.43	237°33.00	47.37	113°11.16	43.99	158°49.70	38.67	240°25.13	4.01	Jupiter		20:31
8	243°53.89	252°33.53	46.20	128°14.62	44.14	173°52.26	38.66	255°27.36	3.91	Saturn	$11^{\circ}46.49$	15:04
9	258°56.36	267°34.06	• • 45.03	143°18.09	• • 44.29	188°54.83	• • 38.66	270°29.59	• • 3.81	lan 22 Th	CHV	Me:
10	273°58.82	282°34.60	43.86	158°21.55	44.44	203°57.39	38.66	285°31.82	3.71	Jan 23 Thu Venus	<b>SHA</b> 9°42.10	Mer.pass 15:10
11	289°1.29	297°35.13	42.68	173°25.02	44.59	218°59.96	38.65	300°34.05	3.60		9 42.10 243°48.34	23:29
12	304°3.75	312°35.67		188°28.48	N25°44.74	234° 2.52	N21°38.65	315°36.28	S07°3.50	Jupiter		20:26
13	319°6.22	327°36.21	40.34	203°31.94	44.89	249°5.09	38.64	330°38.51	3.40	Saturn	11°40.95	15:01
14	334°8.68	342°36.75	39.17	218°35.40	45.04	264°7.65	38.64	345°40.74	3.30			13.01
15	349°11.14	357°37.29	• • 38.00	233°38.86	• • 45.18	279°10.22	• 38.64	0°42.96	• • 3.19	Jan 24 Fri	SHA	Mer.pass
16	4° 13.61	12°37.83	36.83	248°42.32	45.33	294°12.78	38.63	15°45.19	3.09	Venus	$8^{\circ}55.13$	15:10
17	19°16.07	27°38.37	35.65	263°45.78	45.48	309°15.34	38.63	30°47.42	2.99		244°12.70	23:23
18	34° 18.54	42°38.92		278°49.24	N25°45.63	324°17.90	N21°38.63	45°49.65	S07°2.88		289°57.54	20:22
19	49°21.00	57°39.46	33.31	293°52.70	45.77	339°20.47	38.62	60°51.88	2.78	Saturn	11°35.35	14:57
20	64°23.46	72°40.01	32.14	308°56.15	45.92	354°23.03	38.62	75°54.11	2.68	Horizo	ıtal parallax	
21	79°25.93		30.97	323°59.61	· · 46.07	9°25.59	· · 38.62	90°56.33	• • 2.57	11011201	Venus:	0.3
22	94°28.39	102°41.11	29.80	339°3.07	46.21 46.26	24°28.15	38.61	105°58.56	2.47		Mars:	0.3
23	109°30.86	117°41.66	28.63	354° 6.52	46.36	39°30.71	38.61	121°0.79	2.37		141013.	0.2
Mer.	pass. 15:43	$\nu$ 0.5′ $d$ -1.2	2′ m-4.67	$\nu$ 3.5′ d0.	2′ m-1.29	$\nu$ 2.6′ d-0	.0′ m-2.58	$\nu$ 2.2′ d-0.	1'  m1.10			

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°7.75	S19°40.08	271°5.29	15.4'	S15°30.83	12.2'	54.2'
1 2	192°7.58 207°7.41	39.51 38.94	285°39.69 300°14.03	15.3' 15.3'	15°42.98 15°55.08	12.1' 12.0'	54.2' 54.2'
3	207 7.41 222°7.24	38.36	314°48.31	15.3'	16°7.12	12.0'	54.2'
4	237°7.08	37.79	329°22.52	15.1'	$16^{\circ}19.10$	11.9'	54.3'
5	252°6.91	37.21	343°56.67	15.1'	16°31.02	11.9'	54.3'
6 7	267° 6.75 282° 6.58	\$19° 36.64 36.06	358°30.75 13°4.77	15.0' 14.9'	\$16°42.88 16°54.68	11.8' 11.7'	54.3' 54.3'
8	297°6.41	35.48	27°38.71	14.9'	17°6.42	11.7'	54.3'
9	312°6.25	• • 34.91	42°12.59	14.8'	17° 18.09	11.6'	54.3'
10 11	327°6.08 342°5.92	34.33 33.75	56°46.40 71°20.14	14.7' 14.7'	17°29.70 17°41.25	11.5' 11.5'	54.3' 54.3'
12	357°5.76	53.75 S19°33.17	85°53.80	14.7	\$17°52.73	11.5	54.3
13	12°5.59	32.59	100°27.39	14.5'	18°4.14	11.3'	54.3'
14	27°5.43	32.01	115°0.91	14.4'	18° 15.49	11.3'	54.3'
15 16	42°5.27 57°5.10	· · 31.42 30.84	129°34.36 144°7.73	14.4' 14.3'	18° 26.77 18° 37.98	11.2' 11.1'	54.4' 54.4'
17	72°4.94	30.26	158°41.02	14.2'	18°49.11	11.1'	54.4'
18	87°4.78	S19°29.68	173°14.23	14.1'	S19°0.18	11.0'	54.4'
19 20	102°4.62 117°4.46	29.09 28.51	187°47.37 202°20.43	14.1' 14.0'	19°11.18 19°22.10	10.9' 10.8'	54.4' 54.4'
21	132°4.29	27.92	216°53.41	13.9'	19° 22.10 19° 32.95	10.8	54.4'
22	147°4.13	27.33	231°26.31	13.8'	19°43.73	10.7'	54.4'
23	162°3.97	26.75	245°59.13	13.7'	19°54.42	10.6'	54.4'
	SD = 16.2'	d = -0.6'		SE	0 = 14.8'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	177°3.81	S19°26.16	260°31.86	13.7'	\$20°5.05	10.5'	54.5'
1	192°3.65	25.57	275°4.52 289°37.09	13.6'	20° 15.59 20° 26.06	10.5'	54.5'
2 3	207°3.49 222°3.33	24.98 •• 24.39	289°37.09 304°9.58	13.5' 13.4'	20°26.06 20°36.44	10.4' 10.3'	54.5' 54.5'
4	237°3.18	23.80	318°41.98	13.4	20° 46.75	10.3	54.5'
5	252°3.02	23.21	333°14.30	13.2'	20°56.97	10.1'	54.5'
6	267°2.86 282°2.70	S19°22.62	347°46.53 2°18.67	13.1'	\$21°7.11 21°17.17	10.1'	54.5'
7 8	282°2.70 297°2.54	22.03 21.44	16°50.73	13.1' 13.0'	21° 17.17 21° 27.14	10.0' 9.9'	54.6' 54.6'
9	312°2.39	• • 20.85	31°22.70	12.9'	21°37.03	9.8'	54.6'
10	327°2.23	20.25	45°54.58	12.8'	21°46.83	9.7'	54.6'
11 12	342°2.07 357°1.92	19.66 \$19°19.06	60°26.37 74°58.07	12.7' 12.6'	21°56.54 \$22°6.16	9.6' 9.5'	54.6' 54.6'
13	12°1.76	18.47	89°29.69	12.5'	22°15.69	9.4'	54.7'
14	27°1.61	17.87	104°1.21	12.4'	22°25.13	9.3'	54.7'
15 16	42°1.45 57°1.30	· · 17.27 16.68	118°32.64 133°3.98	12.3' 12.2'	22°34.48 22°43.74	9.3' 9.2'	54.7' 54.7'
17	72°1.14	16.08	147°35.23	12.2'	22°52.90	9.2	54.7'
18	87°0.99	S19° 15.48	162°6.38	12.1'	\$23°1.97	9.0'	54.7'
19	102°0.83 117°0.68	14.88	176°37.45 191°8.42	12.0'	23° 10.94 23° 19.81	8.9' 8.8'	54.8' 54.8'
20 21	117 0.68 132°0.53	14.28 •• 13.68	205°39.29	11.9' 11.8'	23 19.81 23°28.58	8.7'	54.8'
22	147°0.38	13.08	220°10.08	11.7'	23°37.25	8.6'	54.8'
23	162°0.22	12.48	234°40.77	11.6'	23°45.83	8.5'	54.8'
	SD = 16.2'	d = -0.6'		SE	0 = 14.9'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°0.07	\$19°11.88	249°11.36	11.5'	\$23°54.30	8.4'	54.9'
1 2	191°59.92 206°59.77	11.27 10.67	263°41.86 278°12.27	11.4' 11.3'	24°2.66 24°10.92	8.3' 8.2'	54.9' 54.9'
3	221°59.62	•• 10.06	292°42.58	11.2'	24°19.08	8.0'	54.9'
4	236°59.47	9.46	307°12.80	11.1'	24°27.13	7.9'	54.9'
5 6	251°59.32 266°59.16	8.85 \$19°8.25	321°42.92 336°12.95	11.0' 10.9'	24°35.07 \$24°42.90	7.8' 7.7'	55.0' 55.0'
7	281°59.02	7.64	350°42.88	10.8'	24° 50.63	7.6'	55.0'
8	296°58.87	7.03	5°12.71	10.7'	24°58.24	7.5'	55.0'
9 10	311°58.72 326°58.57	· · 6.43 5.82	19°42.46 34°12.10	10.6' 10.6'	25°5.73 25°13.12	7.4' 7.3'	55.0' 55.1'
11	341°58.42	5.82	48°41.65	10.5	25 13.12 25° 20.39	7.3 7.2'	55.1'
12	356°58.27	<b>S</b> 19°4.60	63°11.11	10.4'	S25°27.54	7.0'	55.1'
13	11°58.12 26°57.98	3.99	77°40.47 92°9.74	10.3'	25°34.58 25°41.50	6.9'	55.1'
14 15	26°57.98 41°57.83	3.38 • • 2.77	92°9.74 106°38.92	10.2' 10.1'	25°41.50 25°48.30	6.8' 6.7'	55.2' 55.2'
16	56°57.68	2.15	121°8.00	10.0'	$25^{\circ}54.97$	6.6'	55.2'
17	71°57.54	1.54	135°36.98	9.9'	26°1.53	6.4	55.2'
18 19	86°57.39 101°57.24	\$19°0.93 19°0.31	150°5.87 164°34.67	9.8' 9.7'	\$26°7.96 26°14.27	6.3' 6.2'	55.2' 55.3'
20	101 57.24 116°57.10	19 0.31 18°59.70	179°3.38	9.7 9.6'	26° 14.27 26° 20.46	6.1	55.3'
21	131°56.95	• • 59.09	193°32.00	9.5'	$26^{\circ}26.51$	5.9'	55.3'
22 23	146°56.81 161°56.66	58.47 57.85	208°0.52 222°28.95	9.4' 9.3'	26°32.44 26°38.24	5.8' 5.7'	55.3' 55.4'
23	$\frac{161^{\circ}56.66}{\text{SD} = 16.2'}$		222 28.95			5.7	55.4
	3D = 10.2	d = -0.6'		) SL	0 = 15.0'		

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

Lat.		Moonris	e		Moonset	t
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	04:26			07:24		
N 70°	03:36			08:16		
68°	03:05	05:42		08:48	07:44	
66°	02:43	04:45		09:12	08:41	
64°	02:25	04:12	06:23	09:31	09:15	08:43
62°	02:10	03:48	05:35	09:47	09:40	09:32
60°	01:58	03:29	05:04	10:00	10:00	10:03
N 58°	01:48	03:13	04:42	10:11	10:16	10:27
56°	01:39	03:00	04:23	10:21	10:30	10:46
54°	01:31	02:48	04:07	10:30	10:43	11:02
52°	01:24	02:38	03:54	10:37	10:53	11:15
50°	01:17	02:29	03:42	10:44	11:03	11:27
45°	01:03	02:10	03:18	11:00	11:23	11:53
N 40°	00:52	01:55	02:59	11:12	11:39	12:13
35°	00:43	01:42	02:43	11:23	11:53	12:30
30°	00:34	01:31	02:29	11:32	12:06	12:44
20°	00:20	01:11	02:05	11:49	12:26	13:09
N 10°	00:07	00:55	01:45	12:03	12:45	13:30
0°		00:39	01:27	12:17	13:02	13:51
<b>S</b> 10°		00:24	01:08	12:30	13:19	14:11
20°		80:00	00:48	12:45	13:37	14:32
30°	23:49		00:25	13:01	13:58	14:58
35°	23:39	•• ••	00:12	13:11	14:11	15:12
40°	23:26	23:56	•• ••	13:22	14:25	15:30
45°	23:12	23:38	•• ••	13:35	14:43	15:51
<b>S</b> 50°	22:54	23:16	23:45	13:51	15:04	16:17
52°	22:46	23:05	23:32	13:59	15:14	16:30
54°	22:37	22:53	23:17	14:08	15:26	16:45
56°	22:27	22:39	22:59	14:17	15:39	17:02
58°	22:15	22:23	22:38	14:28	15:55	17:23
<b>S</b> 60°	22:02	22:04	22:10	14:41	16:13	17:50
		_				

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	49-30%	
22	11:29	11:37	12:12	06:06	18:28		
23	11:45	11:52	12:12	06:50	19:14		
24	12:00	12:07	12:12	07:38	20:04		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	124°33.32	132°42.21 <b>S</b> 02°27.46	9°9.97 N25°46.50	54°33.27 N21°38.61	136°3.02 <b>S</b> 07°2.26	Alpheratz 357°34.93 29°13.81
1	139°35.79	147°42.76 26.29	24°13.43 46.65	69°35.83 38.60	151°5.24 2.16	1 '
2	154° 38.25	162°43.32 25.12	39°16.88 46.79	84°38.39 38.60	166°7.47 2.06	Ankaa 353°7.28 -42°10.43 Schedar 349°31.25 56°40.71
3	$169^{\circ}40.71$	177°43.87 · · 23.95	54°20.33 ·· 46.94	99°40.95 · · 38.60	181°9.70 · · 1.95	Diphda 348°47.37 -17°51.10
4	184°43.18	192°44.43 22.78	69°23.78 47.08	114°43.51 38.60	196°11.93 1.85	Achernar 335°20.22 -57°6.86
5	199°45.64	207°44.99 21.61	84°27.23 47.22	129°46.07 38.59	211°14.15 1.75	Hamal 327°51.15 23°34.93
6	214°48.11	222°45.55 \$02°20.44	99°30.68 N25°47.37	144°48.63 N21°38.59	226°16.38 \$07°1.64	Polaris 313°53.98 89°22.51
7	229° 50.57	237°46.11 19.27	114°34.13 47.51	159°51.18 38.59	241°18.61 1.54	Acamar 315°11.64 -40°12.48
8	244°53.03	252°46.67 18.10	129°37.58 47.65	174°53.74 38.58	256°20.83 1.44	Menkar 314°6.02 4°11.25
9	259°55.50	267°47.24 · · 16.93	144°41.02 · · 47.79	189°56.30 · · 38.58	271°23.06 · · 1.33	Mirfak 308°28.03 49°57.21
10 11	274° 57.96 290° 0.43	282°47.80 15.77 297°48.37 14.60	159°44.47 47.93 174°47.91 48.07	204°58.85 38.58 220°1.41 38.58	286°25.29 1.23 301°27.51 1.13	Aldebaran 290°39.36 16°33.60
12	305°2.89	312°48.93 S02°13.43	189°51.36 N25°48.21	235°3.97 N21°38.57	316°29.74 S07°1.02	Rigel 281°3.58 -8°10.44
13	320°5.36	327°49.50 12.26	204°54.80 48.35	250°6.52 38.57	331°31.97 0.92	Capella 280°21.47 46°1.50
14	335°7.82	342°50.07 11.09	219°58.24 48.49	265° 9.08 38.57	346°34.19 0.82	Bellatrix 278°22.57 6°22.31
15	350° 10.28	357°50.64 · · 9.93	235°1.69 · · 48.63	280°11.63 · · 38.57	1°36.42 · · 0.71	Elnath 278°1.52 28°37.76
16	5°12.75	12°51.22 8.76	250° 5.13 48.77	295°14.19 38.56	16°38.65 0.61	Alnilam 275°37.42 -1°11.21
17	$20^{\circ}15.21$	27°51.79 7.59	265°8.57 48.91	310°16.74 38.56	31°40.87 0.50	Betelgeuse 270°51.75 7°24.67
18	35° 17.68	42°52.37 <b>S</b> 02°6.42	280°12.01 N25°49.05	325°19.29 N21°38.56	46°43.10 <b>S</b> 07°0.40	Canopus 263°51.89 -52°42.64 Sirius 258°25.87 -16°45.11
19	50°20.14	57°52.94 5.26	295°15.44 49.18	340°21.85 38.56	61°45.32 0.30	Adhara 255°5.47 -29°0.44
20	65°22.61	72°53.52 4.09	310°18.88 49.32	355°24.40 38.55	76°47.55 0.19	Procyon 244°50.45 5°9.58
21	80°25.07	87°54.10 · · 2.92	325°22.32 · · 49.46	10°26.95 · · 38.55	91°49.78 · · 0.09	Pollux 243°16.87 27°57.89
22	95°27.53	102°54.68 1.76	340°25.75 49.59	25°29.50 38.55	106°52.00 06°59.99	Avior 234°14.08 -59°35.36
23	110°30.00	117°55.26 0.59	355°29.19 49.73	40°32.06 38.55	121°54.23 06°59.88	Suhail 222°45.84 -43°31.99
Mer.	pass. 15:39	ν0.6' d-1.2' m-4.68	ν3.5′ d0.1′ m-1.27	ν2.6' d-0.0' m-2.58	ν2.2' d-0.1' m1.10	Miaplacidus 221°37.38 -69°49.10
						Alphard 217°47.39 -8°46.08
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.09 11°50.57
Sun 0	<b>GHA</b> 125°32.46	132°55.84 S01°59.43	10°32.62 N25°49.87	55°34.61 N21°38.55	136°56.45 S06°59.78	Dubhe 193°40.40 61°36.71
1	125 32.46 140°34.93	147°56.43 58.26	25°36.06 50.00	70°37.16 38.54	151°58.68 59.67	Denebola 182°24.69 14°25.76
2	155°37.39	162°57.01 57.09	40°39.49 50.14	85°39.71 38.54	167°0.90 59.57	Gienah 175°43.37 -17°40.86
3	170°39.85	177°57.60 · · 55.93	55°42.92 · · 50.27	100°42.26 · · 38.54	182°3.13 · · 59.47	Acrux 172°59.75 -63°14.06
4	185°42.32	192°58.19 54.76	70°46.35 50.40	115°44.81 38.54	197°5.35 59.36	Gacrux 171°51.35 -57°15.01
5	200°44.78	207°58.78 53.60	85°49.78 50.54	130°47.36 38.54	212°7.58 59.26	Alioth 166°12.69 55°49.10 Spica 158°22.18 -11°17.56
6	215°47.25	222°59.37 <b>S</b> 01°52.43	100°53.21 N25°50.67	145°49.91 N21°38.53	227°9.80 S06°59.15	Spica 158°22.18 -11°17.56 Alkaid 152°51.89 49°10.95
7	$230^{\circ}49.71$	237°59.96 51.27	115°56.64 50.80	160°52.45 38.53	242°12.03 59.05	Hadar 148°35.93 -60°29.39
8	$245^{\circ}52.18$	253°0.56 50.10	131° 0.07 50.93	175°55.00 38.53	257°14.25 58.94	Menkent 147°57.56 -36°29.48
9	260°54.64	268°1.15 · · 48.94	146°3.49 · · 51.07	190°57.55 · · 38.53	272°16.48 · · 58.84	Arcturus 145°47.86 19°2.90
10	275°57.10	283°1.75 47.78	161° 6.92 51.20	206° 0.10 38.53	287°18.70 58.74	Rigil Kent. 139°40.31 -60°56.09
11	290°59.57	298°2.35 46.61	176°10.34 51.33	221°2.65 38.53	302°20.93 58.63	Kochab 137°19.94 74°2.73
12	306°2.03	313°2.94 S01°45.45	191°13.77 N25°51.46	236°5.19 N21°38.53	317°23.15 \$06°58.53	Zuben'ubi 136°56.02 -16°8.76
13	321°4.50	328°3.54 44.29	206°17.19 51.59 221°20.61 51.72	251°7.74 38.52	332°25.38 58.42 347°27.60 58.32	Alphecca 126°3.82 26°37.56
14 15	336°6.96 351°9.43	343°4.15 43.12 358°4.75 · · 41.96	221°20.61 51.72 236°24.03 · · 51.85	266°10.29 38.52 281°12.83 · · 38.52	347°27.60 58.32 2°29.83 · · 58.21	Antares 112°15.98 -26°29.22
16	6°11.89	13°5.35 40.80	251°27.45 51.98	296°15.38 38.52	17°32.05 58.11	Atria 107°10.55 -69°4.12
17	21° 14.35	28°5.96 39.63	266°30.87 52.11	311°17.92 38.52	32°34.27 58.00	Sabik 102°2.97 -15°45.38
18	36° 16.82	43°6.57 S01°38.47	281°34.29 N25°52.24	326°20.47 N21°38.52	47°36.50 S06°57.90	Shaula 96°10.62 -37°7.25
19	51° 19.28	58°7.17 37.31	296°37.71 52.36	341°23.01 38.52	62°38.72 57.79	Rasalhague 95°58.76 12°32.34
20	66°21.75	73°7.78 36.15	311°41.13 52.49	356°25.55 38.52	77°40.95 57.69	Eltanin 90°42.60 51°28.86 Kaus Aust. 83°32.80 -34°22.34
21	81°24.21	88°8.39 · · 34.99	326°44.54 · · 52.62	11°28.10 · · 38.51	92°43.17 · · 57.58	Kaus Aust. 83°32.80 -34°22.34 Vega 80°33.58 38°48.21
22	96°26.67	103°9.01 33.83	341°47.96 52.75	26°30.64 38.51	107°45.39 57.48	Nunki 75°48.04 -26°15.96
23	111°29.14	118°9.62 32.66	356°51.37 52.87	41°33.18 38.51	122°47.62 57.38	Altair 62°0.24 8°55.96
Meri	pass. 15:35	ν0.6' d-1.2' m-4.69	ν3.4' d0.1' m-1.24	$\nu$ 2.6' d-0.0' m-2.57	$\nu 2.2' \ d$ -0.1' m1.10	Peacock 53°6.24 -56°39.32
						Deneb 49°26.25 45°22.12
						Enif 33°39.06 9°59.33
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.26 -46°50.55
0 1	126° 31.60 141° 34.07	133°10.24 <b>S</b> 01°31.50 148°10.85 30.34	11°54.78 N25°53.00 26°58.20 53.12	56°35.72 N21°38.51 71°38.27 38.51	137°49.84 S06°57.27 152°52.06 57.17	Fomalhaut 15°14.74 -29°29.54
2	141 34.07 156° 36.53	148 10.85 30.34 163°11.47 29.18	26°58.20 53.12 42°1.61 53.25	86°40.81 38.51	167°54.29 57.06	Scheat 13°45.44 28°13.16
3	171°39.00	178°12.09 · · 28.02	57°5.02 · · 53.37	101°43.35 · · 38.51	182°56.51 · · 56.96	Markab 13°30.11 15°20.39
4	186°41.46	193°12.71 26.86	72°8.43 53.50	116°45.89 38.51	197°58.73 56.85	Jan 25 Sat SHA Mer.pass
5	201°43.92	208°13.33 25.70	87°11.84 53.62	131°48.43 38.51	213°0.96 56.75	Venus 8°8.89 15:09
6	216°46.39	223°13.95 <b>S</b> 01°24.54	102°15.24 N25°53.75	146°50.97 N21°38.51	228°3.18	Mars 244°36.65 23:18
7	231°48.85	238°14.58 23.38	117°18.65 53.87	161°53.51 38.51	243°5.40 56.54	Jupiter 289°59.95 20:18
8	$246^{\circ}51.32$	253°15.20 22.22	132°22.05 53.99	176°56.05 38.51	258°7.62 56.43	Saturn 11°29.69 14:54
9	261°53.78	268°15.83 · · 21.06	147°25.46 · · 54.11	191°58.59 · · 38.51	273°9.85 · · 56.33	Jan 26 Sun SHA Mer.pass
10	276° 56.25	283°16.46 19.91	162°28.86 54.24	207°1.13 38.51	288°12.07 56.22	Venus 7°23.38 15:08
11	291°58.71	298°17.09 18.75	177°32.27 54.36	222°3.66 38.51	303°14.29 56.12	Mars 245°0.16 23:13
12	307°1.17	313°17.72 <b>S</b> 01°17.59	192°35.67 N25°54.48	237°6.20 N21°38.51	318°16.51 S06°56.01	Jupiter 290°2.14 20:14
13 14	322°3.64 337°6.10	328°18.35 16.43 343°18.99 15.27	207°39.07 54.60 222°42.47 54.72	252°8.74 38.50 267°11.28 38.50	333°18.74 55.90 348°20.96 55.80	Saturn 11°23.99 14:50
14 15	352°8.57	358° 19.62 · · 14.12	222°42.47 54.72 237°45.87 •• 54.84	267°11.28 38.50 282°13.81 · · 38.50	3 <sup>°</sup> 23.18 · · 55.69	Ion 27 Mon CLIA Mari
15 16	7°11.03	13°20.26 12.96	252°49.26 54.96	282 13.81 · · 38.50 297°16.35 38.50	18°25.40 55.59	Jan 27 Mon         SHA         Mer.pass           Venus         6°38.63         15:07
17	22° 13.49	28°20.90 11.80	267°52.66 55.08	312°18.89 38.50	33°27.63 55.48	Mars 245°23.18 23:07
18	37° 15.96	43°21.54 S01°10.64	282°56.06 N25°55.20	327°21.42 N21°38.50	48°29.85 S06°55.38	Jupiter 290°4.12 20:10
19	52° 18.42	58°22.18 9.49	297°59.45 55.32	342°23.96 38.50	63°32.07 55.27	Saturn 11°18.24 14:46
20	67°20.89	73°22.82 8.33	313°2.85 55.43	357°26.49 38.50	78°34.29 55.17	
21	82°23.35	88°23.46 · · 7.18	328° 6.24 · · 55.55	12°29.03 · · 38.50	93°36.51 · · 55.06	Horizontal parallax
22	97°25.82	103°24.11 6.02	343°9.63 55.67	27°31.56 38.51	108°38.74 54.96	Venus: 0.3
23	112°28.28	118°24.75 4.86	358°13.02 55.79	42°34.09 38.51	123°40.96 54.85	Mars: 0.2
Mer.	pass. 15:31	ν0.6' d-1.2' m-4.70	ν3.4' d0.1' m-1.21	ν2.5′ d-0.0′ m-2.56	ν2.2' d-0.1' m1.11	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176° 56.52	S18°57.24	236°57.29	9.3'	\$26°43.92	5.5'	55.4'
1 2	191°56.38 206°56.23	56.62 56.00	251°25.54 265°53.71	9.2' 9.1'	26°49.46 26°54.86	5.4' 5.3'	55.4' 55.4'
3	221°56.09	• • 55.38	280°21.78	9.0'	27°0.14	5.1'	55.5'
4	236° 55.95	54.76	294°49.76	8.9'	27°5.28	5.0'	55.5'
5 6	251° 55.81 266° 55.66	54.14 \$18°53.52	309°17.66 323°45.47	8.8' 8.7'	27°10.28 \$27°15.15	4.9' 4.7'	55.5' 55.5'
7	281°55.52	52.90	323 45.47 338°13.20	8. <i>1</i> 8.6'	27°19.88	4. <i>1</i> 4.6'	55.6'
8	296°55.38	52.28	352°40.84	8.6'	27°24.47	4.5'	55.6'
9	311°55.24	• • 51.66	7°8.40	8.5'	27°28.92	4.3'	55.6'
10 11	326°55.10 341°54.96	51.03 50.41	21°35.87 36°3.26	8.4' 8.3'	27°33.23 27°37.40	4.2' 4.0'	55.7' 55.7'
12	356° 54.82	S18°49.79	50°30.57	8.2'	S27°41.42	3.9'	55.7'
13	11°54.68	49.16	64°57.80	8.2'	27°45.30	3.7'	55.7'
14 15	26°54.54 41°54.40	48.54 •• 47.91	79°24.95 93°52.03	8.1' 8.0'	27°49.03 27°52.62	3.6' 3.4'	55.8' 55.8'
16	56° 54.26	47.28	108°19.02	7.9'	27°56.06	3.3'	55.8'
17	71°54.12	46.66	122°45.94	7.8'	27°59.35	3.1'	55.8'
18 19	86° 53.99 101° 53.85	\$18°46.03 45.40	137°12.79 151°39.56	7.8' 7.7'	\$28°2.50 28°5.49	3.0' 2.8'	55.9' 55.9'
20	101 53.85 116°53.71	45.40 44.77	151 39.50 166°6.27	7.7 7.6'	28 5.49 28°8.33	2.8 2.7'	55.9'
21	131°53.57	• • 44.14	180°32.90	7.6'	28°11.02	2.5'	56.0'
22	146°53.44	43.51	194°59.46	7.5'	28°13.56	2.4'	56.0'
23	161°53.30	42.88	209°25.95	7.4'	28°15.94	2.2'	56.0'
	SD = 16.2'	d = -0.6'		SI	O = 15.1'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°53.17	S18°42.25	223°52.38	7.4'	S28°18.16	2.1'	56.0'
1 2	191°53.03 206°52.90	41.62 40.98	238°18.75 252°45.05	7.3' 7.2'	28°20.24 28°22.15	1.9' 1.8'	56.1' 56.1'
3	200 52.90 221°52.76	40.35	267°11.29	7.2'	28°23.91	1.6'	56.1
4	236°52.63	39.72	281°37.46	7.1'	28°25.51	1.4'	56.2'
5	251° 52.49 266° 52.36	39.08 \$18°38.45	296°3.58 310°29.65	7.1'	28°26.94 \$28°28.22	1.3'	56.2'
6 7	200 52.30 281°52.22	37.81	310 29.05 324°55.65	7.0' 7.0'	28°29.34	1.1' 1.0'	56.2' 56.3'
8	296° 52.09	37.18	339°21.61	6.9'	28°30.30	0.8'	56.3'
9	311°51.96	• • 36.54	353°47.51	6.9'	28°31.09	0.6'	56.3'
10 11	326°51.83 341°51.69	35.90 35.26	8°13.36 22°39.17	6.8' 6.8'	28°31.73 28°32.20	0.5' 0.3'	56.3' 56.4'
12	356° 51.56	S18°34.63	37°4.92	6.7'	S28°32.50	0.1'	56.4
13	11°51.43	33.99	51°30.63	6.7'	28°32.64	-0.0'	56.4'
14 15	26°51.30 41°51.17	33.35 · · 32.71	65°56.30 80°21.93	6.6' 6.6'	28°32.61 28°32.42	-0.2' -0.4'	56.5' 56.5'
16	56° 51.04	32.07	94°47.52	6.5	28°32.07	-0.5	56.5
17	71°50.91	31.43	109°13.07	6.5'	28°31.54	-0.7'	56.6'
18 19	86° 50.78 101° 50.65	\$18°30.78 30.14	123°38.58 138°4.06	6.5' 6.4'	\$28°30.85 28°29.99	-0.9' -1.0'	56.6' 56.6'
20	116° 50.52	29.50	152°29.51		28°28.96		56.6'
21	131°50.39	• • 28.85	166°54.93	6.4'	28°27.76	-1.4'	56.7'
22 23	146°50.26 161°50.14	28.21 27.57	181°20.32 195°45.68	6.4' 6.3'	28°26.39 28°24.86	-1.5' -1.7'	56.7' 56.7'
23	SD = 16.2'	d = -0.6'	193 43.00		0 = 15.3'	-1.7	30.7
	<u>JD = 10.2</u>	<u>u = -0.0</u>					
Mon	<b>GHA</b> 176° 50.01	<b>Dec</b> \$18°26.92	<b>GHA</b> 210°11.02	ν 6.3'	<b>Dec</b> \$28°23.15	d -1.9'	<b>HP</b> 56.8'
0 1	176°50.01 191°49.88	26.27	210°11.02 224°36.34	6.3	28°21.27	-1.9' -2.0'	56.8'
2	206°49.75	25.63	239°1.64	6.3'	28°19.23	-2.2'	56.8'
3 4	221°49.63 236°49.50	· · 24.98 24.33	253°26.92 267°52.18	6.3' 6.2'	28°17.01 28°14.62	-2.4' -2.6'	56.9' 56.9'
5	250 49.50 251°49.38	24.33	282°17.43	6.2	28°12.06	-2.0 -2.7'	56.9'
6	266° 49.25	S18°23.03	296°42.67	6.2'	S28°9.33	-2.9'	57.0'
7	281°49.12 296°49.00	22.39 21.74	311°7.90 325°33.12	6.2' 6.2'	28°6.43 28°3.36	-3.1' -3.2'	57.0' 57.0'
8 9	296°49.00 311°48.88	21.74	325°33.12 339°58.33	6.2'	28° 3.36 28° 0.11	-3.2' -3.4'	57.0° 57.0'
10	326°48.75	20.43	354°23.54	6.2'	27°56.69	-3.6'	57.1'
11	341° 48.63	19.78	8°48.74	6.2'	27°53.11	-3.8'	57.1'
12 13	356° 48.50 11° 48.38	\$18°19.13 18.48	23°13.95 37°39.15	6.2' 6.2'	\$27°49.35 27°45.42	-3.9' -4.1'	57.1' 57.2'
14	26°48.26	17.82	52°4.36	6.2'	$27^{\circ}41.31$	-4.3'	57.2'
15	41°48.14	• • 17.17	66°29.58	6.2'	27°37.04	-4.4'	57.2'
16 17	56° 48.01 71° 47.89	16.51 15.86	80°54.80 95°20.03	6.2' 6.2'	27°32.59 27°27.98	-4.6' -4.8'	57.3' 57.3'
18	86° 47.77	\$18°15.20	95 20.03 109°45.27	6.3'	\$27°23.19	-4.0 -5.0'	57.3'
19	101° 47.65	14.55	124°10.53	6.3'	27°18.24	-5.1'	57.3'
20 21	116° 47.53 131° 47.41	13.89 •• 13.23	138°35.80 153°1.09	6.3' 6.3'	27°13.11 27°7.81	-5.3' -5.5'	57.4' 57.4'
22	131 47.41 146°47.29	12.57	167°26.39	6.3	27°2.35	-5.6'	57.4' 57.4'
23	161°47.17	11.91	181°51.72	6.3'	26°56.71	-5.8'	57.5'
	SD = 16.2'	d = -0.6'		SI	O = 15.5'	_	

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

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

		Sun		Moon		
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-8%
25	12:14	12:21	12:12	08:30	20:58	
26	12:27	12:34	12:13	09:26	21:54	
27	12:40	12:46	12:13	10:23	22:52	

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	127° 30.74	133°25.40	S01°3.71	13° 16.41	N25°55.90	57°36.63	N21°38.51	138°43.18	S06° 54.74			
1	142°33.21	148°26.05	2.55	28° 19.80	56.02	72°39.16	38.51	153°45.40	54.64	Alpheratz	357°34.93	29°13.80
2	157° 35.67	163°26.70	1.40	43°23.19	56.13	87°41.69	38.51	168°47.62	54.53	Ankaa	353°7.29	-42°10.42
3	172°38.14	178°27.35	01°0.24	58° 26.58	56.25	102°44.22	38.51	183°49.84	• • 54.43	Schedar	349°31.27	56°40.71
4	187°40.60	193°28.01	$00^{\circ}59.09$	73°29.96	56.36	117°46.76	38.51	198°52.06	54.32	Diphda	348°47.38	-17°51.10
5	202°43.07	208°28.66	57.94	88°33.35	56.48	132°49.29	38.51	213°54.28	54.22	Achernar Hamal	335°20.24 327°51.16	-57° 6.85 23° 34.93
6	217° 45.53	223°29.32	S00°56.78	103°36.73	N25°56.59	147°51.82	N21°38.51	228°56.51	S06°54.11	Polaris	313°55.33	89°22.52
7	232°47.99	238° 29.98	55.63	118° 40.11	56.71	162°54.35	38.51	243°58.73	54.00	Acamar	315° 11.65	-40°12.48
8	247°50.46	253°30.63	54.48	133°43.50	56.82	177°56.88	38.51	259°0.95	53.90	Menkar	314°6.03	4°11.25
9	262°52.92	268°31.29	• • 53.32	148°46.88	• • 56.93	192°59.41	• • 38.51	274°3.17	• • 53.79	Mirfak	308°28.04	49°57.21
10 11	277° 55.39 292° 57.85	283°31.96 298°32.62	52.17 51.02	163°50.26 178°53.63	57.04 57.16	208° 1.94 223° 4.47	38.51 38.51	289°5.39 304°7.61	53.69 53.58	Aldebaran	290°39.36	16°33.60
12	308° 0.31	313°33.28	51.02 500°49.87	176 55.05 193°57.01	N25°57.27	238° 7.00	N21°38.51	319° 9.83	506° 53.47	Rigel	281°3.58	-8°10.44
13	323°2.78	328°33.95	48.71	209°0.39	57.38	253° 9.52	38.51	334°12.05	53.37	Capella	280°21.47	46°1.51
14	338°5.24	343°34.62	47.56	224°3.77	57.49	268°12.05	38.51	349°14.27	53.26	Bellatrix	278°22.57	6°22.31
15	353°7.71	358°35.29	• • 46.41	239°7.14	• • 57.60	283°14.58	• • 38.52	4°16.49	• • 53.16	Elnath	278°1.52	28°37.76
16	8°10.17	13°35.96	45.26	$254^{\circ}10.51$	57.71	298°17.11	38.52	19°18.71	53.05	Alnilam	275°37.42 270°51.75	-1°11.21 7°24.67
17	23°12.64	28°36.63	44.11	$269^{\circ}13.89$	57.82	313°19.63	38.52	34°20.93	52.94	Betelgeuse Canopus	263°51.90	-52°42.65
18	$38^{\circ}15.10$	43°37.30	S00°42.96	284°17.26	N25°57.93	328°22.16	N21°38.52	49°23.15	S06°52.84	Sirius	258°25.87	-16°45.12
19	53° 17.56	58° 37.97	41.81	299° 20.63	58.04	343°24.69	38.52	64°25.37	52.73	Adhara	255°5.47	-29°0.46
20	68°20.03	73°38.65	40.66	314°24.00	58.15	358°27.21	38.52	79°27.59	52.63	Procyon	244°50.44	5° 9.58
21	83°22.49	88° 39.33	• • 39.51	329°27.37	• • 58.26	13°29.74	• • 38.52	94°29.81	• • 52.52	Pollux	243°16.86	27°57.89
22	98°24.96	103°40.01	38.36	344°30.73	58.36	28°32.26	38.52	109°32.03	52.41	Avior	234°14.08	-59°35.38
23	113°27.42	118°40.69	37.21	359°34.10	58.47	43°34.79	38.53	124°34.25	52.31	Suhail	222°45.83	-43°32.01
Mer.p	bass. 15:27	$\nu$ 0.6′ d-1.	2′ m-4.71	$\nu$ 3.4′ d0.	$1^\prime$ m-1.19	$\nu$ 2.5′ d0.	.0′ m-2.55	$\nu$ 2.2′ d-0	$.1^\prime$ m $1.11$	Miaplacidus	221°37.37	-69°49.12
				-			-	-		Alphard	217°47.37	-8°46.10
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.07	11°50.57
0	128° 29.88	133°41.37	S00°36.06	14°37.46	N25°58.58	58°37.31	N21°38.53	139°36.47	S06°52.20	Dubhe Denebola	193°40.36 182°24.66	61°36.71 14°25.76
1	143°32.35	148°42.05	34.91	29°40.83	58.68	73°39.83	38.53	154°38.69	52.09	Gienah	175°43.34	-17°40.88
2	158° 34.81	163°42.73	33.76	44°44.19	58.79	88°42.36	38.53	169°40.91	51.99	Acrux	172°59.71	-63°14.07
3	173°37.28	178°43.42	• • 32.61	59° 47.55	• • 58.90	103°44.88	• • 38.53	184°43.13	• • 51.88	Gacrux	171°51.32	-57°15.03
4	188° 39.74	193°44.11	31.47	74°50.92	59.00	118°47.40	38.53	199°45.35	51.77	Alioth	$166^{\circ}12.65$	55°49.10
5 6	203° 42.21 218° 44.67	208°44.80 223°45.49	30.32 \$00°29.17	89°54.28 104°57.63	59.11 N25°59.21	133°49.92 148°52.45	38.54 N21°38.54	214°47.57 229°49.78	51.67 \$06°51.56	Spica	$158^{\circ}22.15$	-11°17.57
7	233°47.13	238°46.18	28.03	120°0.99	59.31	163°54.97	38.54	244°52.00	51.46	Alkaid	152°51.85	49°10.94
8	248°49.60	253°46.87	26.88	135°4.35	59.42	178°57.49	38.54	259°54.22	51.35	Hadar	148°35.89	-60°29.40
9	263°52.06	268°47.56	25.73	150°7.70	59.52	194° 0.01	• • 38.54	274°56.44	51.24		147°57.52	-36°29.49
10	278°54.53	283°48.26	24.59	$165^{\circ}11.06$	59.62	209° 2.53	38.54	289°58.66	51.14	Arcturus Rigil Kent.	145°47.83 139°40.26	19°2.89 -60°56.10
11	293°56.99	298°48.96	23.44	$180^{\circ}14.41$	59.73	224°5.05	38.55	305°0.88	51.03	Kochab	137°19.87	74° 2.72
12	308°59.45	313°49.66	S00°22.30	195° 17.76	N25°59.83	239°7.57	N21°38.55	320°3.10	S06°50.92	Zuben'ubi	136°55.99	-16°8.77
13	324°1.92	328°50.36	21.15	210°21.12	25°59.93	254°10.09	38.55	335°5.32	50.82	Alphecca	126°3.79	26°37.55
14	339°4.38	343°51.06	20.01	225° 24.47	26° 0.03	269°12.61	38.55	350°7.53	50.71	Antares	$112^{\circ}15.95$	-26°29.22
15 16	354°6.85 9°9.31	358°51.76 13°52.47	· · 18.86 17.72	240°27.81 255°31.16	· · 0.13 0.23	284°15.13 299°17.64	· · 38.55 38.56	5°9.75 20°11.97	• • 50.60 50.49	Atria	107°10.49	-69°4.12
17	24° 11.78	28°53.17	16.57	270° 34.51	0.23	314°20.16	38.56	35°14.19	50.49	Sabik	102°2.94	-15°45.39
18	39° 14.24	43°53.88	S00°15.43	285°37.85	N26° 0.43	329°22.68	N21°38.56	50°16.41		Shaula	96°10.59	-37°7.25
19	54° 16.70	58° 54.59	14.29	300°41.20	0.53	344°25.20	38.56	65°18.62	50.17	Rasalhague	95°58.74	12°32.33 51°28.85
20	$69^{\circ}19.17$	73°55.30	13.14	$315^{\circ}44.54$	0.63	359°27.71	38.57	80°20.84	50.07	Eltanin Kaus Aust.	90°42.57 83°32.78	-34°22.34
21	84°21.63	88°56.01	• • 12.00	330°47.88	• • 0.73	14°30.23	• • 38.57	95°23.06	• • 49.96	Vega	80°33.56	38°48.19
22	99°24.10	103°56.72	10.86	345°51.23	0.83	29°32.74	38.57	110°25.28	49.85	Nunki	75°48.02	-26°15.96
23	114°26.56	118°57.44	9.72	0°54.57	0.93	44°35.26	38.57	125°27.50	49.75	Altair	62°0.23	8°55.95
Mer.	pass. 15:23	$\nu 0.7' d-1.$	1' m-4.72	$\nu 3.4' \ d0.$	1′ m-1.16	$\nu 2.5' d0$	.0′ m-2.54	$\nu 2.2' \ d-0$	.1′ m1.11	Peacock	53°6.21	-56°39.30
										Deneb	49°26.25	45°22.11
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°39.05	9°59.32
I nu O	129° 29.02	<b>GHA</b> 133°58.15	<b>S</b> 00°8.57	БНА 15°57.91	Dec N26°1.03	<b>GHA</b> 59°37.77	Dec N21°38.58	GНА 140°29.71	<b>S</b> 06° 49.64	Al Na'ir	27°33.25	-46°50.53
1	144°31.49	148°58.87	7.43	31°1.24	1.12	74°40.29	38.58	155°31.93	49.53	Fomalhaut	15° 14.74	-29°29.53
2	159°33.95	163°59.59	6.29	46°4.58	1.22	89°42.80	38.58	170°34.15	49.42	Scheat Markab	13°45.44 13°30.11	28°13.15 15°20.39
3	174° 36.42	179°0.31	• • 5.15	61°7.92	• • 1.32	104°45.32	• • 38.58	185°36.37	• • 49.32	iviarkab	10 00.11	10 20.39
4	189°38.88	194°1.03	4.01	76°11.25	1.41	119°47.83	38.59	200°38.58	49.21	Jan 28 Tue	SHA	Mer.pass
5	204°41.35	209°1.76	2.87	91° 14.58	1.51	134°50.34	38.59	215°40.80	49.10	Venus	5°54.66	15:06
6	219°43.81	224°2.48	S00°1.73	106° 17.91	N26°1.60	149°52.86	N21°38.59	230°43.02	S06°49.00	Mars		23:02
7	234° 46.27	239°3.21	S00°0.59	121°21.25	1.70	164°55.37	38.60	245°45.23	48.89	Jupiter	290°5.88	20:06
8	249°48.74	254°3.93	N00° 0.55	136° 24.58	1.79	179°57.88	38.60	260°47.45	48.78	Saturn	11°12.43	14:43
9 10	264°51.20 279°53.67	269°4.66 284°5.40	· · 1.69 2.83	151°27.90 166°31.23	· · 1.89 1.98	195°0.39 210°2.90	· · 38.60 38.61	275°49.67 290°51.89	•• 48.67 48.57	Jan 29 Wed	SHA	Mer.pass
10	279 53.07 294° 56.13	284 5.40 299°6.13	2.83 3.97	181°34.56	2.07	210 2.90 225° 5.41	38.61	305°54.10	48.57 48.46	Venus	5°11.48	15:05
12	309°58.59	314°6.86	N00°5.10	196°37.88	N26° 2.17	240°7.93	N21°38.61	320°56.32	S06°48.35	Mars	246°7.58	22:56
13	325°1.06	329°7.60	6.24	211°41.21	2.26	255°10.44	38.62	335°58.54	48.24	Jupiter	290°7.43	20:02
14	340°3.52	344°8.33	7.38	$226^{\circ}44.53$	2.35	$270^{\circ}12.94$	38.62	351°0.75	48.14	Saturn	11°6.58	14:39
15	355°5.99	359°9.07	• • 8.52	241°47.85	• • 2.44	285°15.45	• • 38.62	6°2.97	• • 48.03	Jan 30 Thu	SHA	Mer.pass
16	10°8.45	14°9.81	9.65	256°51.17	2.53	300°17.96	38.63	21°5.19	47.92	Venus	4°29.13	15:03
17	25°10.91	29°10.55	10.79	271°54.49	2.62	315°20.47	38.63	36°7.40	47.81	Mars		22:51
18 19	40° 13.38 55° 15.84	44°11.30 59°12.04	N00°11.92 13.06	286°57.81 302°1.13	N26°2.71 2.80	330°22.98 345°25.49	N21°38.63 38.64	51°9.62 66°11.83	\$06°47.71 47.60	Jupiter	290°8.75	19:58
20	70° 18.31	74°12.79	14.20	317°4.44	2.89	0°28.00	38.64	81°14.05	47.49	Saturn	11°0.69	14:36
21	85°20.77	89° 13.53	• • 15.33	332°7.76	• • 2.98	15°30.50	38.64	96°16.27	• • 47.38	Horizor	ıtal parallax	
22	100°23.23	104°14.28	16.46	$347^{\circ}11.07$	3.07	30°33.01	38.65	111°18.48	47.28		Venus:	0.3
23	115°25.70	$119^{\circ}15.03$	17.60	2°14.38	3.16	45°35.52	38.65	126°20.70	47.17		Mars:	0.2
Mer.r	pass. 15:20	$\nu$ 0.7′ d-1.	1′ m-4.73	$\nu$ 3.3' d0.	1′ m-1.13	$\nu 2.5' \ d0$	.0′ m-2.54	$\nu 2.2' \ d-0$	.1′ m1.11			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.05	<b>S</b> 18°11.26	196°17.06	6.4'	\$26°50.91	-6.0'	57.5'
1	191°46.93	10.60	210°42.43	6.4	26°44.94	-6.1'	57.5'
2 3	206° 46.81 221° 46.69	9.94 •• 9.27	225°7.83 239°33.25	6.4' 6.5'	26°38.80 26°32.49	-6.3' -6.5'	57.6' 57.6'
4	236° 46.58	8.61	253°58.70	6.5	26°26.02	-6.6'	57.6'
5	251°46.46	7.95	268°24.18	6.5'	$26^{\circ}19.38$	-6.8'	57.6'
6	266° 46.34	\$18°7.29	282°49.70	6.5'	\$26°12.57	-7.0'	57.7'
7 8	281° 46.22 296° 46.11	6.62 5.96	297°15.24 311°40.83	6.6' 6.6'	26°5.60 25°58.47	-7.1' -7.3'	57.7' 57.7'
9	311° 45.99	5.30	326° 6.44	6.7	25°51.17	-7.5'	57.8'
10	326°45.88	4.63	340°32.10	6.7'	$25^{\circ}43.71$	-7.6'	57.8'
11	341°45.76	3.97	354°57.80	6.7'	25°36.09	-7.8'	57.8'
12 13	356° 45.65 11° 45.53	\$18° 3.30 2.63	9°23.53 23°49.31	6.8' 6.8'	\$25°28.30 25°20.36	-7.9' -8.1'	57.9' 57.9'
14	26° 45.42	1.97	38°15.13	6.9	25° 12.25	-8.3	57.9'
15	41°45.30	• • 1.30	52°41.00	6.9'	$25^{\circ}3.99$	-8.4'	57.9'
16	56° 45.19	0.63	67°6.91 81°32.87	7.0'	24°55.57	-8.6'	58.0'
17 18	71°45.08 86°44.96	17°59.96 \$17°59.29	95°58.88	7.0' 7.1'	24°46.99 \$24°38.25	-8.7' -8.9'	58.0' 58.0'
19	101°44.85	58.62	110°24.94	7.1'	24°29.36	-9.0'	58.1'
20	116° 44.74	57.95	124°51.04	7.2'	24°20.31	-9.2'	58.1'
21	131° 44.63	• • 57.28	139°17.20 153°43.42	7.2'	24°11.11	-9.4'	58.1'
22 23	146° 44.51 161° 44.40	56.61 55.94	153°43.42 168°9.68	7.3' 7.3'	24°1.76 23°52.26	-9.5' -9.7'	58.1' 58.2'
	SD = 16.2'	d = -0.7'			D = 15.7'		
	3D = 10.2'	u = -0.1		51	J — 15.1°		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°44.29	S17°55.26	182°36.00	7.4'	S23°42.61	-9.8'	58.2'
1 2	191°44.18 206°44.07	54.59 53.92	197°2.38 211°28.82	7.4' 7.5'	23°32.80 23°22.85	-10.0' -10.1'	58.2' 58.2'
3	200 44.07 221°43.96	53.24	225°55.31	7.5'	23°12.75	-10.1 -10.2'	58.3'
4	236° 43.85	52.57	240°21.85	7.6'	23°2.51	-10.4	58.3'
5	251° 43.74	51.89	254°48.46	7.7'	22°52.12	-10.5'	58.3'
6 7	266° 43.64 281° 43.53	\$17°51.21 50.54	269°15.13 283°41.86	7.7' 7.8'	\$22°41.59 22°30.91	-10.7' -10.8'	58.3' 58.4'
8	281 43.53 296°43.42	50.54 49.86	283 41.86 298°8.65	7.8'	22°20.10	-10.8 -11.0'	58.4'
9	311°43.31	• • 49.18	312°35.50	7.9'	22°9.14	-11.1'	58.4'
10	326° 43.20	48.50	327° 2.41	8.0'	21°58.05	-11.2'	58.4'
11 12	341°43.10 356°42.99	47.83 \$17°47.15	341°29.38 355°56.42	8.0' 8.1'	21°46.82 <b>S</b> 21°35.45	-11.4' -11.5'	58.5' 58.5'
13	350 42.99 11°42.88	46.47	10°23.52	8.1 8.2'	21°23.95	-11.5 -11.6'	58.5'
14	26°42.78	45.79	24°50.69	8.2'	21°12.31	-11.8'	58.5'
15	41° 42.67	• • 45.10	39°17.91	8.3'	21°0.55	-11.9'	58.6'
16 17	56° 42.57 71° 42.46	44.42 43.74	53°45.21 68°12.57	8.4' 8.4'	20°48.65 20°36.62	-12.0' -12.2'	58.6' 58.6'
18	86° 42.36	\$17°43.06	82°39.99	8.5	520°24.47	-12.2	58.6'
19	101°42.25	42.37	97°7.48	8.6'	20°12.18	-12.4'	58.7'
20	116° 42.15	41.69	111°35.03	8.6'	19°59.78		
21 22	131° 42.05 146° 41.94	· · 41.01 40.32	126°2.65 140°30.33	8.7' 8.8'	19°47.25 19°34.59	-12.7' -12.8'	58.7' 58.7'
23	161°41.84	39.64	154°58.09	8.8'	19° 21.82	-12.9'	58.8'
	SD = 16.2'	d = -0.7'		SI	D = 15.9'		
	- 10.2	<del>u - 0.1</del>		ال			
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°41.74	\$17°38.95	169°25.90	8.9'	\$19°8.93	-13.0'	58.8'
1 2	191°41.64 206°41.54	38.26 37.58	183°53.78 198°21.73	8.9' 9.0'	18°55.92 18°42.79	-13.1' -13.2'	58.8' 58.8'
3	221°41.43	• • 36.89	212°49.74	9.1'	18°29.55	-13.4'	58.8'
4	236°41.33	36.20	227°17.82	9.1'	18°16.20	-13.5'	58.9'
5 6	251°41.23 266°41.13	35.51 \$17°34.82	241°45.96 256°14.17	9.2' 9.3'	18°2.73 \$17°49.15	-13.6' -13.7'	58.9' 58.9'
7	200 41.13 281°41.03	34.13	250 14.17 270°42.44	9.3 9.3'	17°35.47	-13. <i>1</i> -13.8'	58.9'
8	296°40.93	33.44	285°10.78	9.4'	$17^{\circ}21.68$	-13.9'	58.9'
9	311°40.83	• • 32.75	299°39.18	9.5'	17°7.78	-14.0'	59.0'
10 11	326° 40.73 341° 40.64	32.06 31.37	314°7.65 328°36.18	9.5' 9.6'	16°53.78 16°39.68	-14.1' -14.2'	59.0' 59.0'
12	356° 40.54	\$1.37 \$17°30.67	343° 4.77	9.0	\$16°25.47	-14.2	59.0'
13	11°40.44	29.98	357°33.42	9.7'	$16^{\circ}11.17$	-14.4'	59.0'
14	26°40.34	29.29	12°2.14	9.8'	15°56.77	-14.5'	59.1'
15 16	41° 40.25 56° 40.15	· · 28.59 27.90	26°30.92 40°59.76	9.8' 9.9'	15°42.27 15°27.68	-14.6' -14.7'	59.1' 59.1'
17	71°40.05	27.90	55°28.66	10.0'	15°12.99	-14.7 -14.8'	59.1'
18	86°39.96	S17°26.51	69°57.62	10.0'	S14°58.22	-14.9'	59.1'
19	101°39.86	25.81	84°26.64	10.1	14°43.35	-15.0'	59.1'
20 21	116°39.77 131°39.67	25.11 •• 24.42	98°55.72 113°24.86	10.1' 10.2'	14°28.40 14°13.36	-15.0' -15.1'	59.2' 59.2'
22	131 39.67 146°39.58	23.72	113 24.86 127°54.06	10.2	14 13.36 13°58.24	-15.1 -15.2'	59.2'
23	161°39.48	23.02	142°23.31	10.3'	13°43.03	-15.3'	59.2'
	SD = 16.2'	d = -0.7'		SI	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	29-1	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-0%	
28	12:52	12:57	12:13	11:21	23:49		
29	13:03	13:08	12:13	12:17	-:-		
30	13:13	13:18	12:13	13:10	00:44		

# January 31, 01, 02 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	130°28.16	134°15.78 N00°18.73	17°17.70 N26°3.25	60°38.02 N21°38.65	141°22.91 \$06°47.06	
1	145°30.63	149° 16.54 19.87	32°21.01 3.34	75°40.53 38.66	156°25.13 46.95	Alpheratz 357°34.94 29°13.80
2	160°33.09	164°17.29 21.00	47°24.31 3.42	90°43.03 38.66	171°27.34 46.84	Ankaa 353°7.30 -42°10.41
3	175°35.56	179°18.05 · · 22.13	62°27.62 · · 3.51	105°45.54 · · 38.67	186°29.56 · · 46.74	Schedar 349°31.29 56°40.70
4	190°38.02	194°18.81 23.26	77°30.93 3.60	120°48.04 38.67	201°31.78 46.63	Diphda 348°47.38 -17°51.10
5	205°40.48	209°19.57 24.40	92°34.23 3.68	135°50.54 38.67	216°33.99 46.52	Achernar 335°20.26 -57°6.85
6	220° 42.95	224°20.33 N00°25.53	107°37.54 N26°3.77	150°53.05 N21°38.68	231°36.21	Hamal 327°51.17 23°34.93
7	235°45.41	239°21.09 26.66	122° 40.84 3.85	165°55.55 38.68	246°38.42 46.30	Polaris 313°56.97 89°22.53
8	250° 47.88	254°21.85 27.79	137°44.14 3.94	180°58.05 38.69	261°40.64 46.20	Acamar 315°11.67 -40°12.48
9	265°50.34	269°22.62 · · 28.92	152° 47.44 · · 4.02	196°0.56 · · 38.69	276° 42.85 · · 46.09	Menkar 314°6.04 4°11.25
10	280°52.80	284°23.39 30.05	167° 50.74 4.11	211°3.06 38.69	291°45.07 45.98	Mirfak 308°28.06 49°57.21
11	295°55.27	299°24.16 31.18	182°54.04 4.19	226°5.56 38.70	306° 47.28 45.87	Aldebaran 290°39.37 16°33.60
12	310°57.73	314°24.93 N00°32.31	197°57.34 N26°4.28	241°8.06 N21°38.70	321°49.50 \$06°45.76	Rigel 281°3.59 -8°10.45 Capella 280°21.48 46°1.51
13	326°0.20	329°25.70 33.44	213°0.63 4.36	256°10.56 38.71	336°51.71 45.66	· ·
14	341°2.66	344°26.47 34.57	228°3.93 4.44	271°13.06 38.71	351°53.93 45.55	Bellatrix 278°22.58 6°22.31 Elnath 278°1.53 28°37.76
15	356°5.12	359°27.25 · · 35.70	243°7.22 · · 4.52	286°15.56 · · 38.72	6°56.14 · · 45.44	Alnilam 275°37.43 -1°11.21
16	$11^{\circ}7.59$	14°28.02 36.83	258° 10.51 4.61	301°18.06 38.72	21°58.36 45.33	Betelgeuse 270°51.76 7°24.67
17	$26^{\circ}10.05$	29°28.80 37.96	273°13.80 4.69	316°20.56 38.73	37°0.57 45.22	Canopus 263°51.91 -52°42.67
18	$41^{\circ}12.52$	44°29.58 N00°39.08	288°17.09 N26°4.77	331°23.06 N21°38.73	52°2.78 <b>S</b> 06°45.11	Sirius 258°25.88 -16°45.13
19	$56^{\circ}14.98$	59°30.36 40.21	303°20.38 4.85	346°25.56 38.73	67°5.00 45.01	Adhara 255°5.47 -29°0.46
20	71° 17.44	74°31.14 41.34	318°23.67 4.93	1°28.06 38.74	82°7.21 44.90	Procyon 244°50.44 5°9.58
21	$86^{\circ}19.91$	89°31.93 · · 42.46	333°26.95 · · 5.01	16°30.56 · · 38.74	97°9.43 · · 44.79	Pollux 243°16.85 27°57.90
22	101°22.37	104°32.71 43.59	348°30.24 5.09	31°33.05 38.75	112°11.64 44.68	Avior 234°14.09 -59°35.40
23	$116^{\circ}24.84$	119°33.50 44.71	3°33.52 5.17	46°35.55 38.75	127° 13.86 44.57	Suhail 222°45.83 -43°32.03
Mar	pass. 15:16	ν0.8′ d1.1′ m-4.74	ν3.3' d0.1' m-1.10	ν2.5' d0.0' m-2.53	ν2.2' d-0.1' m1.11	Miaplacidus 221°37.37 -69°49.14
ivier.	pass. 13.10	V0.0 U1.1 III-4.74	νσ.σ αυ.1 III-1.10	ν Δ.J UU.U III-Δ.33	ν Δ.Δ. U-U.1 III1.11	Alphard 217°47.37 -8°46.10
						Regulus 207°34.05 11°50.56
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.32 61°36.72
0	131°27.30	134°34.29 N00°45.84	18°36.80 N26°5.25	61°38.05 N21°38.76	142°16.07 S06°44.46	Denebola 182°24.64 14°25.75
1	$146^{\circ}29.77$	149°35.08 46.96	33°40.08 5.33	76°40.54 38.76	157° 18.28 44.36	Gienah 175°43.32 -17°40.89
2	161°32.23	164°35.87 48.09	48°43.36 5.41	91°43.04 38.77	172°20.50 44.25	Acrux 172°59.68 -63°14.09
3	$176^{\circ}34.69$	179°36.67 · · 49.21	63°46.64 · · 5.48	106°45.54 · · 38.77	187°22.71 · · 44.14	Gacrux 171°51.29 -57°15.04
4	191°37.16	194°37.46 50.34	78°49.92 5.56	121°48.03 38.78	202°24.92 44.03	Alioth 166°12.62 55°49.10
5	$206^{\circ}39.62$	209°38.26 51.46	93°53.19 5.64	136°50.53 38.78	217°27.14 43.92	Spica 158°22.13 -11°17.58
6	221°42.09	224°39.06 N00°52.58	108°56.47 N26°5.71	151°53.02 N21°38.79	232°29.35 <b>S</b> 06°43.81	Alkaid 152°51.81 49°10.94
7	$236^{\circ}44.55$	239°39.86 53.71	123°59.74 5.79	166°55.51 38.79	247°31.56 43.70	Hadar 148°35.85 -60°29.41
8	251°47.01	254°40.66 54.83	139°3.01 5.87	181°58.01 38.80	262°33.78 43.60	Menkent 147°57.50 -36°29.50
9	266°49.48	269°41.46 •• 55.95	154°6.28 · · 5.94	197°0.50 · · 38.80	277°35.99 · · 43.49	Arcturus 145°47.81 19°2.88
10	281°51.94	284°42.26 57.07	169°9.55 6.02	212°2.99 38.81	292°38.20 43.38	Rigil Kent. 139°40.22 -60°56.11
11	296°54.41	299°43.07 58.19	184°12.82 6.09	227°5.49 38.82	307°40.42 43.27	Kochab 137°19.80 74°2.72
12	311°56.87	314°43.88 N00°59.31	199°16.09 N26°6.17	242°7.98 N21°38.82	322°42.63 <b>S</b> 06°43.16	Zuben'ubi 136°55.96 -16°8.78
13	$326^{\circ}59.33$	329°44.69 01°0.43	214°19.35 6.24	257°10.47 38.83	337°44.84 43.05	Alphecca 126°3.77 26°37.54
14	342°1.80	344°45.50 1.55	229°22.62 6.31	272°12.96 38.83	352°47.06 42.94	Antares 112°15.93 -26°29.23
15	357°4.26	359°46.31 · · 2.67	244°25.88 · · 6.39	287°15.45 · · 38.84	7°49.27 · · 42.83	Atria 107°10.43 -69°4.12
16	12°6.73	14°47.13 3.79	259°29.14 6.46	302°17.94 38.84	22°51.48 42.72	Sabik 102°2.92 -15°45.40
17	27°9.19	29°47.94 4.91	274°32.40 6.53	317°20.43 38.85	37°53.70 42.62	Shaula 96°10.56 -37°7.26
18	42°11.65	44°48.76 N01°6.03	289°35.66 N26°6.60	332°22.92 N21°38.86	52°55.91 S06°42.51	Rasalhague 95°58.72 12°32.32
19	57° 14.12	59°49.58 7.15	304°38.92 6.68	347°25.41 38.86	67°58.12 42.40	Eltanin 90°42.55 51°28.83
20	72°16.58	74°50.40 8.26	319° 42.18 6.75	2°27.90 38.87	83°0.33 42.29	Kaus Aust. 83°32.75 -34°22.34
21	87° 19.05	89°51.22 · · 9.38	334°45.43 · · 6.82	17°30.39 · · 38.87	98°2.55 · · 42.18	Vega 80°33.54 38°48.17
22	102°21.51	104°52.05 10.50	349° 48.69 6.89	32°32.88 38.88	113°4.76 42.07	Nunki 75°48.00 -26°15.96
23	117°23.97	119°52.87 11.61	4°51.94 6.96	47°35.37 38.88	128°6.97 41.96	Altair 62°0.22 8°55.94
Mer.	pass. 15:12	$ u 0.8' \ d1.1' \ { m m-4.75}$	$ u 3.3' \ d0.1' \ \text{m-}1.07$	$\nu 2.5' \ d0.0' \ \text{m-}2.52$	$ u 2.2' \ d$ -0.1' m1.11	Peacock 53°6.20 -56°39.29
						Deneb 49°26.24 45°22.09
_						Enif 33°39.05 9°59.31
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.25 -46°50.52
0	132°26.44	134°53.70 N01°12.73	19°55.19 N26°7.03	62°37.85 N21°38.89	143°9.18 \$06°41.85	Fomalhaut 15°14.74 -29°29.53
1	147°28.90	149°54.53 13.84	34°58.44 7.10	77°40.34 38.90	158° 11.39 41.74	Scheat 13°45.45 28°13.14
2	162°31.37	164°55.36 14.96	50°1.69 7.17	92°42.83 38.90	173°13.61 41.63	Markab 13°30.11 15°20.38
3	177° 33.83 192° 36.29	179°56.19 · · 16.07	65°4.94 · · 7.24 80°8.19 7.31	107°45.32 · · 38.91 122°47.80 38.92	188° 15.82 · · 41.52	Jan 31 Fri SHA Mer.pass
4	192°36.29 207°38.76	194°57.02 17.19			203°18.03 41.41	Jan 31 Fri         SHA         Mer.pass           Venus         3°47.62         15:02
5		209°57.86 18.30		137°50.29 38.92	218°20.24 41.31	Mars 246°49.53 22:46
6 7	222°41.22	224°58.69 N01°19.41	110°14.68 N26°7.44	152°52.77 N21°38.93	233°22.45 \$06°41.20	Jupiter 290°9.86 19:54
7 8	237°43.69	239°59.53 20.53	125°17.92 7.51 140°21.16 7.57	167°55.26 38.93 182°57.74 38.94	248°24.67 41.09 263°26.88 40.98	Saturn 10°54.75 14:32
8 9	252° 46.15 267° 48.61	255°0.37 21.64 270°1.21 · · 22.75				Jatum 10 54.75 14:32
10	282°51.08	285°2.06 23.86	155°24.40 · · 7.64 170°27.64 7.71	198°0.23 · · 38.95 213°2.71 38.95	278°29.09 · · 40.87 293°31.30 40.76	Feb 01 Sat SHA Mer.pass
10	282°51.08 297°53.54	300°2.90 24.97	170°27.64 7.71 185°30.88 7.77	213°2.71 38.95 228°5.19 38.96	308°33.51 40.65	Venus 3° 6.99 15:01
12	312° 56.01	315°3.75 N01°26.08	200°34.11 N26°7.84	243°7.68 N21°38.97	323°35.72 \$06°40.54	Mars 247° 9.50 22:41
13	312 56.01 327°58.47	330°4.60 27.20	200 34.11 N26 7.84 215°37.35 7.90	258°10.16 38.97	338°37.93 40.43	Jupiter 290°10.75 19:50
14	343°0.94	345°5.45 28.30	230° 40.58 7.97	273°12.64 38.98	353° 40.15 40.32	Saturn 10°48.77 14:29
15	358° 3.40	0°6.30 · · 29.41	245°43.81 · · 8.03	288°15.12 · · 38.99	8°42.36 · · 40.21	Ech 02 Sun CUA Mari
16	13°5.86	15°7.15 30.52	260°47.04 8.10	303°17.60 38.99	23°44.57 40.10	Feb 02 Sun SHA Mer.pass
17	28°8.33	30°8.01 31.63	275°50.27 8.16	318°20.09 39.00	38°46.78 39.99	Venus 2°27.26 15:00
18	43° 10.79	45°8.86 N01°32.74	290°53.50 N26°8.22	333°22.57 N21°39.01	53°48.99 S06°39.88	Mars 247°28.75 22:35
19	58° 13.26	60°9.72 33.85	305°56.73 8.29	348°25.05 39.01	68° 51.20 39.77	Jupiter 290°11.42 19:46 Saturn 10°42.74 14:25
20	73° 15.72	75°10.58 34.95	320°59.95 8.35	3°27.53 39.02	83°53.41 39.66	Jatum 10 42.74 14:25
21	88° 18.18	90°11.44 · · 36.06	336°3.18 · · 8.41	18°30.01 · · 39.03	98°55.62 · · 39.55	Horizontal parallax
22	103° 20.65	105°12.31 37.17	351°6.40 8.47	33°32.48 39.04	113° 57.83 39.44	Venus: 0.3
23	118° 23.11	120°13.17 38.27	6°9.62 8.53	48°34.96 39.04	129°0.04 39.33	Mars: 0.2
Mer.	pass. 15:08	ν0.8′ d1.1′ m-4.76	ν3.3′ d0.1′ m-1.05	ν2.5′ d0.0′ m-2.51	ν2.2' d-0.1' m1.11	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°39.39	<b>S</b> 17°22.32	156°52.62	10.4'	S13°27.75	-15.4'	59.2'
1	191°39.30	21.62	171°21.98	10.4	13°12.38	-15.4'	59.2'
2	206°39.20 221°39.11	20.92	185°51.40 200°20.88	10.5' 10.5'	12°56.93 12°41.41	-15.5' -15.6'	59.3' 59.3'
4	236°39.02	19.52	214°50.40	10.6	12°25.82	-15.7'	59.3'
5	251°38.93	18.82	229°19.98	10.6'	12°10.15	-15.7'	59.3'
6	266°38.83	S17° 18.12	243°49.61	10.7'	S11°54.41	-15.8'	59.3'
7 8	281°38.74 296°38.65	17.41 16.71	258°19.30 272°49.03	10.7' 10.8'	11°38.60 11°22.72	-15.9' -15.9'	59.3' 59.3'
9	311°38.56	. 16.01	287°18.81	10.8	11 22.72 11°6.77	-15.9 -16.0'	59.3'
10	326°38.47	15.30	301°48.64	10.9'	10°50.76	-16.1	59.4'
11	341°38.38	14.60	$316^{\circ}18.51$	10.9'	$10^{\circ}34.69$	-16.1'	59.4'
12	356°38.29	\$17°13.89	330°48.44 345°18.40	11.0'	S10°18.56	-16.2'	59.4'
13 14	11°38.20 26°38.11	13.19 12.48	345°18.40 359°48.42	11.0' 11.1'	10°2.36 09°46.11	-16.3' -16.3'	59.4' 59.4'
15	41°38.03	. 11.77	14°18.47	11.1'	09° 40.11	-16.4'	59.4
16	56°37.94	11.07	28°48.57	11.1'	$09^{\circ}13.44$	-16.4'	59.4'
17	71°37.85	10.36	43°18.71	11.2'	08°57.03	-16.5'	59.4'
18	86°37.76 101°37.68	\$17°9.65	57°48.89 72°19.10	11.2' 11.3'	\$08°40.56 08°24.04	-16.5'	59.4' 59.5'
19 20	101°37.68 116°37.59	8.94 8.23	72°19.10 86°49.36	11.3	08° 24.04 08° 7.48	-16.6' -16.6'	59.5' 59.5'
21	131°37.50	7.52	101°19.65	11.3'	07°50.87	-16.7	59.5'
22	146°37.42	6.81	115°49.98	11.4'	$07^{\circ}34.21$	-16.7'	59.5'
23	161°37.33	6.10	130°20.34	11.4'	07° 17.51	-16.7'	59.5'
	SD = 16.2'	d = -0.7'		SI	D = 16.2'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.25	S17°5.39	144°50.74	11.4'	S07°0.77	-16.8'	59.5'
1	191°37.16	4.67	159°21.17	11.5'	06°43.99	-16.8'	59.5'
2	206°37.08 221°36.99	3.96 · · 3.25	173°51.63 188°22.12	11.5' 11.5'	06°27.18 06°10.32	-16.9' -16.9'	59.5' 59.5'
4	236°36.91	2.53	202°52.64	11.5'	05°53.43	-16.9'	59.5'
5	251°36.83	1.82	217°23.19	11.6'	05°36.51	-17.0'	59.5'
6	266°36.74	\$17°1.11	231°53.76	11.6'	S05°19.56	-17.0'	59.5'
7	281°36.66	17°0.39	246°24.36	11.6'	05°2.58	-17.0'	59.5'
8 9	296°36.58 311°36.50	16° 59.67 •• 58.96	260°54.99 275°25.63	11.6' 11.7'	04°45.57 04°28.53	-17.0' -17.1'	59.5' 59.6'
10	326°36.42	58.24	289°56.30	11.7'	04°20.33	-17.1	59.6'
11	341°36.33	57.52	304°26.99	11.7'	03°54.38	-17.1'	59.6'
12	356°36.25	S16°56.81	318°57.70	11.7'	S03°37.27	-17.1'	59.6'
13 14	11°36.17 26°36.09	56.09 55.37	333°28.43 347°59.17	11.7' 11.8'	03°20.15 03°3.00	-17.1' -17.2'	59.6' 59.6'
15	41°36.01	54.65	2°29.93	11.8'	02°45.84	-17.2	59.6'
16	56°35.93	53.93	$17^{\circ}0.71$	11.8'	$02^{\circ}28.67$	-17.2'	59.6'
17	71°35.85	53.21	31°31.49	11.8'	02°11.48	-17.2'	59.6'
18 19	86°35.78 101°35.70	\$16° 52.49 51.77	46°2.29 60°33.10	11.8' 11.8'	\$01°54.28 01°37.07	-17.2' -17.2'	59.6' 59.6'
20	116° 35.62	51.04	75°3.92		01°19.85		59.6'
21	131°35.54	• • 50.32	89°34.74	11.8'	01°2.62	-17.2'	59.6'
22	146°35.46	49.60	104°5.58	11.8'	00°45.39	-17.2'	59.6'
23	161°35.39	48.87	118°36.41	11.8'	00°28.15	-17.2'	59.6'
	SD = 16.2'	d = -0.7'		51	D = 16.2'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	176°35.31 191°35.24	\$16° 48.15 47.43	133°7.26 147°38.10	11.8' 11.8'	\$00°10.92 N00°6.32	-17.2' 17.2'	59.6' 59.6'
2	206°35.16	46.70	162°8.95	11.8'	00°23.55	17.2'	59.6'
3	221°35.08	• • 45.98	176°39.79	11.8'	00°40.79	17.2'	59.6'
4	236°35.01	45.25	191°10.64	11.8'	00°58.01	17.2'	59.6'
5 6	251°34.93 266°34.86	44.52 \$16° 43.80	205°41.48 220°12.32	11.8' 11.8'	01°15.24 N01°32.45	17.2' 17.2'	59.6' 59.6'
7	200°34.80 281°34.79	43.80	220°12.32 234°43.16	11.8'	01°49.65	17.2' 17.2'	59.6'
8	296°34.71	42.34	249°13.98	11.8'	$02^{\circ}6.85$	17.2'	59.6'
9	311°34.64	• • 41.61	263°44.80	11.8'	02°24.03	17.2'	59.6'
10 11	326°34.57 341°34.49	40.88 40.15	278°15.61 292°46.42	11.8' 11.8'	02°41.19 02°58.34	17.2' 17.1'	59.6' 59.6'
11	341 34.49 356°34.42	40.15 \$16°39.42	307°17.20	11.8	02°58.34 N03°15.48	17.1	59.6'
13	11°34.35	38.69	321°47.98	11.8'	03°32.59	17.1'	59.6'
14	26°34.28	37.96	336°18.74	11.7'	03°49.69	17.1'	59.6'
15 16	41°34.21 56°34.14	· · 37.23 36.50	350°49.49 5°20.22	11.7' 11.7'	04°6.76 04°23.80	17.0' 17.0'	59.6' 59.6'
16 17	56°34.14 71°34.07	36.50 35.76	19°50.93	11.7' 11.7'	04°23.80 04°40.83	17.0° 17.0'	59.6'
18	86°34.00	\$16°35.03	34°21.62	11.7'	N04°57.82	17.0'	59.6'
19	101°33.93	34.30	48°52.29	11.6'	05° 14.79	16.9'	59.6'
20	116°33.86 131°33.79	33.56 •• 32.83	63°22.94 77°53.56	11.6'	05°31.72 05°48.63	16.9'	59.6'
21 22	131°33.79 146°33.72	32.83	77°53.56 92°24.16	11.6' 11.6'	05°48.63 06°5.50	16.9' 16.8'	59.6' 59.5'
23	161°33.65	31.36	106°54.74	11.5'	06°22.34	16.8'	59.5'
	SD = 16.2'	d = -0.7'	-	SI	D = 16.3'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-15%	
31	13:22	13:27	12:13	14:01	01:36		
01	13:31	13:35	12:14	14:50	02:25		
02	13:39	13:42	12:14	15:38	03:14		

#### February 03, 04, 05 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	133°25.58	135°14.04 N01°39.38	21°12.84 N26°8.59	63°37.44 N21°39.05	144°2.25 \$06°39.22	
1	148°28.04	150°14.91 40.48	36°16.06 8.65	78°39.92 39.06	159°4.46 39.11	Alpheratz 357°34.96 29°13.79 Ankaa 353°7.31 -42°10.41
2	163°30.50	165°15.78 41.59	51° 19.28 8.71	93°42.40 39.06	174°6.67 39.00	Schedar 349°31.31 56°40.69
3	178° 32.97	180°16.65 · · 42.69	66°22.49 · · 8.77	108°44.88 · · 39.07	189°8.89 · · 38.89	Diphda 348°47.40 -17°51.10
4 5	193°35.43 208°37.90	195°17.52 43.80 210°18.40 44.90	81°25.71 8.83 96°28.92 8.89	123°47.35 39.08 138°49.83 39.09	204°11.10 38.78 219°13.31 38.67	Achernar 335°20.28 -57°6.85
6	208 37.90 223°40.36	210 18.40 44.90 225°19.27 N01°46.00	111°32.13 N26°8.95	153°52.30 N21°39.09	234°15.52 S06°38.56	Hamal 327°51.19 23°34.92
7	238° 42.82	240°20.15 47.10	126°35.34 9.01	168°54.78 39.10	249°17.73 38.45	Polaris 313°58.52 89°22.53
8	253° 45.29	255°21.03 48.21	141°38.55 9.07	183°57.26 39.11	264°19.94 38.34	Acamar 315°11.69 -40°12.49 Menkar 314°6.05 4°11.24
9	268° 47.75	270°21.91 · · 49.31	156°41.76 · · 9.13	198°59.73 · · 39.12	279°22.15 · · 38.23	Menkar 314°6.05 4°11.24 Mirfak 308°28.09 49°57.21
10	283°50.22	285°22.80 50.41	171°44.97 9.18	214°2.21 39.12	294°24.36 38.12	Aldebaran 290°39.38 16°33.60
11	298° 52.68 313° 55.14	300°23.68 51.51 315°24.57 N01°52.61	186°48.17 9.24	229° 4.68 39.13 244° 7.15 N21° 39.14	309°26.57 38.01	Rigel 281°3.60 -8°10.45
12 13	328° 57.61	330°25.46 53.71	201°51.38 N26°9.30 216°54.58 9.35	244°7.15 N21°39.14 259°9.63 39.15	324°28.77	Capella 280°21.50 46°1.52
14	344°0.07	345°26.35 54.81	231°57.78 9.41	274°12.10 39.16	354°33.19 37.68	Bellatrix 278°22.59 6°22.31
15	359°2.54	0°27.24 · · 55.91	247°0.98 · · 9.46	289°14.57 · · 39.16	9°35.40 · · 37.57	Elnath 278°1.54 28°37.76
16	14°5.00	15°28.14 57.00	262°4.18 9.52	304°17.05 39.17	24°37.61 37.46	Alnilam 275°37.44 -1°11.22 Betelgeuse 270°51.77 7°24.67
17	29°7.46	30°29.03 58.10	277°7.38 9.57	319°19.52 39.18	39°39.82 37.35	Canopus 263°51.93 -52°42.68
18	44°9.93	45°29.93 N01°59.20	292°10.57 N26°9.63	334°21.99 N21°39.19	54°42.03	Sirius 258°25.89 -16°45.14
19 20	59° 12.39 74° 14.86	60°30.83 02°0.30 75°31.73 1.39	307°13.77 9.68 322°16.96 9.74	349°24.46 39.20 4°26.93 39.20	69°44.24 37.13 84°46.45 37.02	Adhara 255°5.48 -29°0.48
21	89° 17.32	90°32.63 · · 2.49	337°20.15 · · 9.79	19°29.40 · · 39.21	99°48.66 · · 36.91	Procyon 244°50.45 5°9.57
22	104° 19.79	105°33.53 3.58	352°23.34 9.84	34°31.87 39.22	114°50.87 36.80	Pollux 243°16.86 27°57.90
23	119° 22.25	120°34.44 4.68	7°26.53 9.89	49°34.34 39.23	129°53.08 36.69	Avior 234°14.09 -59°35.41 Suhail 222°45.83 -43°32.04
Merr	pass. 15:04	ν0.9' d1.1' m-4.77	ν3.2' d0.1' m-1.02	$\nu$ 2.5' $d$ 0.0' m-2.50	ν2.2' d-0.1' m1.11	Suhail 222°45.83 -43°32.04 Miaplacidus 221°37.37 -69°49.15
14161.			ν J.Σ UU.1 III-1.UZ	ν 2.3 αυ.υ III-2.30	ν Δ.Δ. U-U.1 III1.11	Alphard 217°47.36 -8°46.11
_	CIIA	CHA	CHA	CUA	CHA	Regulus 207°34.05 11°50.56
Tue 0	<b>GHA</b> 134°24.71	<b>GHA Dec</b> 135°35.35 <b>N</b> 02°5.77	<b>GHA Dec</b> 22°29.72 N26°9.95	<b>GHA Dec</b> 64°36.81 N21°39.24	<b>GHA Dec</b> 144°55.29 <b>S</b> 06°36.58	Dubhe 193°40.30 61°36.73
1	134 24.71 149°27.18	150°36.26 6.87	37°32.91 10.00	79°39.28 39.25	159°57.49 36.47	Denebola 182°24.63 14°25.75
2	164°29.64	165°37.17 7.96	52°36.09 10.05	94°41.75 39.25	174°59.70 36.36	Gienah 175°43.31 -17°40.90
3	179°32.11	180°38.08 · · 9.05	67°39.28 · · 10.10	109°44.22 · · 39.26	190°1.91 · · 36.25	Acrux 172°59.65 -63°14.10 Gacrux 171°51.26 -57°15.06
4	194°34.57	195°39.00 10.14	82°42.46 10.15	124°46.68 39.27	205°4.12 36.14	Alioth 166°12.59 55°49.10
5	209°37.03	210°39.91 11.24	97°45.64 10.20	139°49.15 39.28	220°6.33 36.03	Spica 158°22.11 -11°17.59
6	224°39.50	225°40.83 N02°12.33	112°48.82 N26°10.25	154°51.62 N21°39.29	235°8.54 \$06°35.92	Alkaid 152°51.79 49°10.94
7 8	239° 41.96 254° 44.43	240°41.75 13.42 255°42.67 14.51	127°52.00 10.30 142°55.17 10.35	169°54.08 39.30 184°56.55 39.31	250°10.75 35.81 265°12.95 35.69	Hadar 148°35.81 -60°29.41
9	269° 46.89	270°43.59 · · 15.60	157°58.35 · · 10.40	199°59.02 · · 39.31	280°15.16 · · 35.58	Menkent 147°57.47 -36°29.51
10	284° 49.35	285°44.52 16.69	173°1.52 10.45	215°1.48 39.32	295°17.37 35.47	Arcturus 145°47.79 19°2.87
11	299°51.82	300°45.45 17.78	188°4.69 10.50	230° 3.95 39.33	310°19.58 35.36	Rigil Kent. 139°40.18 -60°56.11 Kochab 137°19.73 74°2.72
12	314°54.28	315°46.37 N02°18.86	203°7.87 N26°10.55	245°6.41 N21°39.34	325°21.79 <b>S</b> 06°35.25	Zuben'ubi 136°55.94 -16°8.79
13	329° 56.75	330°47.31 19.95	218°11.03 10.59	260°8.88 39.35	340°23.99 35.14	Alphecca 126°3.74 26°37.53
14	344°59.21	345°48.24 21.04	233°14.20 10.64	275°11.34 39.36	355°26.20 35.03	Antares 112°15.91 -26°29.23
15 16	0°1.68 15°4.14	0°49.17 · · 22.13 15°50.11 23.21	248°17.37 ·· 10.69 263°20.54 10.73	290°13.80 · · 39.37 305°16.27 39.38	10°28.41 · · 34.92 25°30.62 34.81	Atria 107°10.38 -69°4.11
17	30°6.60	30°51.04 24.30	278° 23.70 10.78	320°18.73 39.39	40°32.83 34.70	Sabik 102°2.90 -15°45.40
18	45°9.07	45°51.98 N02°25.38	293°26.86 N26°10.83	335°21.19 N21°39.39	55°35.03 <b>S</b> 06°34.59	Shaula 96°10.54 -37°7.25 Rasalhague 95°58.70 12°32.31
19	$60^{\circ}11.53$	60°52.92 26.47	308° 30.02 10.87	350°23.65 39.40	70°37.24 34.48	Eltanin 90°42.53 51°28.82
20	75° 14.00	75°53.87 27.55	323°33.18 10.92	5°26.12 39.41	85°39.45 34.36	Kaus Aust. 83°32.74 -34°22.34
21	90°16.46	90°54.81 · · 28.64	338°36.34 · · 10.96	20°28.58 · · 39.42	100°41.66 · · 34.25	Vega 80°33.53 38°48.16
22 23	105° 18.92 120° 21.39	105°55.76 29.72 120°56.71 30.80	353°39.50 11.01 8°42.66 11.05	35°31.04 39.43 50°33.50 39.44	115°43.86 34.14 130°46.07 34.03	Nunki 75°47.99 -26°15.96
						Altair 62°0.21 8°55.93
Mer.	pass. 15:00	$\nu 0.9' \ d1.1' \ \text{m-4.78}$	ν3.2' d0.1' m-0.99	$\nu 2.5' \ d0.0' \ \text{m-}2.50$	ν2.2' d-0.1' m1.11	Peacock 53°6.19 -56°39.28 Deneb 49°26.24 45°22.07
						Enif 33°39.05 9°59.31
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.25 -46°50.52
0	135°23.85	135°57.66 N02°31.88	23°45.81 N26°11.09	65°35.96 N21°39.45	145°48.28	Fomalhaut 15°14.74 -29°29.53
1 2	150° 26.32 165° 28.78	150°58.61 32.97 165°59.56 34.05	38° 48.96 11.14 53° 52.11 11.18	80°38.42 39.46 95°40.88 39.47	160°50.49 33.81 175°52.69 33.70	Scheat 13°45.46 28°13.13
3	165°28.78 180°31.24	181° 0.52 · · 35.13	68°55.26 · · 11.22	95°40.88 39.47 110°43.34 · · 39.48	175°52.69 33.70 190°54.90 · · 33.59	Markab 13°30.12 15°20.37
4	195°33.71	196°1.48 36.21	83°58.41 11.26	125°45.80 39.49	205°57.11 33.48	Feb 03 Mon SHA Mer.pass
5	210°36.17	211°2.43 37.29	99°1.56 11.31	140°48.25 39.50	220°59.31 33.36	Venus 1°48.46 14:58
6	225°38.64	226°3.40 N02°38.37	114°4.71 N26°11.35	155°50.71 N21°39.51	236°1.52 <b>S</b> 06°33.25	Mars 247° 47.27 22:30
7	240°41.10	241°4.36 39.44	129°7.85 11.39	170°53.17 39.52	251°3.73 33.14	Jupiter 290°11.87 19:42
8 9	255° 43.57 270° 46.03	256°5.32 40.52	144°10.99 11.43	185°55.63 39.53 200°58.08 · · 39.54	266°5.93 33.03 281°8.14 · · 32.92	Saturn 10°36.68 14:22
10	270° 46.03 285° 48.49	271°6.29 · · 41.60 286°7.26 42.68	159°14.14 · · 11.47 174°17.28	200°58.08 · · 39.54 216°0.54 39.55	281°8.14 · · · 32.92 296°10.35	Feb 04 Tue SHA Mer.pass
11	300°50.96	301°8.23 43.75	189°20.41 11.55	231° 3.00 39.56	311°12.55 32.70	Venus 1°10.63 14:57
12	315°53.42	316°9.20 N02°44.83	204°23.55 N26°11.59	246°5.45 N21°39.57	326°14.76	Mars 248°5.01 22:25 Jupiter 290°12.10 19:38
13	330°55.89	331°10.17 45.90	219°26.69 11.63	261°7.91 39.58	341°16.97 32.47	Jupiter 290°12.10 19:38 Saturn 10°30.57 14:18
14	345°58.35	346°11.15 46.98	234°29.82 11.67	276°10.36 39.59	356°19.17 32.36	
15 16	1°0.81 16°3.28	1°12.13 · · · 48.05 16°13.10 49.13	249°32.96 ·· 11.71 264°36.09     11.74	291°12.82 · · 39.60 306°15.27 39.61	11°21.38 · · 32.25 26°23.59 32.14	Feb 05 Wed SHA Mer.pass
16 17	31°5.74	31°14.09 50.20	279°39.22 11.78	306 15.27 39.61 321°17.72 39.62	20 23.59 32.14 41°25.79 32.03	Venus 0°33.80 14:55 Mars 248°21.96 22:20
18	46°8.21	46°15.07 N02°51.27	294° 42.35 N26° 11.82	336°20.18 N21°39.63	56°28.00 S06°31.92	Jupiter 290°12.11 19:34
19	61° 10.67	61°16.05 52.34	309°45.47 11.86	351°22.63 39.64	71°30.20 31.80	Saturn 10°24.43 14:15
20	76°13.13	76°17.04 53.42	324°48.60 11.89	6°25.08 39.65	86°32.41 31.69	
21	91°15.60	91°18.03 · · 54.49	339°51.72 · · 11.93	21°27.53 · · 39.66	101°34.62 · · 31.58	Horizontal parallax Venus: 0.3
22 23	106° 18.06 121° 20.53	106°19.02 55.56 121°20.01 56.63	354°54.85 11.97 9°57.97 12.00	36°29.99 39.67 51°32.44 39.68	116°36.82 31.47 131°39.03 31.36	Mars: 0.2
Mer.p	pass. 14:56	$ u 1.0' \; d 1.1' \; \text{m-4.79}$	$ u 3.2' \ d0.0' \ \text{m-}0.96$	$\nu 2.5' \ d0.0' \ \text{m-}2.49$	$\nu 2.2' \ d ext{-}0.1' \ m1.11$	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.58	S16°30.62	$121^{\circ}25.28$	11.5'	$N06^{\circ}39.14$	16.8'	59.5'
1	191°33.52	29.89	135°55.80	11.5'	06°55.90	16.7'	59.5'
2	206°33.45 221°33.38	29.15 •• 28.41	150° 26.29 164° 56.75	11.5' 11.4'	07° 12.62 07° 29.30	16.7' 16.6'	59.5' 59.5'
4	236°33.32	27.67	179° 27.17	11.4'	07°45.94	16.6'	59.5'
5	251°33.25	26.93	193°57.57	11.4'	08°2.54	16.5'	59.5'
6	266°33.18	<b>S</b> 16°26.19	208°27.92	11.3'	N08° 19.08	16.5'	59.5'
7	281°33.12	25.45	222°58.24	11.3'	08°35.59	16.5'	59.5'
8 9	296°33.05 311°32.99	24.71 •• 23.97	237°28.53 251°58.77	11.2' 11.2'	08°52.04 09°8.44	16.4' 16.3'	59.5' 59.5'
10	326°32.93	23.23	266° 28.98	11.2'	09° 24.79	16.3	59.5'
11	341°32.86	22.49	$280^{\circ}59.14$	11.1'	09°41.08	16.2'	59.5'
12	356°32.80	S16°21.75	295°29.27	11.1'	N09°57.32	16.2'	59.5'
13 14	11°32.74 26°32.67	21.01 20.26	309°59.35 324°29.38	11.0' 11.0'	10°13.50 10°29.63	16.1' 16.1'	59.4' 59.4'
14 15	20 32.67 41°32.61	19.52	324 29.38 338°59.37	10.9'	10 29.63 10°45.69	16.1	59.4 59.4'
16	56°32.55	18.78	353°29.31	10.9'	11°1.70	15.9'	59.4'
17	71°32.49	18.03	$7^{\circ}59.21$	10.8'	$11^{\circ}17.64$	15.9'	59.4'
18	86°32.43	S16°17.29	22°29.05	10.8'	N11°33.51	15.8'	59.4'
19 20	101°32.36 116°32.30	16.54 15.80	36°58.85 51°28.59	10.7' 10.7'	11°49.32 12°5.06	15.7' 15.7'	59.4' 59.4'
21	131°32.24	• • 15.05	65°58.28	10.7	12° 20.73	15.6'	59.4'
22	146°32.18	14.30	80° 27.92	10.6'	12°36.33	15.5'	59.4'
23	161°32.12	13.55	$94^{\circ}57.51$	10.5'	$12^{\circ}51.86$	15.5'	59.4'
	SD = 16.2'	d = -0.7'		SE	D = 16.2'		
т	CUA	Daa	CU 4		Dec	اد	μn
Tue 0	<b>GHA</b> 176°32.06	<b>Dec</b> \$16° 12.81	<b>GHA</b> 109° 27.03	u 10.5'	<b>Dec</b> N13°7.32	d 15.4'	<b>HP</b> 59.4'
1	191°32.01	12.06	123° 56.51	10.4	13°22.70	15.3	59.3'
2	206°31.95	11.31	138° 25.92	10.4'	13°38.00	15.2'	59.3'
3	221°31.89	• • 10.56	152°55.28	10.3'	13°53.22	15.1'	59.3'
4 5	236°31.83 251°31.77	9.81 9.06	167°24.57 181°53.81	10.2' 10.2'	14°8.36 14°23.42	15.1' 15.0'	59.3' 59.3'
6	266°31.72	\$16°8.31	196° 22.98	10.2	N14° 38.40	14.9'	59.3'
7	281°31.66	7.56	210°52.10	10.0'	14°53.29	14.8'	59.3'
8	296°31.60	6.81	225°21.15	10.0'	15°8.10	14.7'	59.3'
9	311°31.55	• • 6.05	239°50.13	9.9'	15°22.82	14.6'	59.3'
10 11	326°31.49 341°31.44	5.30 4.55	254° 19.05 268° 47.91	9.9' 9.8'	15° 37.45 15° 51.98	14.5' 14.4'	59.2' 59.2'
12	356°31.38	\$16°3.79	283°16.69	9.7'	N16°6.43	14.4'	59.2'
13	11°31.33	3.04	297°45.42	9.7'	16°20.78	14.3'	59.2'
14	26°31.27	2.28	312° 14.07	9.6'	16°35.04	14.2'	59.2'
15 16	41°31.22 56°31.17	· · 1.53 0.77	326° 42.65 341° 11.17	9.5' 9.4'	16° 49.20 17° 3.25	14.1' 14.0'	59.2' 59.2'
17	71°31.11	16°0.02	355°39.61	9.4 9.4'	17 3.25 17°17.21	13.9'	59.2'
18	86°31.06	S15°59.26	10°7.98	9.3'	N17°31.07	13.8'	59.2'
19	101°31.01	58.50	24°36.28	9.2'	17°44.83	13.6'	59.1'
20	116°30.96	57.75	39°4.51	9.2'	17°58.48		59.1'
21 22	131°30.91 146°30.85	· · 56.99 56.23	53°32.67 68°0.75	9.1' 9.0'	18° 12.02 18° 25.46	13.4' 13.3'	59.1' 59.1'
23	161°30.80	55.47	82°28.76	8.9'	18°38.78	13.2'	59.1'
	SD = 16.2'	d = -0.7'		SE	O = 16.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
oved 0	176°30.75	\$15° 54.71	96°56.70	ν 8.9'	N18° 52.00	13.1'	59.1'
1	191°30.70	53.95	111°24.56	8.8'	19°5.10	13.0'	59.1'
2	206°30.65	53.19	125°52.35	8.7'	19° 18.09	12.9'	59.0'
3 4	221°30.60 236°30.56	· · 52.43 51.67	140°20.06 154°47.69	8.6' 8.6'	19°30.96 19°43.72	12.8' 12.6'	59.0' 59.0'
4 5	250 30.50 251°30.51	50.91	169° 15.25	8.5'	19 43.72 19°56.36	12.5'	59.0'
6	266°30.46	S15°50.15	183°42.73	8.4'	N20°8.88	12.4'	59.0'
7	281°30.41	49.38	198° 10.13	8.3'	20°21.28	12.3'	59.0'
8	296°30.36 311°30.32	48.62	212°37.46 227°4.71	8.3' 8.2'	20°33.55 20°45.70	12.2'	59.0'
9 10	311°30.32 326°30.27	· · 47.86 47.09	227° 4.71 241° 31.89	8.2° 8.1'	20°45.70 20°57.73	12.0' 11.9'	59.0' 58.9'
11	341°30.22	46.33	255°58.98	8.0'	21°9.63	11.8'	58.9'
12	356°30.18	S15°45.56	270°26.00	7.9'	N21°21.40	11.6'	58.9'
13	11°30.13	44.80	284°52.94	7.9'	21°33.04	11.5'	58.9'
14 15	26°30.08 41°30.04	44.03 •• 43.26	299° 19.81 313° 46.59	7.8' 7.7'	21°44.55 21°55.93	11.4' 11.2'	58.9' 58.9'
16	56°29.99	42.50	328° 13.30	7.7 7.6'	21 55.95 22°7.17	11.1'	58.9'
17	71°29.95	41.73	342°39.93	7.6'	22°18.28	11.0'	58.8'
18	86°29.91	S15°40.96	357°6.49	7.5'	N22° 29.25	10.8'	58.8'
19	101°29.86 116°29.82	40.19	11°32.96 25°59.36	7.4' 7.3'	22°40.08 22°50.77	10.7'	58.8'
20 21	116°29.82 131°29.78	39.43 •• 38.66	25°59.36 40°25.69	7.3' 7.2'	22°50.77 23°1.32	10.6' 10.4'	58.8' 58.8'
22	131 29.76 146°29.73	37.89	54° 51.94	7.2'	23°11.73	10.4	58.8'
23	161°29.69	37.12	69° 18.11	7.1'	23°22.00	10.1'	58.7'
	SD = 16.2'	d = -0.8'		SE	D = 16.1'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-46%	
03	13:46	13:49	12:14	16:27	04:02		
04	13:52	13:54	12:14	17:18	04:52		
05	13:57	13:59	12:14	18:12	05:45		

# February 06, 07, 08 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	136°22.99	136°21.00 N02°57.70	25°1.09 N26°12.04	66°34.89 N21°39.69	146°41.23 <b>S</b> 06°31.25	
1	151° 25.46	151°22.00 58.76	40°4.21 12.07	81°37.34 39.70	161°43.44 31.13	Alpheratz 357°34.96 29°13.78 Ankaa 353°7.32 -42°10.40
2	166° 27.92	166°23.00 02°59.83	55°7.33 12.11	96°39.79 39.71	176°45.64 31.02	Schedar 349°31.33 56°40.68
3 4	181°30.38 196°32.85	181°24.00 03°0.90 196°25.00 1.97	70°10.44 · · 12.14 85°13.56 12.18	111°42.24 · · 39.72 126°44.69 39.74	191°47.85 · · 30.91 206°50.06 30.80	Diphda 348°47.40 -17°51.10
5	211°35.31	211°26.00 3.03	100° 16.67 12.21	141°47.14 39.75	221°52.26 30.69	Achernar 335°20.31 -57°6.84
6	226°37.78	226°27.01 N03°4.10	115°19.78 N26°12.24	156°49.59 N21°39.76	236°54.47 <b>S</b> 06°30.58	Hamal 327°51.20 23°34.92 Polaris 313°59.76 89°22.53
7	241° 40.24	241°28.01 5.16	130°22.89 12.28	171°52.04 39.77	251°56.67 30.46	Acamar 315°11.70 -40°12.49
8 9	256° 42.71 271° 45.17	256°29.02 6.23 271°30.03 · · 7.29	145°26.00 12.31 160°29.11 · · 12.34	186°54.48 39.78 201°56.93 · · 39.79	266°58.88 30.35 282°1.08 · · 30.24	Menkar 314°6.06 4°11.24
10	271 45.17 286° 47.63	286°31.05 8.36	175°32.21 12.37	216°59.38 39.80	282°1.08 · · 30.24 297°3.29 30.13	Mirfak 308°28.10 49°57.21
11	301°50.10	301°32.06 9.42	190°35.32 12.41	232°1.83 39.81	312°5.49 30.02	Aldebaran 290°39.39 16°33.59
12	316° 52.56	316°33.08 N03°10.48	205°38.42 N26°12.44	247° 4.27 N21° 39.82	327°7.70 \$06°29.90	Rigel 281°3.61 -8°10.46 Capella 280°21.51 46°1.52
13	331°55.03	331°34.10 11.54	220°41.52 12.47	262° 6.72 39.84	342°9.90 29.79	Bellatrix 278°22.60 6°22.30
14 15	346° 57.49 1° 59.95	346°35.12 12.61 1°36.14 · · 13.67	235° 44.62 12.50 250° 47.72 · · 12.53	277° 9.16 39.85 292° 11.61 · · 39.86	357°12.11 29.68 12°14.31 · · 29.57	Elnath 278°1.55 28°37.76
16	17°2.42	16°37.16 14.73	265°50.82 12.56	307°14.06 39.87	27°16.52 29.46	Alnilam 275°37.44 -1°11.23
17	32°4.88	31°38.19 15.79	280°53.92 12.59	322°16.50 39.88	42°18.72 29.34	Betelgeuse 270°51.77 7°24.66 Canopus 263°51.95 -52°42.69
18	47°7.35	46°39.22 N03°16.84	295°57.01 N26°12.62	337°18.94 N21°39.89	57°20.92 S06°29.23	Sirius 258°25.89 -16°45.15
19 20	62°9.81 77°12.28	61° 40.25 17.90 76° 41.28 18.96	311°0.10 12.65 326°3.19 12.68	352°21.39 39.90 7°23.83 39.92	72°23.13 29.12 87°25.33 29.01	Adhara 255°5.49 -29°0.49
21	92° 14.74	91°42.31 · · 20.02	341°6.28 · · 12.70	22°26.27 · · 39.93	102°27.54 · · 28.89	Procyon 244°50.45 5°9.57
22	107° 17.20	106°43.35 21.07	356°9.37 12.73	37°28.72 39.94	117°29.74 28.78	Pollux 243°16.86 27°57.90 Avior 234°14.10 -59°35.43
23	$122^{\circ}19.67$	121°44.39 22.13	11°12.46 12.76	52°31.16 39.95	132°31.95 28.67	Avior 234°14.10 -59°35.43 Suhail 222°45.82 -43°32.06
Mer.ı	pass. 14:52	$\nu 1.0' \ d1.1' \ \text{m-4.79}$	$\nu 3.1' \ d0.0' \ \text{m-}0.93$	$\nu 2.5' \ d0.0' \ \text{m-}2.48$	ν2.2' d-0.1' m1.11	Miaplacidus 221°37.37 -69°49.18
						Alphard 217°47.35 -8°46.12
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.03 11°50.56
0	137°22.13	136°45.43 N03°23.18	26°15.55 N26°12.79	67°33.60 N21°39.96	147°34.15	Dubhe 193°40.28 61°36.74 Denebola 182°24.61 14°25.74
1	$152^{\circ}24.60$	151°46.47 24.24	41°18.63 12.81	82°36.04 39.97	162°36.36 28.45	Gienah 175°43.29 -17°40.91
2	167°27.06	166° 47.51 25.29	56°21.71 12.84	97°38.48 39.99	177°38.56 28.33	Acrux 172°59.61 -63°14.12
3 4	182°29.52 197°31.99	181°48.56 · · 26.35 196°49.60 27.40	71°24.79 · · 12.87 86°27.87 12.89	112°40.93 ·· 40.00 127°43.37     40.01	192°40.76 · · 28.22 207°42.97 28.11	Gacrux 171°51.23 -57°15.07
5	212° 34.45	211°50.65 28.45	101°30.95 12.92	142°45.81 40.02	207 42.97 28.11 222°45.17 28.00	Alioth 166°12.56 55°49.10
6	227°36.92	226°51.70 N03°29.50	116°34.03 N26°12.95	157°48.25 N21°40.03	237°47.37 <b>S</b> 06°27.88	Spica 158°22.09 -11°17.60 Alkaid 152°51.76 49°10.94
7	242° 39.38	241°52.76 30.55	131° 37.10 12.97	172°50.69 40.05	252°49.58 27.77	Hadar 148°35.76 -60°29.42
8	257° 41.85	256°53.81 31.60	146°40.18 13.00	187°53.12 40.06	267°51.78 27.66	Menkent 147°57.44 -36°29.51
9 10	272° 44.31 287° 46.77	271°54.87 · · 32.65 286°55.93 33.70	161°43.25 ·· 13.02 176°46.32     13.04	202°55.56 ·· 40.07 217°58.00 40.08	282°53.99 · · 27.55 297°56.19 27.43	Arcturus 145°47.76 19°2.87
11	302°49.24	301°56.99 34.75	191°49.39 13.07	233° 0.44 40.09	312°58.39 27.32	Rigil Kent. 139°40.13 -60°56.12
12	317°51.70	316°58.05 N03°35.80	206°52.46 N26°13.09	248°2.88 N21°40.11	328°0.60 S06°27.21	Kochab 137°19.68 74°2.72 Zuben'ubi 136°55.92 -16°8.79
13	332°54.17	331°59.12 36.85	221°55.53 13.11	263°5.31 40.12	343°2.80 27.10	Alphecca 126°3.72 26°37.53
14	347° 56.63	347°0.19 37.89	236°58.59 13.14	278° 7.75 40.13	358°5.00 26.98 13°7.21 · · · 26.87	Antares 112°15.88 -26°29.23
15 16	2°59.10 18°1.56	2°1.25 · · 38.94 17°2.32	252°1.65 ·· 13.16 267°4.72 13.18	293°10.19 · · 40.14 308°12.62 40.16	13°7.21 · · · 26.87 28°9.41	Atria 107°10.32 -69°4.11
17	33°4.02	32°3.40 41.03	282°7.78 13.20	323°15.06 40.17	43°11.61 26.65	Sabik 102°2.87 -15°45.40 Shaula 96°10.51 -37°7.25
18	48°6.49	47°4.47 N03°42.07	297°10.84 N26°13.23	338°17.49 N21°40.18	58°13.82 <b>S</b> 06°26.53	Rasalhague 95°58.68 12°32.31
19	63°8.95	62°5.55 43.12	312°13.90 13.25	353°19.93 40.19	73°16.02 26.42	Eltanin 90° 42.51 51° 28.81
20 21	78° 11.42 93° 13.88	77°6.63 44.16 92°7.71 · · 45.20	327°16.95 13.27 342°20.01 · · 13.29	8°22.36 40.21 23°24.80 • 40.22	88°18.22 26.31 103°20.43 · · 26.19	Kaus Aust. 83°32.71 -34°22.33
22	108° 16.34	107°8.79 46.25	357°23.06 13.31	38°27.23 40.23	118°22.63 26.08	Vega 80°33.51 38°48.15
23	123° 18.81	122°9.88 47.29	12°26.11 13.33	53°29.66 40.25	133°24.83 25.97	Nunki 75°47.97 -26°15.96 Altair 62°0.20 8°55.93
Mer.ı	pass. 14:48	$\nu 1.0' \ d1.1' \ \text{m-4.80}$	ν3.1' d0.0' m-0.90	ν2.4' d0.0' m-2.47	ν2.2' d-0.1' m1.12	Peacock 53°6.17 -56°39.27
						Deneb 49°26.23 45°22.06
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.05 9°59.30
0	138°21.27	137°10.96 N03°48.33	27°29.16 N26°13.35	68°32.10 N21°40.26	148°27.03	Al Na'ir 27°33.25 -46°50.50 Fomalhaut 15°14.75 -29°29.52
1	153°23.74	152°12.05 49.37	42°32.21 13.37	83°34.53 40.27	163°29.24 25.74	Scheat 13°45.46 28°13.13
2	168° 26.20	167° 13.14 50.41	57°35.26 13.39	98°36.96 40.28	178°31.44 25.63	Markab 13°30.12 15°20.37
3 4	183° 28.67 198° 31.13	182°14.24 · · 51.44 197°15.33 52.48	72°38.31 ·· 13.41 87°41.35 13.42	113°39.39 · · 40.30 128°41.83 40.31	193°33.64 · · 25.52 208°35.84 25.40	Feb 06 Thu SHA Mer.pass
5	213°33.59	212°16.43 53.52	102°44.39 13.44	143°44.26 40.32	223°38.05 25.29	Venus 359°58.01 14:54
6	228°36.06	227°17.53 N03°54.56	117°47.43 N26°13.46	158°46.69 N21°40.34	238°40.25 <b>S</b> 06°25.18	Mars 248°38.10 22:15
7	243°38.52	242°18.63 55.59	132°50.47 13.48	173°49.12 40.35	253°42.45 25.07	Jupiter 290°11.90 19:30
8 9	258° 40.99 273° 43.45	257°19.73 56.63 272°20.84 •• 57.66	147°53.51 13.49	188°51.55 40.36 203°53.98 • • 40.38	268°44.65 24.95	Saturn 10°18.24 14:11
10	273 45.45 288° 45.92	272°20.84 · · 57.66 287°21.94 58.69	162°56.55 · · 13.51 177°59.59 13.53	203°53.98 · · 40.38 218°56.41 40.39	283°46.86 · · 24.84 298°49.06 24.73	Feb 07 Fri SHA Mer.pass
11	303°48.38	302°23.05 03°59.73	193°2.62 13.54	233°58.84 40.40	313°51.26 24.61	Venus 359°23.29 14:52
12	318° 50.84	317°24.16 N04°0.76	208°5.65 N26°13.56	249°1.26 N21°40.42	328°53.46 <b>S</b> 06°24.50	Mars 248°53.41 22:10 Jupiter 290°11.47 19:27
13	333°53.31	332°25.28 1.79	223°8.68 13.58	264° 3.69 40.43	343°55.66 24.39	Saturn 10°12.02 14:08
14 15	348° 55.77 3° 58.24	347°26.39 2.82 2°27.51 · · 3.85	238°11.71 13.59 253°14.74 · · 13.61	279°6.12 40.44 294°8.55 • 40.46	358°57.87 24.27 14°0.07 •• 24.16	
16	19° 0.70	17°28.63 4.88	268°17.77 13.62	309°10.98 40.47	29°2.27 24.05	Feb 08 Sat SHA Mer.pass Venus 358°49.69 14:50
17	34°3.16	32°29.75 5.91	283°20.80 13.63	324°13.40 40.49	44°4.47 23.93	Mars 249°7.89 22:06
18	49°5.63	47°30.87 N04°6.94	298°23.82 N26°13.65	339°15.83 N21°40.50	59°6.67	Jupiter 290°10.83 19:23
19 20	64°8.09 79°10.56	62°32.00 7.97 77°33.12 9.00	313°26.84 13.66 328°29.86 13.68	354°18.25 40.51 9°20.68 40.53	74°8.87 23.71 89°11.08 23.59	Saturn 10°5.76 14:04
21	79 10.56 94°13.02	92°34.25 · · 10.02	343°32.88 · · 13.69	24°23.10 · · 40.54	104°13.28 · · 23.48	Horizontal parallax
22	$109^{\circ}15.49$	107°35.39 11.05	358°35.90 13.70	39°25.53 40.55	119°15.48 23.37	Venus: 0.3
23	124° 17.95	122°36.52 12.07	13°38.92 13.71	54°27.95 40.57	134°17.68 23.25	Mars: 0.2
Mer.	pass. 14:44	ν1.1' d1.0' m-4.81	ν3.0′ d0.0′ m-0.87	ν2.4' d0.0' m-2.46	ν2.2' d-0.1' m1.12	

11 —		+0.0434 Sec	$\Delta I = II$	-011	- +09.130	0 360	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°29.65	\$15°36.35	83°44.21	7.0'	N23°32.12	10.0'	58.7'
1 2	191°29.61 206°29.57	35.57 34.80	98°10.23 112°36.18	6.9' 6.9'	23°42.09 23°51.92	9.8' 9.7'	58.7' 58.7'
3	200 29.57 221°29.53	34.80 •• 34.03	112 30.18 127°2.06	6.8'	23 51.92 24°1.60	9.7 9.5'	58.7'
4	236°29.48	33.26	141°27.86	6.7'	24°11.13	9.4'	58.7'
5	251°29.44	32.49	155°53.59	6.7'	24°20.51	9.2'	58.7'
6	266°29.40	S15°31.71	170°19.25	6.6'	N24°29.73	9.1'	58.6'
7	281°29.37	30.94	184°44.84	6.5'	24°38.80	8.9'	58.6'
8	296°29.33	30.16	199°10.36	6.4'	24°47.72	8.8'	58.6'
9	311°29.29 326°29.25	· · 29.39 28.61	213°35.80 228°1.19	6.4' 6.3'	24°56.48 25°5.08	8.6' 8.4'	58.6' 58.6'
10 11	320 29.25 341°29.21	27.84	242°26.50	6.2	25° 13.53	8.3'	58.6'
12	356°29.17	\$15°27.06	256°51.75	6.2	N25°21.82	8.1'	58.5
13	11°29.14	26.29	271°16.93	6.1'	25° 29.94	8.0'	58.5'
14	$26^{\circ}29.10$	25.51	285°42.04	6.1'	25°37.90	7.8'	58.5'
15	41°29.06	• • 24.73	300°7.10	6.0'	25°45.71	7.6'	58.5'
16	56°29.03	23.95	314°32.09	5.9'	25°53.34	7.5'	58.5'
17 18	71°28.99 86°28.96	23.18 \$15°22.40	328°57.02 343°21.89	5.9' 5.8'	26°0.82 N26°8.12	7.3' 7.1'	58.5' 58.4'
19	101°28.92	21.62	357°46.71	5.8'	26° 15.26	7.1	58.4'
20	116°28.89	20.84	12°11.46	5.7'	26°22.24	6.8'	58.4
21	131°28.85	20.06	26°36.16	5.6'	26°29.04	6.6'	58.4'
22	146°28.82	19.28	41°0.81	5.6'	26°35.68	6.5'	58.4'
23	161°28.78	18.50	55°25.41	5.5'	26°42.14	6.3'	58.4'
	SD = 16.2'	d = -0.8'		S	D = 16.0'		
Fri	GHA	Dec	GHA	ν,	Dec	d	HP
0 1	176°28.75 191°28.72	\$15°17.71 16.93	69°49.95 84°14.44	5.5' 5.4'	N26° 48.44 26° 54.56	6.1' 5.9'	58.3' 58.3'
2	206°28.68	16.15	98°38.89	5.4	20° 34.50 27° 0.51	5.8'	58.3
3	221°28.65	. 15.37	113°3.29	5.4	27°6.28	5.6'	58.3
4	236°28.62	14.58	127°27.64	5.3'	27° 11.88	5.4'	58.3'
5	251°28.59	13.80	141°51.95	5.3'	27° 17.31	5.3'	58.3'
6	266°28.56	S15°13.02	156°16.22	5.2'	N27°22.56	5.1'	58.2'
7	281°28.53	12.23	170°40.46	5.2'	27° 27.64	4.9'	58.2'
8 9	296°28.49 311°28.46	11.45 •• 10.66	185°4.65 199°28.81	5.2' 5.1'	27°32.53 27°37.25	4.7' 4.5'	58.2' 58.2'
10	326°28.43	9.88	213°52.93	5.1'	27°41.80	4.4	58.2'
11	341°28.41	9.09	228°17.02	5.1'	27°46.16	4.2'	58.2'
12	356°28.38	S15°8.30	242°41.09	5.0'	N27°50.34	4.0'	58.1'
13	11°28.35	7.52	$257^{\circ}5.12$	5.0'	27°54.35	3.8'	58.1'
14	26°28.32	6.73	271°29.13	5.0'	27°58.17	3.6'	58.1'
15	41°28.29 56°28.26	• • 5.94	285°53.11 300°17.08	5.0'	28°1.82 28°5.28	3.5'	58.1' 58.1'
16 17	71°28.24	5.15 4.36	300°17.08 314°41.02	4.9' 4.9'	28° 5.28 28° 8.56	3.3' 3.1'	58.1
18	86°28.21	\$15°3.57	329°4.94	4.9	N28° 11.66	2.9'	58.0'
19	101°28.18	2.78	343°28.85	4.9'	28° 14.58	2.7'	58.0'
20	116°28.16	1.99	357°52.75	4.9'	28° 17.32	2.6'	58.0'
21	131°28.13	•• 1.20	12°16.63	4.9'	$28^{\circ}19.87$	2.4'	58.0'
22	146°28.10	15°0.41	26°40.51	4.9'	28° 22.25	2.2'	58.0'
23	161°28.08	14°59.62	41°4.38	4.9'	28°24.44	2.0'	58.0'
	SD = 16.2'	d = -0.8'		S	D = 15.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.05	S14°58.83	55°28.24	4.9'	N28° 26.44	1.8'	57.9'
1	191°28.03	58.03	69°52.11	4.9'	28° 28.27	1.6'	57.9'
2	206°28.00	57.24	84°15.97	4.9'	28° 29.91	1.5'	57.9'
3	221°27.98 236°27.96	• • 56.45	98°39.83 113°3.70	4.9'	28°31.37 28°32.65	1.3'	57.9'
4 5	236°27.96 251°27.93	55.65 54.86	113°3.70 127°27.58	4.9' 4.9'	28° 32.65 28° 33.74	1.1' 0.9'	57.9' 57.8'
6	266°27.91	\$14°54.06	121 21.56 141°51.46	4.9	N28° 34.65	0.9	57.8'
7	281°27.89	53.27	156°15.35	4.9'	28°35.38	0.5'	57.8'
8	296°27.87	52.47	170°39.26	4.9'	28°35.93	0.4'	57.8'
9	311°27.84	•• 51.68	185°3.19	4.9'	28°36.29	0.2'	57.8'
10	326°27.82	50.88	199°27.13	5.0'	28° 36.47	0.0'	57.8'
11 12	341°27.80 356°27.78	50.09 \$14°49.29	213°51.09 228°15.08	5.0' 5.0'	28° 36.47 N28° 36.29	-0.2' -0.4'	57.7' 57.7'
13	11°27.76	48.49	242°39.09	5.0'	28° 35.93	-0.4 -0.5'	57.7'
14	26°27.74	47.69	257°3.12	5.1'	28°35.39	-0.3'	57.7'
15	41°27.72	• • 46.89	271°27.19	5.1'	28° 34.67	-0.9'	57.7'
16	56°27.70	46.09	285°51.29	5.1'	28° 33.76	-1.1'	57.6'
17	71°27.68	45.30	300°15.42	5.2'	28° 32.68	-1.3'	57.6'
18	86°27.66 101°27.65	\$14°44.50	314°39.58	5.2'	N28°31.42 28°29.98	-1.4'	57.6'
19 20	101°27.65 116°27.63	43.69 42.89	329°3.79 343°28.03	5.2' 5.3'	28°29.98 28°28.37	-1.6' -1.8'	57.6' 57.6'
21	131°27.61	• • 42.09	357°52.32	5.3'	28° 26.57	-2.0'	57.5'
22	146°27.59	41.29	12°16.65	5.4'	28°24.60	-2.1'	57.5'
23	161°27.58	40.49	26°41.03	5.4'	28°22.46	-2.3'	57.5'
	SD = 16.2'	d = -0.8'		S	D = 15.8'		

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

Lat.		Moonris	e		Moonset	t .
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°	08:02			05:05		
62° 60°	08:44	08:30	10.00	04:24	06:41	07.15
	09:13	09:25	10:02	03:56	05:46	07:15
N 58°	09:35	09:58	10:43	03:35	05:14	06:34
56° 54°	09:54	10:22	11:11	03:17	04:50	06:06
54 52°	10:09 10:22	10:42 10:59	11:33 11:51	03:02 02:49	04:30 04:14	05:45 05:27
50°	10:22	11:13	12:06	02:49	04:14	05:27
45°	10:59	11:42	12:37	02:30	03:31	04:40
<b>N</b> 40°	11:19	12:05	13:01	01:56	03:09	04:16
35°	11:35	12:24	13:21	01:40	02:51	03:56
30°	11:49	12:40	13:38	01:26	02:35	03:39
20°	12:14	13:08	14:07	01:04	02:08	03:11
N 10°	12:35	13:32	14:32	00:44	01:45	02:46
0°	12:55	13:54	14:55	00:25	01:23	02:23
<b>S</b> 10°	13:15	14:17	15:18	00:07	01:02	02:00
20°	13:37	14:41	15:42		00:39	01:36
30°	14:02	15:09	16:11		00:12	01:07
35°	14:17	15:26	16:28	23:57		00:50
40°	14:35	15:46	16:48	23:39	•• ••	00:30
45°	14:56	16:09	17:12	23:17	•• ••	00:06
<b>S</b> 50°	15:22	16:40	17:43	22:49	23:35	
52°	15:35	16:55	17:59	22:36	23:20	
54°	15:50	17:13	18:17	22:21	23:02	00.41
56° 58°	16:08 16:30	17:35 18:02	18:39 19:08	22:03 21:41	22:40 22:12	23:41 23:12
<b>S</b> 60°	16:30	18:02 18:42	19:08 19:49	21:41	22:12	23:12
3 00	10:57	10:42	19:49	21:13	21:32	22:31

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-78%	
06	14:01	14:03	12:14	19:09	06:40		
07	14:05	14:06	12:14	20:09	07:39		
08	14:08	14:09	12:14	21:09	08:39		

### February 09, 10, 11 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	139° 20.41	137°37.66 N04°13.10	28°41.93 N26°13.73	69°30.38 N21°40.58	149°19.88 \$06°23.14	
1	154° 22.88	152°38.79 14.12	43°44.94 13.74	84°32.80 40.60	164°22.08 23.03	Alpheratz 357°34.96 29°13.77
2	169°25.34	167°39.93 15.15	58°47.96 13.75	99°35.23 40.61	179°24.28 22.91	Ankaa 353°7.33 -42°10.39 Schedar 349°31.34 56°40.68
3	184° 27.81	182°41.07 · · 16.17	73°50.97 · · 13.76	114°37.65 · · 40.63	194°26.48 · · 22.80	Diphda 348°47.41 -17°51.09
4	199°30.27	197° 42.22 17.19	88°53.98 13.77	129°40.07 40.64	209°28.69 22.69	Achernar 335°20.33 -57°6.83
5 6	214°32.73	212°43.37 18.21 227°44.51 N04°19.23	103°56.98 13.78	144°42.49 40.65 159°44.91 N21°40.67	224°30.89 22.57 239°33.09 \$06°22.46	Hamal 327°51.20 23°34.92
7	229°35.20 244°37.66	227°44.51 N04°19.23 242°45.66 20.25	118°59.99 N26°13.79 134°2.99 13.80	159°44.91 N21°40.67 174°47.34 40.68	239°33.09 S06°22.46 254°35.29 22.35	Polaris 314°1.05 89°22.53
8	259° 40.13	257° 46.82 21.27	149°6.00 13.81	189°49.76 40.70	269°37.49 22.23	Acamar 315°11.72 -40°12.48
9	274° 42.59	272°47.97 · · 22.29	164°9.00 · · 13.82	204°52.18 · · 40.71	284°39.69 · · 22.12	Menkar 314°6.07 4°11.24
10	289°45.06	287°49.13 23.31	179°12.00 13.83	219°54.60 40.73	299°41.89 22.01	Mirfak 308°28.11 49°57.21 Aldebaran 290°39.40 16°33.59
11	304°47.52	302°50.29 24.32	194°15.00 13.84	234°57.02 40.74	314°44.09 21.89	Rigel 281°3.61 -8°10.46
12	319°49.98	317°51.45 N04°25.34	209°17.99 N26°13.85	249°59.44 N21°40.76	329°46.29	Capella 280°21.52 46°1.52
13 14	334° 52.45 349° 54.91	332°52.61 26.35 347°53.78 27.37	224°20.99 13.86 239°23.98 13.86	265° 1.86 40.77 280° 4.28 40.78	344°48.49 21.66 359°50.69 21.55	Bellatrix 278°22.60 6°22.30
15	4°57.38	2°54.94 · · 28.38	254°26.98 ·· 13.87	295°6.69 · · 40.80	14°52.89 · · 21.44	Elnath 278°1.55 28°37.76
16	19°59.84	17°56.11 29.40	269°29.97 13.88	310° 9.11 40.81	29°55.09 21.32	Alnilam 275°37.45 -1°11.23
17	35°2.31	32°57.28 30.41	284°32.96 13.89	325°11.53 40.83	44°57.29 21.21	Betelgeuse 270°51.77 7°24.66 Canopus 263°51.96 -52°42.71
18	50°4.77	47°58.46 N04°31.42	299°35.95 N26°13.89	340°13.95 N21°40.84	59°59.50 S06°21.10	Sirius 258°25.89 -16°45.16
19	65°7.23	62°59.63 32.43	314°38.93 13.90	355°16.36 40.86	75°1.70 20.98	Adhara 255°5.49 -29°0.50
20 21	80°9.70 95°12.16	78°0.81 33.44 93°1.99 · · 34.45	329°41.92 13.91 344°44.90 · · 13.91	10°18.78 40.87 25°21.20 · · 40.89	90°3.90 20.87 105°6.10 · · 20.75	Procyon 244°50.44 5°9.56
21	95 12.10 110°14.63	108°3.17 35.46	359°47.88 13.92	40°23.61 40.90	105°6.10 · · 20.75 120°8.30 20.64	Pollux 243°16.85 27°57.90
23	125° 17.09	123°4.36 36.47	14°50.86 13.92	55°26.03 40.92	135°10.50 20.53	Avior 234°14.10 -59°35.45
		$\nu 1.1' \ d1.0' \ \text{m-4.82}$	$\frac{1.00.00}{\nu 3.0' \ d0.0' \ \text{m}-0.84}$	$\frac{\nu 2.4' \ d0.0' \ \text{m-}2.46}{\nu 2.4' \ d0.0' \ \text{m-}2.46}$	$\nu 2.2' \ d$ -0.1' m1.12	Suhail 222°45.82 -43°32.08 Miaplacidus 221°37.37 -69°49.20
ivier.	pass. 14:40	ν1.1 α1.0 m-4.82	ν3.0 αυ.υ m-υ.84	ν2.4 αυ.υ m-2.40	ν2.2° α-0.1° m1.12	Miaplacidus 221°37.37 -69°49.20 Alphard 217°47.34 -8°46.13
						Regulus 207°34.02 11°50.55
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.25 61°36.74
0	140° 19.55 155° 22.02	138°5.54 N04°37.48 153°6.73 38.48	29°53.84 N26°13.93 44°56.82 13.93	70°28.44 N21°40.93 85°30.86 40.95	150°12.70 S06°20.41 165°14.90 20.30	Denebola 182°24.59 14°25.74
1 2	170° 24.48	168° 7.92 39.49	59°59.80 13.94	85°30.86 40.95 100°33.27 40.96	180°17.10 20.19	Gienah 175°43.26 -17°40.93
3	185°26.95	183°9.12 · · 40.50	75°2.77 · · 13.94	115°35.69 · · 40.98	195°19.30 · · 20.07	Acrux 172°59.57 -63°14.14
4	200°29.41	198°10.31 41.50	90°5.74 13.94	130°38.10 41.00	210°21.50 19.96	Gacrux 171°51.19 -57°15.09 Alioth 166°12.52 55°49.10
5	215°31.88	213°11.51 42.50	105°8.72 13.95	145°40.51 41.01	225°23.69 19.84	Spica 158°22.06 -11°17.61
6	230°34.34	228°12.71 N04°43.51	120°11.69 N26°13.95	160°42.93 N21°41.03	240°25.89 <b>S</b> 06°19.73	Alkaid 152°51.72 49°10.94
7	245°36.80	243°13.91 44.51	135°14.65 13.95	175°45.34 41.04	255°28.09 19.62	Hadar 148°35.71 -60°29.44
8 9	260°39.27 275°41.73	258°15.11 45.51 273°16.32 · · 46.51	150°17.62 13.96 165°20.59 · · 13.96	190°47.75 41.06 205°50.16 •• 41.07	270°30.29 19.50 285°32.49 •• 19.39	Menkent 147°57.41 -36°29.53
10	290° 44.20	288°17.53 47.51	180°23.55 13.96	200°52.57 41.09	300°34.69 19.27	Arcturus 145°47.73 19°2.86
11	305° 46.66	303°18.74 48.51	195°26.51 13.96	235°54.99 41.10	315°36.89 19.16	Rigil Kent. 139°40.08 -60°56.13
12	320°49.12	318°19.95 N04°49.51	210°29.48 N26°13.96	250°57.40 N21°41.12	330°39.09	Kochab 137°19.61 74°2.71 Zuben'ubi 136°55.89 -16°8.80
13	335°51.59	333°21.16 50.51	225°32.43 13.96	265°59.81 41.14	345°41.29 18.93	Alphecca 126°3.69 26°37.52
14	350°54.05	348°22.38 51.51	240°35.39 13.96	281°2.22 41.15	0°43.49 18.82	Antares 112°15.84 -26°29.24
15	5°56.52	3°23.60 · · 52.50	255°38.35 · · 13.96	296° 4.63 · · 41.17	15°45.69 · · 18.70	Atria 107°10.25 -69°4.11
16 17	20°58.98 36°1.45	18°24.82 53.50 33°26.05 54.49	270°41.30 13.97 285°44.26 13.97	311°7.03 41.18 326°9.44 41.20	30°47.89 18.59 45°50.09 18.47	Sabik 102°2.84 -15°45.41
18	51°3.91	48°27.27 N04°55.49	300°47.21 N26°13.96	341°11.85 N21°41.22	60°52.29 S06°18.36	Shaula 96°10.48 -37°7.25
19	66°6.37	63°28.50 56.48	315°50.16 13.96	356°14.26 41.23	75°54.48 18.25	Rasalhague 95°58.65 12°32.30 Eltanin 90°42.48 51°28.80
20	81°8.84	78°29.73 57.47	330°53.11 13.96	11°16.67 41.25	90°56.68 18.13	Eltanin 90°42.48 51°28.80 Kaus Aust. 83°32.68 -34°22.33
21	96°11.30	93°30.96 · · 58.47	345°56.06 · · 13.96	26°19.08 · · 41.26	105°58.88 · · 18.02	Vega 80°33.49 38°48.14
22	111° 13.77	108°32.20 04°59.46	0°59.00 13.96	41°21.48 41.28	121°1.08 17.90	Nunki 75°47.94 -26°15.95
23	126°16.23	123°33.43 05°0.45	16°1.95 13.96	56°23.89 41.30	136°3.28 17.79	Altair 62°0.18 8°55.93
Mer.	pass. 14:36	$\nu 1.2' \ d1.0' \ \text{m-4.82}$	$ u 3.0' \ d0.0' \ \text{m-}0.81$	$ u 2.4' \ d0.0' \ \text{m-}2.45$	$ u 2.2' \ d$ -0.1' m1.12	Peacock 53°6.14 -56°39.25
						Deneb 49°26.22 45°22.05
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.04 9°59.30 Al Na'ir 27°33.24 -46°50.49
0	141° 18.69	138°34.67 N05°1.44	31°4.89 N26°13.96	71°26.30 N21°41.31	151°5.48 <b>S</b> 06°17.67	Fomalhaut 15°14.74 -29°29.51
1	156°21.16	153°35.91 2.43	46°7.83 13.95	86°28.70 41.33	166°7.68 17.56	Scheat 13°45.45 28°13.12
2	171°23.62	168° 37.16 3.41	61°10.77 13.95 76°13.71 · · 13.95	101°31.11 41.34 116°33.51 · · 41.36	181°9.87 17.45 196°12.07 •• 17.33	Markab 13°30.11 15°20.36
3 4	186° 26.09 201° 28.55	183°38.40 · · 4.40 198°39.65 5.39	91°16.65 13.95	116°33.51 · · 41.36 131°35.92 41.38	196°12.07 · · 17.33 211°14.27 17.22	Feb 09 Sun SHA Mer.pass
5	216°31.02	213°40.90 6.37	106° 19.58 13.94	146°38.32 41.39	226°16.47 17.10	Venus 358°17.24 14:48
6	231°33.48	228°42.15 N05°7.36	121°22.52 N26°13.94	161°40.72 N21°41.41	241°18.67 <b>S</b> 06°16.99	Mars 249°21.52 22:01
7	246°35.94	243°43.41 8.34	136°25.45 13.93	176°43.13 41.43	256°20.87 16.87	Jupiter 290°9.96 19:19
8	261°38.41	258° 44.66 9.33	151°28.38 13.93	191°45.53 41.44	271°23.06 16.76	Saturn 9°59.47 14:01
9	276° 40.87 291° 43.34	273°45.92 · · 10.31	166°31.31 · · 13.92	206°47.93 · · 41.46	286°25.26 · · 16.64 301°27.46 16.53	Feb 10 Mon SHA Mer.pass
10 11	306° 45.80	288° 47.19 11.29 303° 48.45 12.27	181°34.24 13.92 196°37.17 13.91	221°50.34 41.48 236°52.74 41.49	301°27.46 16.53 316°29.66 16.41	Venus 357°45.99 14:46
12	321°48.26	318°49.71 N05°13.25	211°40.09 N26°13.91	251°55.14 N21°41.51	331°31.86 S06°16.30	Mars 249°34.29 21:56
13	336° 50.73	333°50.98 14.23	226°43.01 13.90	266°57.54 41.53	346°34.05 16.19	Jupiter 290°8.89 19:15   Saturn 9°53.14 13:57
14	351°53.19	348° 52.25 15.21	241°45.94 13.90	281°59.94 41.54	1°36.25 16.07	Saturn 9°53.14 13:57
15	6°55.66	3°53.53 · · 16.19	256°48.86 · · 13.89	297°2.34 · · 41.56	16°38.45 · · 15.96	Feb 11 Tue SHA Mer.pass
16	21°58.12	18°54.80 17.17	271°51.77 13.88	312° 4.74 41.58	31°40.65 15.84	Venus 357°15.98 14:44
17 18	37°0.58 52°3.05	33°56.08 18.14 48°57.36 N05°19.12	286°54.69 13.88 301°57.61 N26°13.87	327°7.14 41.60 342°9.54 N21°41.61	46°42.85 15.73 61°45.04 \$06°15.61	Mars 249°46.20 21:51 Jupiter 290°7.60 19:11
19	67°5.51	63°58.64 20.09	317°0.52 13.86	357°11.94 41.63	76°47.24 15.50	Saturn 9° 46.78 13:54
20	82°7.98	78°59.92 21.07	332°3.44 13.85	12°14.34 41.65	91°49.44 15.38	
21	97° 10.44	94°1.21 · · 22.04	347°6.35 · · 13.85	27°16.74 · · 41.66	106°51.64 · · 15.27	Horizontal parallax
22	112°12.91	109°2.50 23.01	2°9.26 13.84	42°19.14 41.68	121°53.83 15.15	Venus: 0.3 Mars: 0.2
23	127° 15.37	124°3.79 23.98	17°12.17 13.83	57°21.54 41.70	136°56.03 15.04	ividis. 0.2
Mer.	pass. 14:32	ν1.2′ d1.0′ m-4.83	ν2.9' d-0.0' m-0.79	ν2.4' d0.0' m-2.44	ν2.2' d-0.1' m1.12	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.56	S14°39.69	41°5.46	5.5'	N28°20.14	-2.5'	57.5'
1	191°27.54	38.88	55°29.93	5.5'	$28^{\circ}17.64$	-2.7'	57.5'
2	206°27.53	38.08	69°54.46	5.6'	28° 14.97	-2.8'	57.5'
3	221°27.51	• • 37.28	84° 19.05	5.6'	28° 12.13	-3.0'	57.4'
4 5	236°27.50 251°27.48	36.47 35.67	98° 43.69 113° 8.39	5.7' 5.8'	28° 9.12 28° 5.93	-3.2' -3.4'	57.4' 57.4'
6	266°27.48	514°34.86	113 8.39 127°33.15	5.8'	28 5.93 N28°2.58	-3.4 -3.5'	57.4'
7	281°27.45	34.06	141°57.97	5.9'	27° 59.05	-3.7'	57.4
8	296°27.44	33.25	156° 22.85	6.0'	27°55.36	-3.9'	57.3'
9	311°27.42	• • 32.45	$170^{\circ}47.81$	6.0'	$27^{\circ}51.50$	-4.0'	57.3'
10	326°27.41	31.64	185° 12.82	6.1'	27°47.47	-4.2'	57.3'
11	341°27.40	30.83	199°37.91	6.2'	27°43.27 N27°38.92	-4.4'	57.3'
12 13	356°27.39 11°27.37	\$14° 30.03 29.22	214°3.07 228°28.31	6.2' 6.3'	N27° 38.92 27° 34.39	-4.5' -4.7'	57.3' 57.2'
14	26°27.36	28.41	242° 53.61	6.4	27°29.71	-4.7 -4.8'	57.2'
15	41°27.35	27.60	257° 18.99	6.5'	27°24.86	-5.0'	57.2'
16	56°27.34	26.79	271°44.45	6.5'	$27^{\circ}19.85$	-5.2'	57.2'
17	71°27.33	25.98	$286^{\circ}9.99$	6.6'	$27^{\circ}14.69$	-5.3'	57.2'
18	86°27.32	S14°25.17	300°35.61	6.7'	N27°9.36	-5.5'	57.1'
19	101°27.31	24.36	315°1.31	6.8'	27°3.88	-5.6'	57.1'
20 21	116°27.30 131°27.29	23.55	329°27.10 343°52.96	6.9' 7.0'	26° 58.25 26° 52.45	-5.8' -5.9'	57.1' 57.1'
22	131 27.29 146°27.28	21.93	343 52.90 358° 18.92	7.0'	26°46.51	-5.9 -6.1'	57.1'
23	161°27.27	21.93	12° 44.96	7.0	26°40.41	-6.2'	57.1°
	SD = 16.2'	d = -0.8'			D = 15.7'		
		<u> </u>		- 3	10.1		
Mon	GHA	Dec	GHA	$\nu$	Dec	d G A'	HP
0 1	176°27.26 191°27.25	\$14°20.30 19.49	27°11.09 41°37.31	7.2' 7.3'	N26°34.16 26°27.77	-6.4' -6.5'	57.0' 57.0'
2	206°27.25	18.68	56° 3.61	7.3 7.4'	26°21.22	-6.7'	57.0'
3	221°27.24	. 17.86	70°30.01	7.5'	26° 14.53	-6.8'	57.0'
4	236°27.23	17.05	84°56.51	7.6'	26°7.69	-7.0'	57.0'
5	251°27.23	16.24	99°23.09	7.7'	$26^{\circ}0.71$	-7.1'	56.9'
6	266°27.22	S14° 15.42	113°49.77	7.8'	N25°53.58	-7.3	56.9'
7	281°27.21 296°27.21	14.61	128° 16.55	7.9'	25°46.31 25°38.91	-7.4'	56.9'
8 9	311°27.20	13.79 •• 12.97	142° 43.42 157° 10.39	8.0' 8.1'	25° 38.91 25° 31.36	-7.5' -7.7'	56.9' 56.9'
10	326°27.20	12.16	171° 37.45	8.2'	25°23.67	-7.7 -7.8'	56.8'
11	341°27.19	11.34	186°4.62	8.3'	25° 15.85	-8.0'	56.8'
12	356°27.19	S14°10.52	200°31.88	8.4'	N25°7.90	-8.1'	56.8'
13	11°27.18	9.71	214°59.24	8.5'	24°59.81	-8.2'	56.8'
14	26°27.18	8.89	229°26.71	8.6'	24°51.59	-8.4'	56.8'
15 16	41°27.18 56°27.17	· · 8.07 7.25	243°54.27 258°21.94	8.7' 8.8'	24° 43.24 24° 34.76	-8.5' -8.6'	56.7' 56.7'
17	71°27.17	6.43	272°49.70	o.o 8.9'	24° 34.70 24° 26.15	-8.7'	56.7'
18	86°27.17	S14°5.61	287° 17.57	9.0'	N24° 17.42	-8.9'	56.7'
19	101°27.17	4.79	301°45.54	9.1'	24°8.56	-9.0'	56.7'
20	$116^{\circ}27.17$	3.97	$316^{\circ}13.62$	9.2'	23° 59.58	-9.1'	56.6'
21	131°27.16	• • 3.15	330°41.80	9.3'	23°50.48	-9.2'	56.6'
22	146°27.16 161°27.16	2.33	345°10.08 359°38.46	9.4' 9.5'	23°41.26 23°31.91	-9.3'	56.6'
23		1.51	359 38.40			-9.5'	56.6'
	SD = 16.2'	d = -0.8'		5	D = 15.6'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°27.16 191°27.16	\$14°0.68 13°59.86	14°6.95 28°35.54	9.6' 9.7'	N23°22.45 23°12.88	-9.6' -9.7'	56.5' 56.5'
1 2	191°27.16 206°27.16	13°59.86 59.04	28°35.54 43°4.24	9.7	23°12.88 23°3.19	-9.7° -9.8'	56.5'
3	221°27.16	58.22	57°33.04	9.9'	23° 53.19	-9.0' -9.9'	56.5
4	236°27.16	57.39	72°1.94	10.0'	22°43.47	-10.0'	56.5'
5	251°27.17	56.57	86° 30.95	10.1'	22°33.45	-10.1'	56.4'
6	266°27.17	S13°55.74	101°0.06	10.2'	N22°23.32	-10.2'	56.4'
7	281°27.17	54.92	115°29.28	10.3'	22°13.08	-10.3'	56.4'
8 9	296°27.17 311°27.17	54.09 •• 53.27	129°58.60 144°28.02	10.4' 10.5'	22°2.74 21°52.29	-10.4' -10.6'	56.4' 56.4'
10	311 27.17 326°27.18	52.44	144° 28.02 158° 57.55	10.5	21° 52.29 21° 41.74	-10.6 -10.7'	56.3
11	341°27.18	51.61	173°27.18	10.7	21°31.09	-10.7	56.3'
12	356°27.18	S13°50.79	187°56.92	10.8'	N21°20.33	-10.8'	56.3'
13	11°27.19	49.96	202°26.76	10.9'	21°9.49	-10.9'	56.3'
14	26°27.19	49.13	216° 56.70	11.0'	20° 58.54	-11.0'	56.3'
15 16	41°27.20 56°27.20	· · 48.30	231°26.74	11.1'	20° 47.50 20° 36.36	-11.1'	56.2'
16 17	56°27.20 71°27.21	47.48 46.65	245°56.88 260°27.13	11.2' 11.3'	20°36.36 20°25.14	-11.2' -11.3'	56.2' 56.2'
18	86°27.21	\$13°45.82	274°57.47	11.4	N20° 13.82	-11.5	56.2'
19	101°27.22	44.99	289°27.92	11.5'	20°2.41	-11.5'	56.2'
20	116°27.23	44.16	303°58.47	11.6'	$19^{\circ}50.92$	-11.6'	56.1'
21	131°27.23	• • 43.33	318°29.12	11.7'	19°39.33	-11.7'	56.1'
22 23	146°27.24 161°27.25	42.50 41.67	332°59.86 347°30.71	11.8' 11.9'	19° 27.67 19° 15.92	-11.8' -11.8'	56.1' 56.1'
23			347 30.71			-11.8	20.1
	SD = 16.2'	d = -0.8'		5	D = 15.4'		

	Twi	light	_	_	Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	06:34	07:56	09:22	15:08	16:34	17:56	
N 70°	06:30	07:44	08:57	15:33	16:46	18:00	
68°	06:27	07:34	08:38	15:52	16:56	18:03	
66°	06:24	07:25	08:23	16:07	17:04	18:06	
64°	06:21	07:18	08:10	16:19	17:12	18:08	
62°	06:19	07:12	08:00	16:30	17:18	18:11	
60°	06:17	07:06	07:51	16:38	17:23	18:13	
N 58°	06:15	07:01	07:43	16:46	17:28	18:15	
56°	06:13	06:57	07:36	16:53	17:33	18:17	
54°	06:11	06:52	07:30	16:59	17:37	18:19	
52°	06:09	06:49	07:24	17:05	17:40	18:20	
50°	06:07	06:45	07:19	17:10	17:44	18:22	
45°	06:03	06:37	07:08	17:21	17:52	18:26	
N 40°	05:59	06:31	06:59	17:30	17:58	18:30	
35°	05:55	06:25	06:51	17:38	18:04	18:34	
30°	05:51	06:19	06:44	17:45	18:09	18:38	
20°	05:43	06:09	06:32	17:57	18:20	18:46	
N 10° 0°	05:34	05:59	06:21 06:11	18:08	18:29	18:54	
_	05:25	05:49		18:18	18:39	19:04	
<b>S</b> 10°	05:13	05:39	06:00	18:28	18:50	19:15	
20° 30°	04:59 04:41	05:26	05:49	18:39 18:52	19:02 19:17	19:29	
35°	04:41	05:11 05:02	05:36 05:29	18:52	19:17	19:47 19:58	
40°	04:30	03.02	05:29	19:07	19:26	20:12	
45°	03:59	04:38	05:20	19:17	19:49	20:12	
<b>S</b> 50°	03:36	04:22	04:58	19:29	20:05	20:51	
52°	03:25	04:14	04:52	19:35	20:13	21:02	
54°	03:11	04:05	04:46	19:41	20:22	21:15	
56°	02:56	03:55	04:39	19:48	20:31	21:30	
58°	02:37	03:44	04:31	19:56	20:43	21:48	
<b>S</b> 60°	02:12	03:30	04:22	20:05	20:56	22:12	

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
- ",	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	86-97%	
09	14:10	14:10	12:14	22:07	09:38		
10	14:11	14:11	12:14	23:01	10:35		
11	14:11	14:11	12:14	23:52	11:27		

### February 12, 13, 14 UT (Wed., Thu., Fri.)

h	Aries	Ven	านร	M	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0 0	142° 17.83		N05°24.95	32° 15.07	N26°13.82	72°23.93	N21°41.72	151°58.23	S06° 14.92			
1	157° 20.30	154°6.38	25.92	47° 17.98	13.81	87°26.33	41.73	167°0.43	14.81	Alpheratz		29°13.77
2	$172^{\circ}22.76$	169°7.68	26.89	62°20.88	13.80	102°28.73	41.75	182°2.62	14.69	Ankaa Schedar	353°7.33 349°31.36	-42°10.38 56°40.67
3	187° 25.23	184°8.98	• • 27.86	77°23.78	• • 13.79	117°31.12	• • 41.77	197°4.82	• • 14.58	Diphda	349 31.30 348°47.41	-17°51.09
4	202°27.69	199° 10.28	28.83	92°26.68	13.78	132°33.52	41.79	212°7.02	14.46	Achernar		-57°6.82
5 6	217° 30.15 232° 32.62	214°11.59 229°12.89	29.79 N05°30.76	107°29.58 122°32.48	13.77 N26°13.76	147°35.92 162°38.31	41.80 N21°41.82	227°9.21 242°11.41	14.35 \$06° 14.23	Hamal		23°34.92
7	232 32.02 247°35.08	244° 14.20	31.72	122 32.48 137°35.38	N20 13.70 13.75	102 38.31 177°40.71	N21 41.82 41.84	242 11.41 257°13.61	14.12	Polaris	314°2.64	89°22.53
8	262°37.55	259° 15.52	32.69	157° 33.30	13.74	192°43.10	41.86	272°15.81	14.12	Acamar	315°11.73	-40°12.48
9	277° 40.01	274° 16.83	• • 33.65	167°41.17	• • 13.73	207°45.49	• • 41.87	287°18.00	• 13.89	Menkar	314°6.08	4°11.24
10	292° 42.47	289° 18.15	34.61	182° 44.06	13.72	222°47.89	41.89	302°20.20	13.77	Mirfak Aldebaran	308°28.13 290°39.41	49°57.21 16°33.60
11	307° 44.94	304° 19.47	35.58	197° 46.95	13.71	237°50.28	41.91	317°22.40	13.66	Rigel	281°3.62	-8° 10.46
12 13	322° 47.40 337° 49.87	319°20.79 334°22.11	N05°36.54	212°49.84 227°52.72	N26°13.69	252°52.67 267°55.07	N21°41.93	332°24.59 347°26.79	S06° 13.54	Capella	280°21.53	46°1.53
13 14	352° 52.33	334 22.11 349°23.44	37.50 38.45	242° 55.61	13.68 13.67	207 55.07 282°57.46	41.95 41.96	2°28.99	13.43 13.31	Bellatrix	278°22.61	6°22.30
15	7°54.80	4° 24.77	• • 39.41	257°58.49	• • 13.65	297°59.85	41.98	17°31.18	13.20	Elnath	278°1.56	28° 37.77
16	22°57.26	19°26.10	40.37	273°1.38	13.64	313°2.24	42.00	32°33.38	13.08	Alnilam	275°37.45	-1°11.23
17	$37^{\circ}59.72$	34°27.43	41.33	288°4.26	13.63	328° 4.63	42.02	47°35.58	12.97	Betelgeuse Canopus	270°51.78 263°51.98	7°24.66 -52°42.71
18	53°2.19		N05°42.28	303°7.14	N26°13.61	343°7.02	N21°42.04	62°37.77	S06°12.85	Sirius	258°25.90	-16° 45.16
19	68°4.65	64°30.10	43.24	318° 10.01	13.60	358° 9.41	42.05	77°39.97	12.74	Adhara	255°5.50	-29°0.51
20	83°7.12 98°9.58	79°31.44 94°32.79	44.19	333°12.89 348°15.77	13.59	13°11.80	42.07	92°42.16 107°44.36	12.62	Procyon	244°50.44	5°9.56
21 22	98°9.58 113°12.04	94°32.79 109°34.13	•• 45.14 46.10	348° 15.77 3° 18.64	· · 13.57 13.56	28°14.19 43°16.58	· · 42.09 42.11	107°44.36 122°46.56	· · 12.51 12.39	Pollux	243°16.85	27°57.91
23	113 12.04 128° 14.51	124° 35.48	47.05	18°21.51	13.54	58° 18.97	42.11	137°48.75	12.39	Avior	234°14.11	-59°35.47
		$\nu 1.3' \ d1.0$			.0′ m-0.76		.0′ m-2.43			Suhail	222°45.82	-43°32.10
ivier.p	pass. 14:28	$\nu_{1.3}$ a1.0	J III-4.ŏ4	ν2.9 α-0	.0 111-0./0	ν2.4 α0.	U III-2.43	ν2.2 α-0	.1′ m1.12	Miaplacidus Alphard	221°37.38 217°47.34	-69°49.22 -8°46.14
	<b></b>		_		_		_		_		207°34.01	11°50.55
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	_	193°40.22	61°36.75
0 1	143° 16.97 158° 19.44	139°36.83 154°38.18	N05°48.00 48.95	33°24.38 48°27.25	N26°13.53 13.51	73°21.36 88°23.75	N21°42.15 42.16	152°50.95 167°53.14	S06° 12.16 12.05		182°24.57	14°25.73
2	158 19.44 173°21.90	169°39.53	48.95 49.90	48 27.25 63°30.12	13.51	88 23.75 103°26.14	42.16	182°55.34	12.05		175°43.24	-17°40.94
3	188°24.36	184° 40.89	• • 50.84	78°32.98	• • 13.48	118°28.52	42.20	197°57.54	• • 11.82		172°59.54	-63°14.15
4	203°26.83	199°42.25	51.79	93°35.85	13.46	133°30.91	42.22	212°59.73	11.70		171°51.17 166°12.49	-57°15.11 55°49.11
5	$218^{\circ}29.29$	214°43.61	52.74	108°38.71	13.44	148°33.30	42.24	228°1.93	11.59		158°22.04	-11° 17.62
6	233°31.76		N05°53.68	123°41.57	N26°13.43	163°35.69	N21°42.26		S06°11.47		152°51.69	49° 10.93
7	248°34.22	244°46.34	54.63	138° 44.43	13.41	178°38.07	42.28	258°6.32	11.35	Hadar	148°35.68	-60° 29.45
8 9	263°36.68 278°39.15	259°47.71 274°49.08	55.57 •• 56.51	153° 47.29 168° 50.15	13.39 •• 13.38	193°40.46 208°42.84	42.29 •• 42.31	273°8.52 288°10.71	11.24 •• 11.12		147°57.38	-36°29.54
10	276 39.13 293°41.61	289° 50.46	57.45	183°53.00	13.36	200 42.04 223°45.23	42.33	303°12.91	11.12	1	145°47.71	19°2.85
11	308° 44.08	304°51.83	58.40	198°55.86	13.34	238°47.61	42.35	318°15.10	10.89	Rigil Kent. Kochab		-60°56.14 74°2.71
12	323°46.54		N05°59.34	213°58.71	N26°13.32	253°50.00	N21°42.37	333°17.30	S06° 10.78		137°19.54 136°55.86	-16°8.81
13	338° 49.00	334° 54.59	06°0.27	229°1.56	13.30	268°52.38	42.39	348°19.49	10.66	Alphecca	126°3.66	26° 37.51
14	353°51.47	349°55.98	1.21	244°4.41	13.28	283°54.76	42.41	3°21.69	10.55		112°15.82	-26°29.24
15 16	8° 53.93 23° 56.40	4° 57.36 19° 58.75	· · 2.15 3.09	259°7.26 274°10.10	· · 13.26 13.24	298°57.15 313°59.53	· · 42.43 42.45	18°23.88 33°26.08	· · 10.43 10.31	Atria	107°10.19	-69°4.11
16 17	23 50.40 38° 58.86	19 58.75 35°0.14	3.09 4.02	274 10.10 289°12.95	13.24	313 59.53 329°1.91	42.45 42.47	33 26.08 48°28.27	10.31	Sabik	102°2.82	-15°45.41
18	54°1.33	50°1.54	N06° 4.96	304° 15.79	N26°13.20	344° 4.29	N21°42.49		S06° 10.08	Shaula	96°10.45	-37°7.25
19	69°3.79	65°2.93	5.89	319° 18.63	13.18	359°6.67	42.50	78°32.66	9.97	Rasalhague Eltanin	95°58.63 90°42.45	12°32.29 51°28.78
20	84°6.25	80°4.33	6.82	334°21.47	13.16	14°9.06	42.52	93°34.86	9.85	Kaus Aust.	90 42.45 83°32.66	-34°22.33
21	99°8.72	95°5.73	• • 7.76	349°24.31	• • 13.14	29°11.44	• • 42.54	108°37.05	• • 9.74	Vega	80°33.46	38°48.13
22	114°11.18	110°7.13	8.69	4°27.15	13.12	44°13.82	42.56	123°39.25	9.62	Nunki	$75^{\circ}47.92$	-26° 15.95
23	129° 13.65	125°8.54	9.62	19°29.99	13.10	59°16.20	42.58	138°41.44	9.51	Altair	62°0.16	8°55.92
Mer.p	pass. 14:25	$\nu$ 1.4′ d0.9	)′ m-4.84	$\nu^{2.9'} d-0$	.0′ m-0.73	$\nu^{2.4'} d0.$	.0′ m-2.42	$\nu^{2.2'}$ d-0	.1′ m1.12	Peacock		-56°39.24
										Deneb Enif	49°26.21 33°39.03	45°22.03 9°59.29
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.23	
0	144° 16.11		N06°10.55	34°32.82	N26°13.08	74°18.58	N21°42.60	153°43.64	S06°9.39	Fomalhaut	15°14.74	-29°29.50
1	159° 18.57	155°11.36	11.47	49°35.65	13.06	89°20.96	42.62 42.64	168°45.83	9.27	Scheat	13°45.46	28°13.11
2	174°21.04 189°23.50	170° 12.77 185° 14.19	12.40 •• 13.33	64°38.48 79°41.31	13.03 •• 13.01	104°23.34 119°25.72	42.64 •• 42.66	183°48.03 198°50.22	9.16 • • 9.04	Markab	13°30.11	15°20.36
4	204° 25.97	200° 15.61	14.25	94°44.14	12.99	134°28.09	42.68	213°52.42	8.93	Feb 12 Wed	SHA	Mer.pass
5	219° 28.43	215° 17.03	15.18	109° 46.97	12.96	149°30.47	42.70	228°54.61	8.81	Venus		14:42
6	234°30.89	230°18.45	N06°16.10	124°49.79	N26°12.94	164°32.85	N21°42.72	243°56.81	<b>S</b> 06°8.70	Mars		21:47
7	249°33.36	245° 19.87	17.02	139°52.62	12.92	179°35.23	42.74	258°59.00	8.58	Jupiter	290°6.10	19:07
8	264°35.82	260°21.30	17.95	154°55.44	12.89	194°37.60	42.76	274°1.20	8.46	Saturn	9°40.39	13:50
9 10	279°38.29 294°40.75	275°22.73 290°24.17	· · 18.87 19.79	169°58.26 185°1.08	· · 12.87 12.85	209°39.98 224°42.36	· · 42.78 42.80	289°3.39 304°5.59	· · 8.35 8.23	Feb 13 Thu	SHA	Mer.pass
11	309° 43.21	305° 25.60	20.71	200°3.90	12.82	239°44.73	42.80	319°7.78	8.12	Venus		14:40
12	324° 45.68		N06°21.62	215°6.71	N26°12.80	254°47.11	N21°42.84	334°9.97	S06°8.00	Mars	250°7.41	21:42
13	$339^{\circ}48.14$	$335^{\circ}28.48$	22.54	$230^{\circ}9.53$	12.77	269°49.48	42.86	$349^{\circ}12.17$	7.88	Jupiter Saturn	290°4.39 9°33.98	19:04 13:47
14	354°50.61	350° 29.92	23.46	245°12.34	12.75	284°51.86	42.88	4°14.36	7.77			
15	9°53.07	5°31.37	• • 24.37	260°15.15	12.72	299°54.23	· · 42.90	19°16.56	· · 7.65	Feb 14 Fri	SHA	Mer.pass
16 17	24°55.53 39°58.00	20°32.82 35°34.27	25.29 26.20	275°17.96 290°20.77	12.70 12.67	314°56.61 329°58.98	42.92 42.94	34°18.75 49°20.95	7.54 7.42		355°53.84	14:38
18	55°0.46		N06°27.11	305°23.58	N26°12.64	345° 1.35	N21°42.96	64°23.14	506°7.30	Mars Jupiter	250°16.71 290°2.47	21:38 19:00
19	70°2.93	65° 37.18	28.02	320°26.38	12.62	0°3.73	42.98	79°25.33	7.19	Saturn	9°27.53	13:43
20	85°5.39	80°38.64	28.94	$335^{\circ}29.18$	12.59	15°6.10	43.00	94°27.53	7.07			
21	100°7.85	95°40.10	• • 29.84	350°31.99	• • 12.56	30°8.47	• • 43.02	109°29.72	• • 6.96	Horizor	tal parallax	0.3
22 23	115° 10.32 130° 12.78	110°41.56 125°43.03	30.75 31.66	5°34.79	12.54 12.51	45°10.84	43.04 43.06	124°31.91 139°34.11	6.84 6.72		Venus: Mars:	0.3 0.2
				20°37.59		60°13.21						J
Mer.p	pass. 14:21	$\nu$ 1.4′ d0.9	୬′ m-4.85	$\nu 2.8' \ d-0$	.0′ m-0.70	$\nu$ 2.4′ d0.	.0′ m-2.42	$\nu^{2.2'} d-0$	.1′ m1.12			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.26	S13°40.83	$2^{\circ}1.65$	12.0'	N19°4.08	-11.9'	56.1'
1	191°27.26	40.00	16°32.69	12.1'	18°52.17	-12.0'	56.0'
2	206°27.27 221°27.28	39.17 •• 38.34	31°3.83 45°35.06	12.2' 12.3'	18°40.18 18°28.11	-12.1' -12.1'	56.0' 56.0'
4	236°27.29	37.50	60°6.39	12.4'	18°15.96	-12.2'	56.0'
5	251°27.30	36.67	$74^{\circ}37.82$	12.5'	$18^{\circ}3.74$	-12.3'	56.0'
6	266°27.31	S13°35.84	89°9.34	12.6'	N17°51.44	-12.4'	55.9'
7 8	281°27.32 296°27.33	35.00 34.17	103°40.95 118°12.66	12.7' 12.8'	17°39.07 17°26.63	-12.4' -12.5'	55.9' 55.9'
9	311°27.34	33.33	132°44.46	12.9'	17°14.12	-12.6'	55.9'
10	326°27.35	32.50	$147^{\circ}16.35$	13.0'	$17^{\circ}1.55$	-12.6'	55.9'
11	341°27.36 356°27.37	31.66 \$13°30.82	161°48.33 176°20.40	13.1'	16°48.90 N16°36.19	-12.7'	55.8'
12 13	11°27.38	29.99	170 20.40 190°52.56	13.2' 13.2'	16°23.41	-12.8' -12.8'	55.8' 55.8'
14	26°27.40	29.15	205°24.80	13.3'	16°10.58	-12.9'	55.8'
15	41°27.41	• • 28.31	219°57.14	13.4'	15°57.68	-13.0'	55.8'
16 17	56°27.42 71°27.44	27.48 26.64	234°29.56 249°2.07	13.5' 13.6'	15°44.72 15°31.70	-13.0' -13.1'	55.7' 55.7'
18	86°27.45	\$13°25.80	263°34.66	13.7'	N15°18.62	-13.1'	55.7'
19	101°27.46	24.96	278°7.34	13.8'	15°5.48	-13.2'	55.7'
20	116°27.48	24.12	292°40.10	13.8'	14°52.29	-13.2'	55.7'
21 22	131°27.49 146°27.51	· · 23.28 22.44	307°12.94 321°45.87	13.9' 14.0'	14°39.05 14°25.75	-13.3' -13.3'	55.6' 55.6'
23	140 27.51 161°27.52	22.44	321 45.87 336°18.87	14.0 14.1'	14 25.75 14°12.40	-13.3 -13.4'	55.6'
	SD = 16.2'	d = -0.8'			D = 15.3'		
	- 10.2			JI			
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	176°27.54 191°27.55	\$13°20.76 19.92	350°51.95 5°25.11	14.2' 14.2'	N13°59.01 13°45.56	-13.4' -13.5'	55.6' 55.6'
2	206°27.57	19.92	5 25.11 19°58.35	14.2	13°32.06	-13.5'	55.5'
3	221°27.59	• • 18.24	34°31.67	14.4'	13°18.52	-13.6'	55.5'
4	236°27.60	17.39	49°5.06	14.5'	13°4.93	-13.6'	55.5'
5 6	251°27.62 266°27.64	16.55 \$13°15.71	63°38.53 78°12.07	14.5' 14.6'	12°51.30 N12°37.62	-13.7' -13.7'	55.5' 55.5'
7	281°27.65	14.86	92°45.68	14.7	12°23.90	-13.7 -13.8'	55.4'
8	296°27.67	14.02	107°19.37	14.8'	12°10.14	-13.8'	55.4'
9	311°27.69	• • 13.18	121°53.12	14.8'	11°56.35	-13.8'	55.4'
10 11	326°27.71 341°27.73	12.33 11.49	136°26.95 151°0.84	14.9' 15.0'	11°42.51 11°28.63	-13.9' -13.9'	55.4' 55.4'
12	356°27.75	\$13°10.64	165°34.80	15.0'	N11°14.72	-13.9'	55.3'
13	11°27.77	9.79	$180^{\circ}8.83$	15.1'	$11^{\circ}0.78$	-14.0'	55.3'
14	26°27.79	8.95 • • 8.10	194°42.92 209°17.08	15.2'	10°46.79	-14.0'	55.3'
15 16	41°27.81 56°27.83	7.26	209°17.08 223°51.30	15.2' 15.3'	10°32.78 10°18.74	-14.0' -14.1'	55.3' 55.3'
17	71°27.85	6.41	238°25.58	15.3'	10°4.66	-14.1'	55.2'
18	86°27.87	\$13°5.56	252°59.93	15.4'	N09°50.55	-14.1'	55.2'
19 20	101°27.89 116°27.91	4.71 3.86	267°34.33 282°8.80	15.5' 15.5'	09°36.42 09°22.25	-14.2'	55.2' 55.2'
21	131°27.94	• • 3.02	296°43.32	15.6'	09°22.25	-14.2'	55.2'
22	146°27.96	2.17	311°17.90	15.6'	$08^{\circ}53.85$	-14.2'	55.2'
23	161°27.98	1.32	325°52.53	15.7'	08°39.61	-14.3'	55.1'
	SD = 16.2'	d = -0.8'		SI	O = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	176°28.00	\$13°0.47	340°27.23	15.7'	N08°25.35	-14.3'	55.1'
1	191°28.03	$12^{\circ}59.62$	355°1.97	15.8'	08°11.06	-14.3'	55.1'
2	206°28.05 221°28.08	58.77 •• 57.92	9°36.77 24°11.62	15.8' 15.9'	07°56.75 07°42.42	-14.3' -14.3'	55.1' 55.1'
3 4	221 28.08 236°28.10	57.92 57.06	38°46.52	15.9' 15.9'	07°42.42 07°28.08	-14.3' -14.4'	55.1° 55.0'
5	251°28.12	56.21	53°21.46	16.0'	$07^{\circ}13.71$	-14.4'	55.0'
6	266°28.15	\$12°55.36	67°56.46	16.0'	N06°59.33	-14.4'	55.0'
7 8	281°28.18 296°28.20	54.51 53.66	82°31.51 97°6.60	16.1' 16.1'	06°44.92 06°30.51	-14.4' -14.4'	55.0' 55.0'
9	311°28.23	• • 52.80	111°41.73	16.1	06°16.08	-14.4' -14.4'	55.0'
10	326°28.25	51.95	$126^{\circ}16.91$	16.2'	$06^{\circ}1.63$	-14.5'	54.9'
11	341°28.28	51.10	140°52.14	16.3'	05°47.17	-14.5'	54.9'
12 13	356°28.31 11°28.33	\$12°50.24 49.39	155°27.40 170°2.71	16.3' 16.3'	N05°32.70 05°18.22	-14.5' -14.5'	54.9' 54.9'
14	26°28.36	48.53	184°38.05	16.4	05°3.73	-14.5'	54.9'
15	41°28.39	• • 47.68	199°13.44	16.4'	04°49.23	-14.5'	54.9'
16 17	56°28.42 71°28.45	46.82 45.97	213°48.86 228°24.32	16.5' 16.5'	04°34.72 04°20.21	-14.5' -14.5'	54.8' 54.8'
18	71°28.45 86°28.47	45.97 \$12°45.11	228° 24.32 242° 59.81	16.5'	N04° 5.68	-14.5'	54.8'
19	101°28.50	44.25	257°35.34	16.6'	03°51.16	-14.5'	54.8'
20	116°28.53	43.40	272°10.90	16.6'	03°36.62	-14.5'	54.8'
21 22	131°28.56 146°28.59	· · 42.54 41.68	286°46.49 301°22.12	16.6' 16.7'	03°22.09 03°7.55	-14.5' -14.5'	54.8' 54.7'
23	140 28.59 161°28.62	41.08	301 22.12 315°57.77	16.7'	03 7.55 02°53.00	-14.5'	54.7'
	SD = 16.2'	d = -0.9'			D = 15.0'		
					20.0		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-98%	
12	14:11	14:11	12:14	-:-	12:15		
13	14:10	14:09	12:14	00:38	12:59		
14	14:08	14:07	12:14	01:20	13:41		

#### February 15, 16, 17 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	145° 15.25	140°44.50 N06°32.57	35°40.39 N26°12.48	75°15.58 N21°43.08	154°36.30 \$06°6.61	
1	160° 17.71	155°45.97 33.47	50°43.18 12.45	90°17.96 43.10	169°38.50 6.49	Alpheratz 357°34.98 29°13.76
2	175°20.17	170°47.44 34.38	65°45.98 12.42	105°20.33 43.12	184°40.69 6.37	Ankaa 353°7.34 -42°10.38
3	190°22.64	185°48.92 · · 35.28	80°48.77 · · 12.40	120°22.70 · · 43.14	199°42.88 · · 6.26	Schedar 349°31.38 56°40.65
4	205°25.10	200°50.39 36.18	95°51.56 12.37	135°25.07 43.16	214°45.08 6.14	Diphda 348°47.42 -17°51.09
5	220°27.57	215°51.88 37.09	110°54.35 12.34	150°27.43 43.18	229°47.27 6.03	Achernar 335°20.37 -57°6.81 Hamal 327°51.23 23°34.91
6	235°30.03	230°53.36 N06°37.99	125°57.14 N26°12.31	165°29.80 N21°43.21	244°49.46 <b>S</b> 06°5.91	Polaris 314°4.28 89°22.53
7	250° 32.49	245°54.85 38.89	140°59.93 12.28	180°32.17 43.23	259°51.66 5.79	Acamar 315°11.75 -40°12.48
8	265°34.96	260°56.34 39.79	156°2.71 12.25	195°34.54 43.25	274°53.85 5.68	Menkar 314°6.09 4°11.24
9	280° 37.42	275°57.83 · · 40.68	171°5.50 · · 12.22	210°36.91 · · 43.27	289°56.04 · · 5.56	Mirfak 308°28.16 49°57.21
10 11	295°39.89 310°42.35	290°59.32 41.58 306°0.82 42.48	186°8.28 12.19 201°11.06 12.16	225°39.28 43.29 240°41.64 43.31	304°58.24 5.44 320°0.43 5.33	Aldebaran 290°39.42 16°33.59
12	325° 44.82	321°2.32 N06°43.37	216°13.84 N26°12.13	255°44.01 N21°43.33	320°0.43 5.33 335°2.62 \$06°5.21	Rigel 281°3.64 -8°10.47
13	340° 47.28	336°3.82 44.27	231°16.62 12.10	270°46.38 43.35	350°4.82 5.10	Capella 280°21.55 46°1.53
14	355°49.74	351°5.33 45.16	246° 19.40 12.07	285°48.74 43.37	5°7.01 4.98	Bellatrix 278°22.63 6°22.30
15	10°52.21	6°6.83 · · 46.05	261°22.17 ·· 12.03	300°51.11 · · 43.39	20°9.20 · · 4.86	Elnath 278°1.58 28°37.77
16	25°54.67	21°8.34 46.94	276°24.94 12.00	315°53.47 43.42	35°11.40 4.75	Alnilam 275°37.47 -1°11.23   Betelgeuse 270°51.79 7°24.66
17	40°57.14	36°9.86 47.83	291°27.72 11.97	330°55.84 43.44	50°13.59 4.63	Betelgeuse 270°51.79 7°24.66 Canopus 263°52.00 -52°42.72
18	55° 59.60	51°11.37 N06°48.72	306°30.49 N26°11.94	345°58.20 N21°43.46	65°15.78 <b>S</b> 06°4.51	Sirius 258°25.91 -16°45.17
19	71°2.06	66°12.89 49.61	321°33.26 11.91	1°0.57 43.48	80°17.97 4.40	Adhara 255°5.51 -29°0.52
20	86°4.53	81°14.41 50.50	336°36.02 11.87	16°2.93 43.50	95°20.17 4.28	Procyon 244°50.45 5°9.56
21	101°6.99	96°15.93 · · 51.38	351°38.79 · · 11.84	31°5.29 · · 43.52	110°22.36 · · 4.16	Pollux 243°16.86 27°57.91
22	116°9.46 131°11.92	111°17.46 52.27	6°41.55 11.81	46°7.66 43.54	125°24.55 4.05	Avior 234°14.13 -59°35.48
23	131 - 11.92	126°18.99 53.15	21°44.32 11.77	61°10.02 43.57	140°26.75 3.93	Suhail 222°45.82 -43°32.11
Mer.p	bass. 14:17	$ u 1.5' \ d 0.9' \ \text{m-}4.85$	$\nu$ 2.8′ <i>d</i> -0.0′ m-0.67	$\nu$ 2.4′ $d$ 0.0′ m-2.41	$ u 2.2' \ d$ -0.1' m1.12	Miaplacidus 221°37.40 -69°49.23
						Alphard 217°47.34 -8°46.15
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.01 11°50.55 Dubhe 193°40.20 61°36.77
0	$146^{\circ}14.38$	141°20.52 N06°54.03	36°47.08 N26°11.74	76°12.38 N21°43.59	155°28.94 <b>S</b> 06°3.81	Duble 193 40.20 01 30.77 Denebola 182°24.56 14°25.73
1	$161^{\circ}16.85$	156°22.05 54.92	51°49.84 11.71	91°14.74 43.61	170°31.13 3.70	Gienah 175°43.23 -17°40.95
2	176° 19.31	171°23.59 55.80	66° 52.60 11.67	106°17.11 43.63	185°33.32 3.58	Acrux 172°59.52 -63°14.17
3	191°21.78	186°25.13 · · 56.68	81°55.35 · · 11.64	121°19.47 · · 43.65	200°35.52 · · 3.46	Gacrux 171°51.15 -57°15.12
4 5	206°24.24 221°26.70	201°26.67 57.56 216°28.21 58.43	96°58.11 11.60 112°0.86 11.57	136°21.83 43.67 151°24.19 43.70	215°37.71 3.35 230°39.90 3.23	Alioth 166°12.46 55°49.11
6	236° 29.17	231°29.76 N06°59.31	112°0.86 11.57 127°3.62 N26°11.53	151°24.19 43.70 166°26.55 N21°43.72	230°39.90 3.23 245°42.09 \$06°3.12	Spica 158°22.02 -11°17.63
7	251°31.63	246°31.31 07°0.19	142°6.37 11.50	181°28.91 43.74	260°44.28 3.00	Alkaid 152°51.66 49°10.94
8	266°34.10	261°32.86 1.06	157°9.12 11.46	196°31.27 43.76	275°46.48 2.88	Hadar 148°35.65 -60°29.46
9	281°36.56	276°34.42 · · 1.94	172°11.87 · · 11.43	211°33.63 · · 43.78	290°48.67 · · 2.76	Menkent 147°57.36 -36°29.55 Arcturus 145°47.69 19°2.85
10	296°39.02	291°35.97 2.81	187°14.61 11.39	226°35.99 43.80	305°50.86 2.65	Arcturus 145°47.69 19°2.85   Rigil Kent. 139°40.01 -60°56.15
11	311°41.49	306°37.54 3.68	202°17.36 11.35	241°38.35 43.83	320°53.05 2.53	Kochab 137°19.47 74°2.71
12	326° 43.95	321°39.10 N07°4.55	217°20.10 N26°11.32	256°40.70 N21°43.85	335°55.25 \$06°2.41	Zuben'ubi 136°55.84 -16°8.82
13	341°46.42	336°40.66 5.42	232°22.84 11.28	271°43.06 43.87	350°57.44 2.30	Alphecca 126°3.64 26°37.51
14	356° 48.88	351°42.23 6.29	247°25.58 11.24	286°45.42 43.89	5°59.63 2.18	Antares 112°15.80 -26°29.25
15 16	11°51.34 26°53.81	6°43.80 · · 7.16 21°45.38 8.02	262°28.32 ·· 11.21 277°31.06	301°47.78 · · · 43.92 316°50.13	21°1.82 · · 2.06 36°4.01 1.95	Atria 107°10.14 -69°4.11
17	41°56.27	36°46.95 8.89	292°33.79 11.13	331°52.49 43.96	51°6.21 1.83	Sabik 102°2.80 -15°45.42
18	56°58.74	51°48.53 N07°9.75	307°36.53 N26°11.09	346°54.84 N21°43.98	66°8.40 <b>S</b> 06°1.71	Shaula 96°10.43 -37°7.25 Rasalhague 95°58.61 12°32.28
19	72°1.20	66°50.12 10.62	322°39.26 11.06	1°57.20 44.00	81°10.59 1.60	Rasalhague 95°58.61 12°32.28   Eltanin 90°42.43 51°28.77
20	87°3.66	81°51.70 11.48	337°41.99 11.02	16°59.56 44.03	96°12.78 1.48	Kaus Aust. 83°32.64 -34°22.33
21	102°6.13	96°53.29 · · 12.34	352°44.72 · · 10.98	32°1.91 · · 44.05	111°14.97 · · 1.36	Vega 80°33.45 38°48.11
22	117°8.59	111°54.88 13.20	7°47.45 10.94	47° 4.26 44.07	126°17.16 1.25	Nunki 75°47.90 -26°15.95
23	132°11.06	126° 56.47 14.06	22°50.18 10.90	62°6.62 44.09	141°19.36 1.13	Altair 62°0.15 8°55.91
Mer.p	bass. 14:13	$\nu 1.5' \ d0.9' \ \text{m-4.85}$	$\nu$ 2.8′ <i>d</i> -0.0′ m-0.64	$\nu 2.4' \ d0.0' \ \text{m-}2.40$	$ u 2.2' \ d ext{-}0.1' \ \text{m}1.12$	Peacock 53°6.10 -56°39.23
	-					Deneb 49°26.20 45°22.02
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.03 9°59.29
0	147° 13.52	141°58.07 N07°14.92	37°52.90 N26°10.86	77°8.97 N21°44.12	156°21.55	Al Na'ir 27°33.23 -46°50.47   Fomalhaut 15°14.74 -29°29.50
1	162° 15.98	156°59.67 15.77	52°55.63 10.82	92°11.33 44.14	171°23.74 0.90	Fomalhaut 15°14.74 -29°29.50   Scheat 13°45.46 28°13.10
2	$177^{\circ}18.45$	172°1.27 16.63	67°58.35 10.78	107°13.68 44.16	186°25.93 0.78	Markab 13°30.12 15°20.35
3	192°20.91	187°2.87 · · 17.48	83°1.07 · · 10.74	122°16.03 · · 44.18	201°28.12 · · 0.66	
4	207°23.38	202°4.48 18.34	98°3.79 10.70	137°18.38 44.21	216°30.31 0.54	Feb 15 Sat SHA Mer.pass
5	222°25.84	217°6.09 19.19	113°6.51 10.66	152°20.74 44.23	231°32.50 0.43	Venus 355°29.25 14:36
6	237°28.31	232°7.70 N07°20.04	128°9.22 N26°10.62	167°23.09 N21°44.25	246°34.69 \$06°0.31	Mars 250°25.14 21:33
7	252°30.77	247°9.31 20.89	143°11.94 10.58	182°25.44 44.28	261°36.89 0.19	Jupiter 290°0.34 18:56   Saturn 9°21.06 13:40
8 9	267°33.23 282°35.70	262°10.93 21.74 277°12.55 •• 22.59	158° 14.65 10.54 173° 17.36 •• 10.50	197°27.79 44.30 212°30.14 · · 44.32	276°39.08 0.08 291°41.27 05°59.96	
10	297°38.16	292°14.18 23.44	188°20.08 10.46	227°32.49 44.34	306°43.46 05°59.84	Feb 16 Sun SHA Mer.pass
11	312°40.63	307°15.80 24.28	203°22.78 10.41	242°34.84 44.37	321°45.65 59.72	Venus 355°6.13 14:33
12	327° 43.09	322°17.43 N07°25.13	218°25.49 N26°10.37	257°37.19 N21°44.39	336°47.84 <b>S</b> 05°59.61	Mars 250° 32.70 21:29
13	342° 45.55	337°19.06 25.97	233°28.20 10.33	272°39.54 44.41	351°50.03 59.49	Jupiter 289°58.00 18:52 Saturn 9°14.55 13:36
14	357°48.02	352°20.70 26.81	248°30.90 10.29	287°41.89 44.44	6°52.22 59.37	
15	12°50.48	7°22.33 · · 27.66	263°33.60 · · 10.25	302°44.24 · · 44.46	21°54.41 · · 59.26	Feb 17 Mon SHA Mer.pass
16 17	27°52.95 42°55.41	22°23.97 28.50 37°25.62 29.34	278°36.31 10.20 293°39.01 10.16	317°46.58 44.48 332°48.93 44.51	36°56.61 59.14 51°58.80 59.02	Venus 354° 44.55 14:31
18	42 55.41 57°57.87	52°27.26 N07°30.17	308°41.70 N26°10.12	347°51.28 N21°44.53	67°0.99 S05°58.90	Mars 250°39.38 21:25   Jupiter 289°55.45 18:48
19	73°0.34	67°28.91 31.01	323°44.40 10.07	2°53.63 44.55	82°3.18 58.79	Saturn 9°8.03 13:33
20	88°2.80	82°30.56 31.85	338°47.10 10.03	17°55.97 44.58	97°5.37 58.67	
21	103°5.27	97°32.22 · · 32.68	353°49.79 · · 9.98	32°58.32 · · 44.60	112°7.56 · · 58.55	Horizontal parallax
22	118°7.73	112°33.87 33.52	8°52.48 9.94	48°0.67 44.62	127°9.75 58.44	Venus: 0.4
23	133°10.19	127°35.53 34.35	23°55.17 9.90	63°3.01 44.65	142°11.94 58.32	Mars: 0.2
Mer.p	oass. 14:09	$ u 1.6' \ d0.9' \ \text{m-4.86}$	$\nu 2.7' \ d\text{-}0.0' \ \text{m-}0.61$	$\nu 2.4' \ d0.0' \ \text{m-}2.39$	$\nu 2.2' \ d\text{-}0.1' \ \text{m}1.12$	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.65	S12°39.96	330° 33.45	16.7'	N02°38.46	-14.5'	54.7'
1	191°28.68	39.11	345°9.16	16.7'	02°23.91	-14.5'	54.7'
2	206°28.72 221°28.75	38.25 · · 37.39	359°44.90 14°20.66	16.8' 16.8'	02°9.37 01°54.83	-14.5' -14.5'	54.7' 54.7'
4	236°28.78	36.53	28° 56.44	16.8'	01°40.29	-14.5'	54.7'
5	251°28.81	35.67	43°32.25	16.8'	$01^{\circ}25.75$	-14.5'	54.6'
6	266°28.84	\$12°34.81	58°8.08	16.9'	N01°11.21	-14.5'	54.6'
7 8	281°28.88 296°28.91	33.95 33.08	72° 43.94 87° 19.81	16.9' 16.9'	00°56.68 00°42.16	-14.5' -14.5'	54.6' 54.6'
9	311°28.94	• • 32.22	101°55.70	16.9'	00° <del>42</del> .10	-14.5'	54.6'
10	326°28.98	31.36	116°31.61	16.9'	N00°13.13	-14.5'	54.6'
11	341°29.01 356°29.05	30.50 \$12°29.64	131°7.53 145°43.47	16.9'	\$00°1.38 \$00°15.87	14.5	54.6'
12 13	11°29.08	28.77	145 43.47 160° 19.43	17.0' 17.0'	00°30.36	14.5' 14.5'	54.5' 54.5'
14	26°29.12	27.91	174°55.40	17.0'	00°44.84	14.5	54.5'
15	41°29.15	• • 27.05	189°31.38	17.0'	00°59.30	14.5'	54.5'
16 17	56°29.19 71°29.22	26.18 25.32	204°7.37 218°43.37	17.0' 17.0'	01°13.76 01°28.20	14.4' 14.4'	54.5' 54.5'
18	86°29.26	512° 24.45	210 45.57 233° 19.38	17.0'	S01°42.63	14.4	54.5'
19	101°29.30	23.59	247°55.40	17.0'	01°57.05	14.4'	54.5'
20	116°29.33	22.72	262°31.43	17.0'	02°11.45	14.4'	54.4'
21 22	131°29.37 146°29.41	· · 21.86	277°7.46 291°43.50	17.0' 17.0'	02°25.83 02°40.20	14.4' 14.4'	54.4' 54.4'
23	146 29.41 161°29.44	20.99	306° 19.54	17.0'	02 40.20 02°54.56	14.4	54.4' 54.4'
	SD = 16.2'	d = -0.9'			D = 14.9'		
				JI			
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	176°29.48 191°29.52	\$12° 19.26 18.39	320° 55.58 335° 31.62	17.0' 17.0'	\$03°8.89 03°23.21	14.3' 14.3'	54.4' 54.4'
2	191°29.52 206°29.56	18.39 17.52	335° 31.62 350° 7.67	17.0'	03° 23.21 03° 37.51	14.3'	54.4' 54.4'
3	221°29.60	• • 16.65	4°43.71	17.0'	03°51.79	14.3'	54.4'
4	236°29.64	15.79	19° 19.75	17.0'	04°6.05	14.2'	54.3'
5 6	251°29.68 266°29.72	14.92 \$12°14.05	33°55.79 48°31.83	17.0' 17.0'	04°20.28 \$04°34.50	14.2' 14.2'	54.3' 54.3'
7	281°29.76	13.18	40 31.03 63°7.86	17.0'	04° 48.69	14.2'	54.3'
8	296°29.80	12.31	77°43.88	17.0'	05°2.86	14.1'	54.3'
9	311°29.84	• • 11.44	92° 19.90	17.0'	05° 17.00	14.1'	54.3'
10 11	326°29.88 341°29.92	10.57 9.70	106°55.91 121°31.90	17.0' 17.0'	05°31.12 05°45.22	14.1' 14.1'	54.3' 54.3'
12	356°29.96	\$12°8.83	136°7.89	17.0'	S05°59.29	14.0	54.3
13	11°30.00	7.96	$150^{\circ}43.87$	17.0'	$06^{\circ}13.33$	14.0'	54.3'
14	26°30.05	7.08	165° 19.84	17.0'	06°27.34	14.0'	54.3'
15 16	41°30.09 56°30.13	· · 6.21 5.34	179°55.79 194°31.72	16.9' 16.9'	06°41.33 06°55.28	14.0' 13.9'	54.2' 54.2'
17	71°30.18	4.47	209°7.65	16.9'	07°9.21	13.9'	54.2'
18	86°30.22	S12°3.59	223° 43.55	16.9'	507°23.11	13.9'	54.2'
19	101°30.26 116°30.31	2.72	238° 19.44	16.9'	07°36.97 07°50.80	13.8'	54.2' 54.2'
20 21	131°30.35	1.85 •• 0.97	252°55.31 267°31.15	16.8' 16.8'	07 50.80 08°4.60	13.8' 13.8'	54.2'
22	146°30.40	12°0.10	282°6.98	16.8'	08° 18.37	13.7'	54.2'
23	161°30.44	11°59.22	296° 42.79	16.8'	08°32.10	13.7'	54.2'
	SD = 16.2'	d = -0.9'		SI	D = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 0	176°30.49	S11° 58.35	311° 18.57	ν 16.8'	S08° 45.80	a 13.7'	<b>пР</b> 54.2'
1	191°30.53	57.47	325°54.33	16.7'	08°59.46	13.6'	54.2'
2	206°30.58 221°30.62	56.60	340°30.06 355°5.77	16.7'	09°13.09 09°26.68	13.6' 13.6'	54.2'
3 4	221°30.62 236°30.67	· · 55.72 54.85	355°5.77 9°41.45	16.7' 16.7'	09°26.68 09°40.23	13.6	54.2' 54.2'
5	251°30.72	53.97	24° 17.10	16.6'	09°53.74	13.5'	54.1'
6	266°30.76	S11°53.09	38°52.73	16.6	\$10°7.22	13.4'	54.1'
7 8	281°30.81 296°30.86	52.22 51.34	53°28.32 68°3.88	16.6' 16.5'	10°20.65 10°34.04	13.4' 13.4'	54.1' 54.1'
9	296°30.86 311°30.91	51.34	82° 39.41	16.5'	10° 34.04 10° 47.40	13.4	54.1'
10	326°30.95	49.58	$97^{\circ}14.91$	16.5'	$11^{\circ}0.71$	13.3'	54.1'
11	341°31.00	48.70	111°50.37	16.4	11°13.97	13.2'	54.1'
12 13	356°31.05 11°31.10	\$11° 47.82 46.94	126°25.80 141°1.19	16.4' 16.4'	\$11°27.20 11°40.38	13.2' 13.1'	54.1' 54.1'
13 14	26°31.15	46.94 46.07	141 · 1.19 155 ° 36.54	16.4	11° 40.38 11° 53.51	13.1'	54.1'
15	41°31.20	• • 45.19	$170^{\circ}11.85$	16.3'	$12^{\circ}6.60$	13.0'	54.1'
16	56°31.25	44.31	184°47.13	16.2'	12°19.65	13.0'	54.1'
17 18	71°31.30 86°31.35	43.42 \$11° 42.54	199° 22.37 213° 57.56	16.2' 16.2'	12°32.64 \$12°45.59	12.9' 12.9'	54.1' 54.1'
18 19	86°31.35 101°31.40	41.66	213°57.56 228°32.71	16.2	12° 58.49	12.9' 12.9'	54.1'
20	116°31.45	40.78	243°7.82	16.1'	13°11.34	12.8'	54.1'
21	131°31.50	• • 39.90	257° 42.89	16.0'	13°24.14	12.7'	54.1'
22 23	146°31.56 161°31.61	39.02 38.13	272° 17.91 286° 52.88	16.0' 15.9'	13°36.89 13°49.59	12.7' 12.6'	54.1' 54.1'
23	SD = 16.2'		200 32.00			12.0	J4.1
	3D = 10.2	d = -0.9'		51	D = 14.8'		

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

1 1	Sat 21:03 20:59	Sun 23:05	Mon	Sat	<b>Moonset</b> Sun	
N 72°	21:03		Mon	Sat	C	
		23:05			Sun	Mon
N 700	20.50			08:18	07:45	07:08
101 / 0   .	20.59	22:51		08:17	07:52	07:24
	20:56	22:40		08:16	07:58	07:37
	20:54	22:31		08:16	08:02	07:48
	20:52	22:23	23:58	08:15	08:06	07:57
	20:50	22:17	23:46	08:15	08:10	08:05
	20:48	22:11	23:36	08:15	08:13	08:12
	20:47	22:07	23:27	08:14	08:16	08:18
	20:46	22:02	23:20	08:14	08:18	08:23
	20:45	21:58	23:13	08:14	08:21	08:28
	20:44	21:55	23:07	08:14	08:23	08:32
	20:43	21:52	23:01	08:14	08:25	08:36
1	20:41	21:45	22:50	08:13	08:29	08:45
	20:39	21:39	22:40	08:13	08:32	08:52
	20:38	21:34	22:32	08:12	08:35	08:58
	20:37	21:30	22:24	08:12	08:38	09:04
	20:35 20:33	21:23 21:17	22:12 22:01	08:12 08:11	08:42 08:46	09:13 09:22
	20:33	21:17	21:51	08:11	08:50	09:22
.	20:29 20:28	21:05 20:58	21:41 21:30	08:10 08:10	08:54 08:58	09:38 09:46
	20:28 20:26	20:58	21:30	08:10	08:58	09:46
	20:25	20:31	21:10	08:09	09:05	10:02
	20:23	20:47	21:04	08:08	09:03	10:02
	20:22	20:38	20:54	08:08	09:12	10:16
<b>S</b> 50°	20:20	20:31	20:44	08:07	09:16	10:25
	20:19	20:28	20:39	08:07	09:18	10:29
	20:19	20:25	20:33	08:06	09:20	10:34
	20:18	20:22	20:27	08:06	09:23	10:39
	20:17	20:18	20:20	08:06	09:25	10:45
<b>S</b> 60°	20:15	20:14	20:12	08:05	09:28	10:52

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-83%	
15	14:05	14:04	12:14	02:01	14:21		
16	14:02	14:00	12:14	02:41	15:00		
17	13:58	13:56	12:14	03:20	03:20 15:40		

### February 18, 19, 20 UT (Tue., Wed., Thu.)

h	Aries	Ver	านร	Ma	ars	Jup	oiter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	148° 12.66		N07°35.18	38° 57.86	N26°9.85	78°5.36	N21°44.67	157° 14.13	S05°58.20			
1	$163^{\circ}15.12$	157°38.86	36.01	54°0.55	9.81	93°7.70	44.69	$172^{\circ}16.32$	58.08	Alpheratz	357°34.99 353°7.36	29°13.75 -42°10.37
2	$178^{\circ}17.59$	172°40.53	36.84	69°3.24	9.76	$108^{\circ}10.05$	44.72	$187^{\circ}18.51$	57.97	Ankaa Schedar	349°31.40	56°40.64
3	193°20.05	187°42.20	• • 37.67	84°5.92	• • 9.72	123°12.39	• • 44.74	202°20.70	• • 57.85	Diphda	348°47.43	-17°51.09
4	208° 22.51	202° 43.87 217° 45.55	38.50	99°8.60	9.67 9.62	138°14.73	44.77	217°22.89	57.73	Achernar	335°20.39	-57°6.81
5 6	223°24.98 238°27.44		39.32 N07°40.15	114° 11.29 129° 13.97	9.62 N26°9.58	153°17.08 168°19.42	44.79 N21°44.81	232°25.08 247°27.27	57.61 \$05°57.50	Hamal	$327^{\circ}51.24$	23°34.90
7	253°29.91	247°48.91	40.97	144° 16.65	9.53	183°21.76	44.84	262°29.46	57.38	Polaris	314°5.73	89°22.52
8	268°32.37	262°50.60	41.79	159° 19.32	9.49	198°24.11	44.86	277°31.65	57.26	Acamar	315°11.77	-40°12.48
9	283°34.83	277°52.29	• • 42.61	174°22.00	• • 9.44	213°26.45	• • 44.88	292°33.84	• • 57.14	Menkar Mirfak	314°6.11 308°28.18	4°11.23 49°57.21
10	298°37.30	292°53.98	43.43	189°24.67	9.39	228°28.79	44.91	307°36.03	57.03	Aldebaran	290°39.44	16°33.59
11	313°39.76	307°55.67	44.25	204°27.35	9.34	243°31.13	44.93	322° 38.22	56.91	Rigel	281°3.65	-8°10.47
12 13	328° 42.23 343° 44.69	322°57.37 337°59.07	N07°45.07 45.89	219°30.02 234°32.69	N26° 9.30 9.25	258°33.47 273°35.81	N21°44.96 44.98	337°40.41 352°42.60	\$05°56.79 56.67	Capella	$280^{\circ}21.57$	$46^{\circ}1.53$
14	358° 47.16	353° 0.77	46.70	249° 35.36	9.20	288°38.15	45.01	7°44.79	56.56	Bellatrix	278°22.64	6°22.30
15	13°49.62	8°2.48	• • 47.52	264°38.02	• • 9.15	303°40.49	• • 45.03	22°46.98	• • 56.44	Elnath	278°1.59	28°37.77
16	$28^{\circ}52.08$	23°4.18	48.33	279°40.69	9.11	$318^{\circ}42.83$	45.05	$37^{\circ}49.17$	56.32	Alnilam Betelgeuse	275°37.48 270°51.81	-1°11.24 7°24.66
17	43°54.55	38°5.90	49.14	294°43.35	9.06	333°45.17	45.08	52°51.36	56.20	Canopus	263°52.03	-52°42.73
18	58° 57.01		N07°49.95	309°46.02	N26°9.01	348°47.51	N21°45.10	67°53.55	S05°56.09	Sirius	258° 25.92	-16°45.17
19 20	73°59.48 89°1.94	68°9.33 83°11.05	50.76 51.57	324°48.68 339°51.34	8.96 8.91	3°49.85 18°52.19	45.13 45.15	82°55.74 97°57.93	55.97 55.85	Adhara	$255^{\circ}5.52$	-29°0.53
21	104°4.40	98° 12.77	52.38	354°53.99	8.86	33°54.52	• • 45.18	113°0.12	• • 55.73	Procyon	244°50.46	5°9.56
22	119°6.87	113° 14.49	53.19	9°56.65	8.81	48°56.86	45.20	128°2.31	55.62	Pollux	243°16.87	27°57.91
23	134°9.33	$128^{\circ}16.22$	53.99	24°59.31	8.76	63°59.20	45.22	143°4.50	55.50	Avior Suhail	234°14.14 222°45.82	-59°35.50 -43°32.13
Merr	pass. 14:05	$\nu 1.7' \ d0.8$	3′ m-4 86	$\nu 2.7' \ d-0.$	0′ m-0 58	ν2 3' d0	.0′ m-2.38	ν2 2' d=0	.1′ m1.12	Miaplacidus	222 45.82 221°37.41	-43 32.13 -69°49.25
- 1v1C1. L		ν 1.1 UU.C		ν Δ. I U-U.		ν Δ.J u0.		ν Δ.Δ u-0	1111.14	Alphard	217°47.34	-8°46.16
\A/c -l	CHV	GHA	Daa	GHA	Daa	CHA	Dec	GHA	Daa	Regulus	$207^{\circ}34.00$	$11^{\circ}50.55$
Wed 0	<b>GHA</b> 149°11.80		<b>Dec</b> N07°54.79	40°1.96	<b>Dec</b> N26°8.71	<b>GHA</b> 79°1.53	N21° 45.25	158° 6.69	<b>Dec</b> \$05°55.38	Dubhe	193°40.19	61°36.78
1	164° 14.26	158° 19.69	55.60	55°4.61	8.66	94°3.87	45.27	173°8.88	55.26	Denebola	182°24.55	14°25.73
2	179° 16.72	173°21.43	56.40	70°7.26	8.61	109°6.21	45.30	188° 11.07	55.14	Gienah	175° 43.22	-17°40.95 -63°14.19
3	$194^{\circ}19.19$	$188^{\circ}23.17$	• • 57.20	85°9.91	• • 8.56	124°8.54	• • 45.32	203°13.26	• • 55.03	Acrux Gacrux	172°59.49 171°51.12	-63 14.19 -57°15.14
4	$209^{\circ}21.65$	203°24.91	58.00	$100^{\circ}12.56$	8.51	139°10.88	45.35	$218^{\circ}15.45$	54.91	Alioth	166° 12.44	55°49.12
5	224°24.12	218°26.66	58.80	115° 15.20	8.46	154°13.21	45.37	233°17.64	54.79	Spica	158°22.00	-11°17.64
6 7	239° 26.58 254° 29.04	233°28.41 248°30.16	N07°59.59	130° 17.85 145° 20.49	N26°8.41	169°15.55 184°17.88	N21°45.40	248°19.83 263°22.01	S05°54.67	Alkaid	152°51.64	49°10.94
8	269° 31.51	263°31.91	08°0.39 1.18	160° 23.13	8.36 8.30	199°20.22	45.42 45.45	203 22.01 278° 24.20	54.56 54.44	Hadar	148°35.61	-60°29.47
9	284°33.97	278° 33.67	. 1.98	175° 25.77	• • 8.25	214°22.55	• • 45.47	293°26.39	• • 54.32	Menkent	147°57.34	-36°29.56
10	299°36.44	293°35.43	2.77	190°28.41	8.20	229°24.88	45.50	308°28.58	54.20	Arcturus Rigil Kent.	145°47.67 139°39.97	19°2.85 -60°56.16
11	314°38.90	308°37.20	3.56	205°31.05	8.15	244°27.21	45.52	323°30.77	54.08	Kochab	139 39.97 137° 19.42	74°2.72
12	329°41.37	323°38.96	N08°4.35	220°33.69	N26°8.10	259°29.55	N21°45.55	338°32.96	S05°53.97	Zuben'ubi	136°55.82	-16°8.83
13	344°43.83	338° 40.73	5.14	235°36.32	8.04	274°31.88	45.57	353°35.15	53.85	Alphecca	126°3.62	$26^{\circ}37.50$
14 15	359°46.29 14°48.76	353°42.51 8°44.28	5.92 · · 6.71	250°38.95 265°41.58	7.99 • • 7.94	289°34.21 304°36.54	45.60 •• 45.62	8°37.34 23°39.53	53.73 • • 53.61	Antares	112° 15.77	-26°29.25
16	29°51.22	23°46.06	7.49	280° 44.21	7.88	319°38.87	45.65	38°41.72	53.49	Atria	107°10.09	-69°4.10
17	44°53.69	38°47.84	8.28	295°46.84	7.83	334°41.20	45.67	53°43.90	53.38	Sabik Shaula	102°2.78 96°10.41	-15°45.42 -37°7.25
18	59°56.15	53°49.63	N08° 9.06	310°49.47	N26°7.78	349°43.53	N21°45.70	68°46.09	S05°53.26	Rasalhague	95°58.60	12°32.28
19	74°58.61	68°51.42	9.84	325°52.09	7.72	4°45.86	45.72	83°48.28	53.14	Eltanin	90°42.40	51°28.76
20	90°1.08	83°53.21 98°55.00	10.62	340°54.72	7.67	19°48.19	45.75	98°50.47	53.02	Kaus Aust.	83°32.62	-34°22.32
21 22	105°3.54 120°6.01	98 55.00 113°56.80	· · 11.40 12.17	355°57.34 10°59.96	· · 7.61 7.56	34°50.52 49°52.85	• • 45.77 45.80	113°52.66 128°54.85	•• 52.90 52.79	Vega	80° 33.43	38°48.11
23	135°8.47	128°58.60	12.95	26°2.58	7.50	64°55.18	45.83	143°57.04	52.67	Nunki	75°47.89	-26°15.95
		$\nu 1.7' d0.8$		$\nu 2.7' \ d-0.$			.0′ m-2.38		.1′ m1.12	Altair Peacock	62°0.14 53°6.08	8°55.90 -56°39.22
ivier.p	pass. 14:01	ν1.1 α0.8		ν2.1 u-0.	111-0.50	ν2.3 d0.	.0 111-2.30	ν2.2 <b>α</b> -0	.1 1111.12	Deneb	49°26.19	45°22.00
										Enif	33°39.03	9°59.28
Thu	GHA	GHA	Dec	GHA 41°5 20	Dec	GHA 70° E 7 E 1	Dec	GHA	Dec	Al Na'ir	27°33.23	-46°50.46
0 1	150° 10.93 165° 13.40	144°0.40 159°2.21	N08°13.72 14.50	41°5.20 56°7.81	N26°7.45 7.39	79°57.51 94°59.84	N21° 45.85 45.88	158°59.23 174°1.41	\$05°52.55 52.43	Fomalhaut	15° 14.74	-29°29.49
2	180° 15.86	174° 4.01	15.27	71° 10.43	7.39	110°2.16	45.80	189°3.60	52.43	Scheat	13°45.47	28°13.09 15°20.34
3	195° 18.33	189°5.83	• • 16.04	86° 13.04	• • 7.28	125°4.49	• • 45.93	204°5.79	• • 52.20	Markab	13°30.12	10 20.34
4	$210^{\circ}20.79$	204°7.64	16.81	$101^{\circ}15.66$	7.23	$140^{\circ}6.82$	45.95	219°7.98	52.08	Feb 18 Tue	SHA	Mer.pass
5	225°23.26	219°9.46	17.58	116° 18.27	7.17	155°9.14	45.98	234°10.17	51.96	Venus	354°24.54	14:28
6	240° 25.72		N08°18.34	131°20.87	N26°7.11	170°11.47		249°12.36	S05°51.84	Mars	250°45.20	21:20
7 8	255°28.18 270°30.65	249°13.10 264°14.93	19.11 19.87	146°23.48 161°26.09	7.06 7.00	185°13.80 200°16.12	46.03 46.06	264° 14.54 279° 16.73	51.72 51.61	Jupiter Saturn	289°52.70 9°1.47	18:45 13:29
9	285°33.11	279° 16.76	20.64	176°28.69	. 6.94	215°18.45	• • 46.08	294° 18.92	51.49			
10	300°35.58	294°18.59	21.40	191°31.30	6.89	230°20.77	46.11	309°21.11	51.37	Feb 19 Wed	SHA 254°6 16	Mer.pass
11	315°38.04	$309^{\circ}20.43$	22.16	206°33.90	6.83	245°23.10	46.14	324°23.30	51.25	Venus Mars	354°6.16 250°50.16	14:25 21:16
12	330° 40.50		N08°22.92	221°36.50	N26°6.77	260°25.42	N21°46.16	339°25.48	S05°51.13	Jupiter	289°49.74	18:41
13 14	345°42.97 0°45.43	339°24.11 354°25.96	23.68	236°39.10 251°41.69	6.71	275°27.74 290°30.07	46.19 46.21	354°27.67 9°29.86	51.01	Saturn	8°54.89	13:26
14 15	0 45.43 15°47.90	354 25.96 9°27.81	24.43 •• 25.19	266° 44.29	6.66 •• 6.60	305°32.39	46.21 •• 46.24	9 29.86 24°32.05	50.90 •• 50.78	Feb 20 Thu	SHA	Mer.pass
16	30°50.36	24°29.66	25.94	281°46.88	6.54	320°34.71	46.27	39°34.24	50.66	Venus	353°49.46	14:22
17	45°52.83	39°31.51	26.70	296°49.48	6.48	335°37.03	46.29	54°36.42	50.54	Mars	250°54.26	21:12
18	60°55.29		N08°27.45	311°52.07	N26°6.42	350°39.36	N21°46.32	69°38.61	S05°50.42	Jupiter	289°46.57	18:37
19	75°57.75 91°0.22	69°35.23 84°37.10	28.20 28.95	326°54.66 341°57.25	6.36 6.31	5°41.68 20°44.00	46.34 46.37	84°40.80 99°42.99	50.31 50.19	Saturn	8°48.29	13:22
20 21	91 0.22 106°2.68	99°38.96	28.95	341 57.25 356° 59.83	• • 6.25	20 44.00 35°46.32	46.37 • • 46.40	99 42.99 114° 45.18	. 50.19	Horizoi	ntal parallax	
22	121°5.15	114° 40.83	30.44	12°2.42	6.19	50°48.64	46.42	129° 47.36	49.95		Venus:	0.4
23	$136^{\circ}7.61$	$129^{\circ}42.71$	31.19	27°5.00	6.13	65°50.96	46.45	$144^{\circ}49.55$	49.83		Mars:	0.2
Mer.p	ass. 13:57	$\nu 1.8' \ d0.8$	3′ m-4.86	$\nu$ 2.6′ d-0.	1' m-0.53	$\nu 2.3' \ d0.$	.0′ m-2.37	ν2.2′ d-0	.1′ m1.12			

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°31.66	S11°37.25	$301^{\circ}27.81$	15.9'	<b>S</b> 14°2.24	12.6'	54.1'
1	191°31.71	36.37	316°2.69	15.8'	14°14.83	12.5'	54.1'
2	206°31.77 221°31.82	35.48 •• 34.60	330°37.52 345°12.29	15.8' 15.7'	14°27.37 14°39.85	12.5' 12.4'	54.1' 54.1'
4	236°31.87	33.72	359°47.02	15.7'	14°52.28	12.4	54.1'
5	251°31.93	32.83	$14^{\circ}21.70$	15.6'	$15^{\circ}4.65$	12.3'	54.1'
6	266°31.98	S11°31.95	28°56.33	15.6'	\$15°16.97	12.3'	54.1'
7 8	281°32.03 296°32.09	31.06 30.18	43°30.90 58°5.41	15.5' 15.5'	15°29.23 15°41.43	12.2' 12.1'	54.1' 54.1'
9	311°32.14	29.29	72°39.87	15.4'	15°53.57	12.1'	54.1'
10	326°32.20	28.41	$87^{\circ}14.28$	15.3'	$16^{\circ}5.65$	12.0'	54.1'
11	341°32.26 356°32.31	27.52	101°48.62	15.3'	16° 17.67	12.0'	54.1'
12 13	11°32.31	\$11°26.63 25.75	116°22.91 130°57.14	15.2' 15.2'	\$16°29.63 16°41.53	11.9' 11.8'	54.1' 54.1'
14	26°32.42	24.86	145°31.31	15.1'	16°53.36	11.8'	54.1'
15	41°32.48	• • 23.97	160°5.42	15.0'	17°5.13	11.7'	54.1'
16	56°32.54 71°32.59	23.08	174°39.47 189°13.45	15.0'	17° 16.83 17° 28.47	11.6'	54.1'
17 18	86°32.65	22.19 \$11°21.31	189°13.45 203°47.37	14.9' 14.9'	\$17° 40.04	11.6' 11.5'	54.1' 54.1'
19	101°32.71	20.42	218°21.23	14.8'	17°51.54	11.4	54.1'
20	116°32.77	19.53	$232^{\circ}55.02$	14.7'	$18^{\circ}2.98$	11.4'	54.1'
21	131°32.83	• • 18.64	247°28.75	14.7'	18° 14.35	11.3'	54.1'
22 23	146°32.88 161°32.94	17.75 16.86	262°2.41 276°36.00	14.6' 14.5'	18° 25.65 18° 36.87	11.2' 11.2'	54.2' 54.2'
23			210 30.00			11.2	J 7.4
	SD = 16.2'	d = -0.9'		SL	0 = 14.8'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°33.00	S11°15.97	291°9.53	14.5'	<b>S</b> 18°48.03	11.1'	54.2'
1 2	191°33.06 206°33.12	15.08 14.19	305°42.98 320°16.37	14.4' 14.3'	18° 59.11 19° 10.12	11.0' 10.9'	54.2' 54.2'
3	206°33.12 221°33.18	14.19	320° 16.37 334° 49.68	14.3 14.2'	19° 10.12 19° 21.05	10.9'	54.2' 54.2'
4	236°33.24	12.40	349°22.92	14.2'	19°31.91	10.8'	54.2'
5	251°33.30	11.51	3°56.10	14.1'	19°42.70	10.7'	54.2'
6	266°33.36 281°33.43	S11°10.62	18°29.19 33°2.22	14.0'	\$19°53.41 20°4.03	10.6'	54.2'
7 8	281°33.43 296°33.49	9.73 8.83	47°35.17	14.0' 13.9'	20° 4.03 20° 14.59	10.6' 10.5'	54.2' 54.2'
9	311°33.55	7.94	62°8.05	13.8'	20°25.06	10.4	54.2'
10	326°33.61	7.05	$76^{\circ}40.85$	13.7'	$20^{\circ}35.45$	10.3'	54.2'
11	341°33.67	6.15	91°13.57	13.6'	20°45.76	10.2'	54.3'
12 13	356°33.74 11°33.80	\$11°5.26 4.36	105°46.22 120°18.79	13.6' 13.5'	\$20°55.99 21°6.13	10.1' 10.1'	54.3' 54.3'
14	26°33.86	3.47	134°51.29	13.4'	21°16.19	10.0'	54.3'
15	41°33.92	• • 2.57	$149^{\circ}23.70$	13.3'	$21^{\circ}26.17$	9.9'	54.3'
16	56°33.99	1.68	163°56.03	13.3'	21°36.06	9.8'	54.3'
17 18	71°34.05 86°34.12	11°0.78 \$10°59.89	178°28.29 193°0.47	13.2' 13.1'	21°45.86 \$21°55.57	9.7' 9.6'	54.3' 54.3'
19	101°34.18	58.99	207°32.56	13.0'	22°5.20	9.5'	54.3'
20	116°34.25	58.09	222°4.57	,	$22^{\circ}14.73$		54.4'
21	131°34.31 146°34.38	• • 57.20	236°36.50	12.8'	22°24.18 22°33.53	9.4'	54.4'
22 23	146 34.38 161°34.44	56.30 55.40	251°8.35 265°40.12	12.8' 12.7'	22° 33.53 22° 42.80	9.3' 9.2'	54.4' 54.4'
25	SD = 16.2'	d = -0.9'	203 10.12		0 = 14.8'	J. <u>L</u>	31.1
	3D = 10.2	<u>u = -0.9</u>		JL	7 — 14.0		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°34.51 191°34.57	\$10°54.51	280°11.80	12.6'	\$22°51.96 23°1.04	9.1'	54.4'
1 2	191°34.57 206°34.64	53.61 52.71	294°43.40 309°14.92	12.5' 12.4'	23°1.04 23°10.01	9.0' 8.9'	54.4' 54.4'
3	221°34.71	51.81	323°46.35	12.3'	23° 18.89	8.8'	54.4'
4	236°34.78	50.91	338°17.70	12.3'	23°27.68	8.7'	54.5'
5	251°34.84	50.01	352°48.96	12.2'	23°36.36	8.6'	54.5'
6 7	266°34.91 281°34.98	\$10°49.11 48.21	7°20.14 21°51.23	12.1' 12.0'	\$23°44.95 23°53.43	8.5' 8.4'	54.5' 54.5'
8	296°35.05	47.31	36°22.23	11.9'	24°1.81	8.3'	54.5
9	311°35.11	• • 46.41	$50^{\circ}53.15$	11.8'	24° 10.09	8.2'	54.5'
10	326°35.18	45.51	65°23.99	11.7'	24° 18.27	8.1'	54.6'
11 12	341°35.25 356°35.32	44.61 \$10°43.71	79°54.73 94°25.39	11.7' 11.6'	24°26.34 \$24°34.31	8.0' 7.9'	54.6' 54.6'
13	11°35.39	42.81	108°55.97	11.5'	24° 42.17	7.9 7.8'	54.6'
14	26°35.46	41.91	$123^{\circ}26.45$	11.4'	24°49.92	7.6'	54.6'
15	41°35.53	• • 41.00	137°56.85	11.3'	24°57.56	7.5'	54.6'
16 17	56°35.60 71°35.67	40.10 39.20	152°27.17 166°57.39	11.2' 11.1'	25°5.10 25°12.52	7.4' 7.3'	54.7' 54.7'
18	71 35.07 86°35.74	39.20 \$10°38.30	181°27.53	11.1'	25 12.52 \$25°19.83	7.3 7.2'	54.7'
19	101°35.81	37.39	195°57.58	11.0'	25°27.03	7.1'	54.7'
20	116°35.89	36.49	210°27.55	10.9'	25°34.11	7.0'	54.7'
21 22	131°35.96 146°36.03	· · 35.59 34.68	224°57.42 239°27.22	10.8' 10.7'	25°41.08 25°47.93	6.9' 6.7'	54.8' 54.8'
23	140 36.03 161°36.10	34.08	259 27.22 253°56.92	10.7	25 47.93 25°54.67	6.6'	54.8'
	SD = 16.2'	d = -0.9'			0 = 14.8'		
	JD — 10.2	<u>u = 0.9</u>		JL	- 17.0		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-57%	
18	13:53	13:51	12:14	04:01	16:22		
19	13:48	13:45	12:14	04:44	17:06		
20	13:42	13:39	12:14	05:30	17:54		

# February 21, 22, 23 UT (Fri., Sat., Sun.)

h	Aries	Venus	•	Mar	S	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	151° 10.07		3°31.93		N26°6.07	80°53.28	N21°46.48	159°51.74	S05°49.71			
1	166° 12.54	159°46.46	32.67	57° 10.17	6.01	95°55.60	46.50	174°53.93	49.59	Alpheratz	357°34.99	29°13.74
2	181° 15.00	174°48.34	33.41	72° 12.75	5.95	110°57.92	46.53	189° 56.11	49.48	Ankaa	353°7.36	-42°10.36
3	196° 17.47		34.15	87° 15.33	• • 5.89	126°0.24	• • 46.56	204°58.30	• • 49.36	Schedar	349°31.41	56°40.63
4	211° 19.93	204°52.12	34.89	102° 17.90	5.83	141°2.56	46.58	220°0.49	49.24	Diphda	348°47.44	-17°51.08
5	226°22.39	219°54.01	35.63	117° 20.48	5.76	156°4.87	46.61	235°2.68	49.12	Achernar	335°20.42	-57°6.80
6	241°24.86		3°36.36		N26°5.70	171°7.19	N21°46.64	250°4.86	S05°49.00	Hamal	327°51.25	23°34.90
7	256°27.32	249°57.80	37.10	147°25.62	5.64	$186^{\circ}9.51$	46.66	265°7.05	48.88	Polaris	314°6.97	89°22.52
8	271°29.79	264°59.71	37.83	162°28.19	5.58	201°11.82	46.69	280°9.24	48.77	Acamar	315°11.79	-40°12.48
9	286°32.25	280°1.61 · ·	38.56	177°30.76	• • 5.52	216°14.14	• • 46.72	295°11.43	• • 48.65	Menkar	314°6.12	4°11.23
10	$301^{\circ}34.72$	295°3.52	39.29	192°33.33	5.46	231°16.46	46.74	310°13.61	48.53	Mirfak	308°28.19 290°39.45	49°57.20 16°33.59
11	$316^{\circ}37.18$	310°5.43	40.02	207°35.90	5.39	246°18.77	46.77	325°15.80	48.41	Aldebaran		-8°10.48
12	331°39.64	325°7.34 N08	3°40.75	222°38.46	N26°5.33	261°21.09	N21°46.80	340°17.99	S05°48.29	Rigel	281°3.66 280°21.59	-8 10.48 46°1.53
13	$346^{\circ}42.11$	340°9.26	41.48	237°41.03	5.27	276°23.40	46.83	355°20.17	48.17	Capella Bellatrix	278°22.65	6°22.29
14	1°44.57	355°11.18	42.20	252°43.59	5.21	291°25.72	46.85	10°22.36	48.05	Elnath	278°1.60	28°37.77
15	16°47.04		42.92	267°46.15	• • 5.14	306°28.03	• • 46.88	25°24.55	• • 47.94	Alnilam	275°37.49	-1°11.24
16	31°49.50	25° 15.03	43.65	282°48.71	5.08	321°30.35	46.91	40°26.74	47.82	Betelgeuse	270°51.82	7°24.65
17	46°51.96	40° 16.96	44.37	297°51.27	5.02	336°32.66	46.93	55° 28.92	47.70	Canopus	263°52.05	-52°42.75
18	61°54.43		3°45.09		N26°4.95	351°34.98	N21°46.96	70°31.11	S05°47.58	Sirius	258°25.93	-16°45.18
19	76° 56.89	70°20.83	45.81	327°56.38	4.89	6°37.29	46.99	85°33.30	47.46	Adhara	255°5.53	-29°0.54
20	91°59.36	85°22.77	46.52	342°58.93	4.83	21°39.60	47.02	100°35.48	47.34	Procyon	244°50.46	5°9.55
21	107°1.82		47.24	358°1.48	• • 4.76	36°41.91	• • 47.04	115°37.67	• • 47.22	Pollux	243°16.87	27°57.92
22	122°4.29	115°26.66	47.95	13°4.03	4.70	51°44.23	47.07	130°39.86	47.11	Avior	234°14.15	-59°35.52
23	137°6.75	130°28.60	48.66	28°6.58	4.63	66°46.54	47.10	145°42.04	46.99	Suhail	222°45.83	-43°32.14
Mer.	pass. 13:53	$\nu 1.9' \ d0.7' \ {\rm m}$	-4.85	$\nu 2.6' \ d-0.1'$	m-0.50	$\nu 2.3' d0.$	.0′ m-2.36	$\nu$ 2.2' d-0	.1′ m1.12	Miaplacidus	221°37.41	-69°49.27
										Alphard	217°47.33	-8°46.16
_			_		_		_		_	Regulus	207°34.00	11°50.54
Sat	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°40.18	61°36.79
0	152°9.21		3°49.38		N26°4.57	81°48.85	N21°47.13	160°44.23	\$05°46.87	Denebola	$182^{\circ}24.54$	14°25.73
1	167° 11.68	160°32.51	50.09	58° 11.68	4.50	96°51.16	47.15	175°46.42	46.75	Gienah	175°43.20	-17°40.97
2	182° 14.14	175°34.47	50.79	73° 14.22	4.44	111°53.47	47.18	190°48.60	46.63	Acrux	172°59.46	-63°14.20
3	197° 16.61		51.50	88° 16.76	• • 4.37	126°55.78	• • 47.21	205°50.79	• • 46.51	Gacrux	171°51.10	-57°15.15
4	212° 19.07	205°38.40	52.21	103° 19.31	4.31	141°58.09	47.24	220°52.98	46.39	Alioth	$166^{\circ}12.41$	55°49.13
5	227°21.53	220°40.37	52.91	118°21.85	4.24	157°0.40	47.26	235°55.16	46.27	Spica	$158^{\circ}21.98$	-11°17.64
6	242°24.00	235°42.34 N08 250°44.31	3°53.61		N26°4.18	172°2.71 187°5.02	N21° 47.29	250° 57.35	\$05°46.16	Alkaid	$152^{\circ}51.61$	49°10.95
7 8	257° 26.46 272° 28.93	265°46.29	54.32	148° 26.92 163° 29.46	4.11	202°7.33	47.32	265°59.54 281°1.72	46.04	Hadar	148°35.57	-60°29.48
9	272 26.93 287°31.39		55.02 · 55.71	178° 31.99	4.05 · · 3.98	202 7.33 217°9.64	47.35 •• 47.38	201 1.72 296°3.91	45.92 •• 45.80	Menkent	147°57.31	-36°29.57
10	302° 33.86	295°50.25	56.41	193°34.53	3.91	232°11.94	47.40	311°6.10	45.68	Arcturus	145°47.65	19°2.84
11	317°36.32	310°52.24	57.11	208° 37.06	3.85	247°14.25	47.43	326°8.28	45.56	Rigil Kent.	139°39.93	-60°56.17
12	332°38.78		37.11 3°57.80		N26°3.78	262°16.56	N21° 47.46	341° 10.47	\$05°45.44	Kochab	137°19.36	74°2.72
13	347°41.25	340°56.23	58.49	238°42.12	3.71	277°18.86	47.49	356° 12.66	45.32	1	136°55.80	-16°8.83
14	2°43.71	355°58.22	59.19	253° 44.64	3.64	292°21.17	47.52	11° 14.84	45.21	Alphecca	126°3.59	26°37.50
15	17°46.18		3°59.88	268° 47.17	• • 3.58	307°23.48	• • 47.54	26° 17.03	• • 45.09	Antares	112°15.75	-26°29.25
16	32°48.64		09°0.56	283°49.69	3.51	322°25.78	47.57	41° 19.21	44.97	Atria	107°10.02	-69°4.10
17	47°51.10	41°4.24	1.25	298°52.22	3.44	337°28.09	47.60	56°21.40	44.85	Sabik	102°2.75	-15°45.42
18	62°53.57		09°1.94		N26°3.37	352°30.39	N21°47.63	71°23.59	S05°44.73	Shaula	96°10.37	-37°7.25
19	77° 56.03	71°8.26	2.62	328° 57.26	3.30	7°32.70	47.66	86°25.77	44.61	Rasalhague	95°58.57	12°32.27
20	92°58.50	86° 10.28	3.31	343°59.78	3.24	22°35.00	47.69	101°27.96	44.49	Eltanin	90°42.37	51°28.76
21	108°0.96		• 3.99	359°2.30	3.17	37°37.31	• • 47.71	116°30.15	• • 44.37	Kaus Aust.	83°32.59	-34°22.32
22	123°3.43	116° 14.32	4.67	14°4.81	3.10	52°39.61	47.74	131°32.33	44.25	Vega	80°33.40	38°48.10
23	138°5.89	131°16.35	5.35	29°7.33	3.03	67°41.91	47.77	146°34.52	44.13	Nunki	75°47.86 62°0.12	-26°15.95 8°55.90
										Altair		-56°39.20
ivier.	pass. 13:49	$\nu 2.0' \ d0.7' \ {\rm m}$	1-4.85	$\nu 2.5' \ d$ -0.1	m-0.47	$\nu$ 2.3 au.	.0′ m-2.35	$\nu$ 2.2 a-0	.1′ m1.12	Peacock Deneb	53° 6.06 49° 26.17	45°21.99
										Enif	33°39.02	9°59.28
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.22	-46°50.44
0	153°8.35	146°18.38 NO	09°6.02		N26°2.96	82°44.22	N21°47.80	161°36.70	S05°44.02	Fomalhaut	15°14.74	-40° 30.44°
1	$168^{\circ}10.82$	161°20.41	6.70	59°12.35	2.89	97°46.52	47.83	176°38.89	43.90	Scheat	13°45.46	28°13.08
2	183° 13.28	176° 22.45	7.37	74° 14.86	2.82	112°48.82	47.86	191°41.07	43.78	Markab	13°30.12	15°20.34
3	198° 15.75		• 8.05	89°17.37	• • 2.75	127°51.12	• • 47.88	206°43.26	• • 43.66			
4	213° 18.21	206°26.53	8.72	104° 19.88	2.68	142°53.43	47.91	221°45.45	43.54	Feb 21 Fri	SHA	Mer.pass
5	228° 20.68	221°28.57	9.39	119°22.38	2.61	157°55.73	47.94	236°47.63	43.42	I	353°34.51	14:19
6	243°23.14		9°10.05		N26°2.54	172°58.03	N21°47.97	251°49.82	S05°43.30	Mars	250°57.51	21:08
7	258° 25.60	251°32.68	10.72	149°27.39	2.47	188°0.33	48.00	266°52.00	43.18	Jupiter	289°43.21	18:34
8	273°28.07	266°34.73	11.39	164° 29.89	2.40	203°2.63	48.03	281°54.19	43.06	Saturn	8°41.66	13:19
9	288° 30.53		12.05	179°32.39	• • 2.33	218°4.93	• 48.06	296° 56.38	• • 42.94	Feb 22 Sat	SHA	Mer.pass
10	303°33.00	296°38.86	12.71	194°34.89	2.26	233°7.23	48.09	311°58.56	42.83	Venus	353°21.34	14:16
11	318° 35.46	311°40.92	13.37	209° 37.38	2.19	248°9.53	48.11	327°0.75	42.71	Mars	250°59.92	21:04
12	333° 37.92		9°14.03		N26°2.11	263°11.83	N21°48.14	342°2.93	\$05°42.59		289°39.63	18:30
13	348° 40.39	341°45.07	14.69	239° 42.37	2.04	278°14.12	48.17	357°5.12	42.47	Saturn	8°35.02	13:15
14 15	3°42.85	356°47.14	15.35	254° 44.87 260° 47.36	1.97	293°16.42	48.20	12°7.30	42.35	F-1 00 0	CIIA	
15 16	18° 45.32 33° 47.78	11°49.22 · · · 26°51.31	· 16.00 16.66	269° 47.36 284° 49.85	· · 1.90 1.83	308°18.72 323°21.02	· · 48.23 48.26	27°9.49 42°11.67	42.23	Feb 23 Sun	SHA	Mer.pass
17	33 47.78 48°50.25	41°53.39	17.31	284 49.85 299°52.34	1.83	323 21.02 338°23.32	48.20 48.29	42 11.07 57°13.86	42.11 41.99	Venus		14:13
18	63°52.71		9°17.96		N26°1.68	353°25.61	46.29 N21°48.32	72° 16.04	\$05°41.87	Mars	251°1.48 289°35.86	21:00 18:26
19	78°55.17	71°57.57	18.61	329° 57.31	1.61	8°27.91	48.35	87° 18.23	41.75	Jupiter	289°35.86 8°28.35	18:26
20	93°57.64	86°59.67	19.25	344° 59.79	1.54	23°30.20	48.38	102° 20.42	41.63	Jaturn	0 20.33	13:12
21	109°0.10		19.90	0°2.28	. 1.46	38°32.50	• • 48.41	117°22.60	• • 41.51	Horizor	ıtal parallax	
22	124°2.57	117°3.87	20.54	15°4.76	1.39	53°34.80	48.44	132°24.79	41.40		Venus:	0.4
23	139°5.03	132°5.98	21.19	30°7.24	1.32	68°37.09	48.46	147°26.97	41.28		Mars:	0.2
ivier.	pass. 13:45	$\nu 2.0' \ d0.7' \ {\rm m}$	ı-4.ŏ5	$\nu$ 2.5′ d-0.1′	m-U.44	$\nu$ 2.3′ d0.	.0′ m-2.34	$\nu$ 2.2′ d-0	.ı mı.12			

h	Sun			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.17	\$10°32.87	268°26.54	10.5'	\$26°1.29	6.5'	54.8'
1 2	191°36.25 206°36.32	31.97 31.06	282°56.07 297°25.51	10.4' 10.4'	26°7.79 26°14.17	6.4' 6.3'	54.8' 54.9'
3	221° 36.39	• • 30.16	311°54.87	10.3'	26°20.43	6.1'	54.9'
4	236°36.47	29.25	326°24.15	10.2'	26°26.56	6.0'	54.9'
5 6	251°36.54 266°36.62	28.34 \$10°27.44	340°53.34 355°22.44	10.1' 10.0'	26°32.57 \$26°38.46	5.9' 5.8'	54.9' 54.9'
7	281°36.69	26.53	9°51.46	9.9'	26°44.22	5.6'	55.0'
8	296°36.76	25.62	24°20.39	9.9'	26°49.86	5.5'	55.0'
9	311°36.84	• • 24.72	38°49.25 53°18.01	9.8'	26°55.37	5.4'	55.0'
10 11	326°36.91 341°36.99	23.81 22.90	67°46.70	9.7' 9.6'	27° 0.75 27° 6.00	5.3' 5.1'	55.0' 55.1'
12	356° 37.07	S10°21.99	82°15.30	9.5'	\$27°11.13	5.0'	55.1'
13	11°37.14	21.08	96°43.82	9.4'	27°16.12	4.9'	55.1'
14 15	26°37.22 41°37.30	20.18 •• 19.27	111°12.26 125°40.62	9.4' 9.3'	27°20.97 27°25.70	4.7' 4.6'	55.1' 55.2'
16	56° 37.37	18.36	140°8.90	9.2'	27°30.29	4.5'	55.2'
17	71°37.45	17.45	154°37.11	9.1'	27°34.74	4.3'	55.2'
18 19	86°37.53 101°37.60	\$10°16.54 15.63	169°5.23 183°33.27	9.0' 9.0'	\$27°39.06 27°43.24	4.2' 4.0'	55.2' 55.3'
20	116° 37.68	14.72	198° 1.24	9.0 8.9'	27°47.28	3.9'	55.3'
21	131°37.76	• • 13.81	212°29.14	8.8'	27°51.19	3.8'	55.3'
22	146°37.84 161°37.92	12.90	226°56.95 241°24.70	8.7'	27°54.95	3.6'	55.3'
23		11.98	241 24.70	8.7'	27°58.57	3.5'	55.4'
	SD = 16.2'	d = -0.9'		SD	0 = 15.0'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°38.00 191°38.08	\$10°11.07	255°52.37	8.6'	\$28°2.05	3.3'	55.4'
1 2	191°38.08 206°38.16	10.16 9.25	270°19.96 284°47.49	8.5' 8.5'	28° 5.39 28° 8.58	3.2' 3.0'	55.4' 55.4'
3	221°38.23	• • 8.34	299°14.95	8.4'	28°11.63	2.9'	55.5'
4	236° 38.31	7.42	313°42.33	8.3'	28°14.54	2.8'	55.5'
5 6	251°38.40 266°38.48	6.51 \$10° 5.60	328° 9.65 342° 36.90	8.3' 8.2'	28°17.29 \$28°19.90	2.6' 2.5'	55.5' 55.6'
7	281°38.56	4.68	357° 4.09	8.1'	28°22.36	2.3'	55.6'
8	296° 38.64	3.77	11°31.21	8.1'	28°24.67	2.2'	55.6'
9	311°38.72 326°38.80	· · 2.86 1.94	25°58.26 40°25.26	8.0' 7.9'	28°26.84 28°28.85	2.0' 1.9'	55.6'
10 11	320 38.80 341°38.88	1.94	40 25.26 54°52.19	7.9' 7.9'	28° 30.71	1.7'	55.7' 55.7'
12	356° 38.96	S10°0.11	69°19.06	7.8'	S28°32.41	1.6'	55.7'
13	11°39.05 26°39.13	09°59.20	83°45.87 98°12.63	7.8' 7.7'	28°33.97 28°35.37	1.4' 1.2'	55.8'
14 15	26 39.13 41°39.21	58.28 •• 57.37	98 12.03 112°39.33	7.6'	28 35.37 28°36.61	1.1'	55.8' 55.8'
16	56° 39.30	56.45	127°5.97	7.6'	28°37.70	0.9'	55.9'
17	71°39.38	55.54	141°32.57	7.5'	28°38.64	0.8'	55.9'
18 19	86°39.46 101°39.55	\$09°54.62 53.70	155°59.11 170°25.60	7.5' 7.4'	\$28°39.41 28°40.03	0.6' 0.5'	55.9' 56.0'
20	116°39.63	52.79	184°52.04	7.4'	28°40.49	0.3'	56.0'
21	131°39.72	• • 51.87	199°18.43	7.3'	28°40.80	0.1'	56.0'
22 23	146°39.80 161°39.89	50.95 50.03	213°44.78 228°11.08	7.3' 7.3'	28°40.94 28°40.92	-0.0' -0.2'	56.0' 56.1'
	SD = 16.2'	d = -0.9'			0 = 15.1'		
Sun 0	<b>GHA</b> 176°39.97	<b>Dec</b> \$09°49.12	<b>GHA</b> 242°37.34	u 7.2'	<b>Dec</b> \$28°40.75	d -0.3'	<b>HP</b> 56.1'
1	191° 40.06	48.20	257° 3.56	7.2'	28°40.41	-0.5	56.1
2	206° 40.14	47.28	271°29.74	7.1'	28°39.91	-0.7'	56.2'
3 4	221°40.23 236°40.31	· · 46.36 45.44	285°55.88 300°21.98	7.1' 7.1'	28°39.24 28°38.42	-0.8' -1.0'	56.2' 56.2'
5	251° 40.40	44.52	314°48.05	7.0'	28°37.43	-1.2'	56.3'
6	266° 40.49	S09°43.60	329°14.08	7.0'	\$28°36.28	-1.3'	56.3'
7 8	281°40.57 296°40.66	42.68 41.76	343°40.09 358°6.06	7.0' 6.9'	28°34.96 28°33.48	-1.5' -1.6'	56.3' 56.4'
9	311°40.75	• • 40.84	12°32.00	6.9'	28°31.84	-1.8'	56.4
10	326°40.84	39.92	26°57.92	6.9'	28°30.03	-2.0'	56.4'
11 12	341°40.93 356°41.01	39.00 \$09°38.08	41°23.81 55°49.68	6.9' 6.8'	28°28.05 \$28°25.91	-2.1' -2.3'	56.5' 56.5'
13	11°41.10	37.16	70°15.53	6.8	28°23.60	-2.5'	56.5'
14	26°41.19	36.24	84°41.36	6.8'	28°21.13	-2.6'	56.6'
15 16	41°41.28 56°41.37	· · 35.32 34.39	99°7.17 113°32.96	6.8' 6.8'	28°18.49 28°15.68	-2.8' -3.0'	56.6' 56.7'
16 17	56°41.37 71°41.46	34.39 33.47	113°32.96 127°58.73	6.8'	28°15.68 28°12.71	-3.0° -3.1'	56.7' 56.7'
18	86°41.55	S09°32.55	142°24.50	6.8'	S28° 9.56	-3.3'	56.7'
19	101°41.64	31.63	156°50.25	6.7'	28° 6.25	-3.5'	56.8'
20 21	116°41.73 131°41.82	30.70 •• 29.78	171°15.99 185°41.72	6.7' 6.7'	28°2.78 27°59.13	-3.6' -3.8'	56.8' 56.8'
22	146° 41.91	28.86	200°7.45	6.7'	27°55.32	-4.0'	56.9'
23	161°42.00	27.93	214°33.17	6.7'	27°51.34	-4.1'	56.9'
	SD = 16.2'	d = -0.9'		SD	0 = 15.3'		

Lat.	Twilight		Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Suririse	Sunset	Civil	Naut.
<b>N</b> 72°	05:42	07:00	08:13	16:16	17:28	18:47
<b>N</b> 70°	05:44	06:54	07:59	16:29	17:34	18:45
68°	05:45	06:49	07:48	16:41	17:39	18:44
66°	05:46	06:45	07:38	16:50	17:43	18:43
64°	05:47	06:42	07:31	16:57	17:47	18:42
62°	05:47	06:38	07:24	17:04	17:50	18:41
60°	05:47	06:35	07:18	17:10	17:53	18:41
<b>N</b> 58°	05:47	06:33	07:13	17:15	17:55	18:41
56°	05:47	06:30	07:08	17:19	17:57	18:41
54°	05:47	06:28	07:04	17:24	18:00	18:41
52°	05:47	06:26	07:00	17:27	18:02	18:41
50°	05:47	06:24	06:57	17:31	18:03	18:41
45°	05:46	06:20	06:50	17:38	18:08	18:42
<b>N</b> 40°	05:44	06:16	06:43	17:44	18:12	18:43
35°	05:43	06:12	06:38	17:49	18:15	18:44
30°	05:41	06:09	06:33	17:54	18:18	18:46
$20^{\circ}$	05:37	06:02	06:25	18:02	18:25	18:50
<b>N</b> 10°	05:31	05:56	06:17	18:10	18:31	18:56
0°	05:25	05:49	06:10	18:17	18:38	19:02
<b>S</b> $10^{\circ}$	05:17	05:41	06:03	18:24	18:45	19:10
20°	05:06	05:32	05:55	18:32	18:54	19:20
$30^{\circ}$	04:52	05:21	05:46	18:40	19:05	19:34
35°	04:43	05:14	05:41	18:46	19:12	19:43
40°	04:33	05:06	05:35	18:51	19:20	19:53
45°	04:19	04:57	05:28	18:58	19:29	20:06
<b>S</b> 50°	04:02	04:45	05:19	19:07	19:41	20:23
52°	03:54	04:39	05:15	19:11	19:46	20:31
54°	03:45	04:33	05:11	19:15	19:53	20:40
56°	03:34	04:25	05:06	19:20	20:00	20:51
58°	03:21	04:17	05:00	19:25	20:08	21:04
<b>S</b> 60°	03:05	04:08	04:54	19:31	20:17	21:19
Lat.		Moonris	ie .		Moonset	:
∟at.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°						

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	48-28%	
21	13:35	13:32	12:14	06:19	18:45		
22	13:28	13:24	12:13	07:12	19:40		
23	13:20	13:16	12:13	08:08	20:36		

### February 24, 25, 26 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	154°7.49	147°8.09 N09°21.83	45°9.72 N26°1.24	83°39.39 N21°48.49	162°29.16 <b>S</b> 05°41.16	Alpheratz 357°34.99 29°13.73
1	$169^{\circ}9.96$	162° 10.20 22.47	60° 12.19 1.17	98°41.68 48.52	177°31.34 41.04	Ankaa 353°7.36 -42°10.34
2	184° 12.42	177°12.32 23.11	75°14.67 1.09	113°43.97 48.55	192°33.53 40.92	Schedar 349°31.41 56°40.62
3 4	199°14.89	192°14.44 · · 23.74	90°17.14 · · 1.02	128°46.27 · · 48.58	207°35.71 · · 40.80	Diphda 348°47.44 -17°51.08
5	214° 17.35 229° 19.82	207°16.56 24.38 222°18.69 25.01	105°19.62 0.95 120°22.09 0.87	143°48.56 48.61 158°50.85 48.64	222°37.90 40.68 237°40.08 40.56	Achernar 335°20.43 -57°6.78
6	244°22.28	237°20.82 N09°25.64	135°24.56 N26°0.80	173°53.15 N21°48.67	252°42.27 S05°40.44	Hamal 327°51.26 23°34.90
7	259° 24.74	252°22.96 26.27	150°27.03 0.72	188°55.44 48.70	267°44.45 40.32	Polaris 314°8.27 89°22.52
8	274°27.21	267°25.09 26.90	165°29.49 0.65	203°57.73 48.73	282°46.64 40.20	Acamar 315°11.80 -40°12.47 Menkar 314°6.12 4°11.23
9	289°29.67	282°27.23 · · 27.53	180°31.96 · · 0.57	219°0.02 · · 48.76	297°48.82 · · 40.08	Mirfak 308°28.21 49°57.20
10	304°32.14	297°29.38 28.16	195°34.42 0.50	234°2.31 48.79	312°51.01 39.96	Aldebaran 290°39.45 16°33.59
11 12	319°34.60 334°37.06	312°31.52 28.78 327°33.67 N09°29.40	210°36.89 0.42 225°39.35 N26°0.34	249° 4.61 48.82 264° 6.90 N21° 48.85	327°53.19 39.84 342°55.38 \$05°39.73	Rigel 281°3.67 -8°10.48
13	349°39.53	342°35.83 30.02	240°41.81 0.27	279° 9.19 48.88	357°57.56 39.61	Capella 280°21.60 46°1.54
14	4°41.99	357°37.99 30.64	255° 44.27 0.19	294°11.48 48.91	12°59.74 39.49	Bellatrix 278°22.66 6°22.29
15	19°44.46	12°40.15 · · 31.26	270°46.72 · · 0.12	309°13.77 · · 48.94	28°1.93 · · 39.37	Elnath 278°1.61 28°37.77 Alnilam 275°37.50 -1°11.24
16	34° 46.92	27°42.31 31.88	285°49.18 0.04	324°16.06 48.97	43°4.11 39.25	Betelgeuse 270°51.82 7°24.65
17	49°49.39	42°44.48 32.49	300°51.63 25°59.96	339°18.34 49.00	58°6.30 39.13	Canopus 263°52.07 -52°42.75
18	64°51.85	57°46.65 N09°33.11	315°54.09 N25°59.89	354°20.63 N21°49.03	73°8.48 \$05°39.01	Sirius 258°25.94 -16°45.19
19 20	79°54.31 94°56.78	72°48.83 33.72 87°51.00 34.33	330°56.54 59.81 345°58.99 59.73	9°22.92 49.06 24°25.21 49.09	88°10.67 38.89 103°12.85 38.77	Adhara 255°5.54 -29°0.55
21	109° 59.24	102°53.19 · · 34.93	1°1.44 · · 59.65	39°27.50 · · 49.12	118°15.04 · · 38.65	Procyon 244°50.46 5°9.55
22	125°1.71	117°55.37 35.54	16°3.88 59.58	54°29.78 49.15	133°17.22 38.53	Pollux 243°16.87 27°57.92
23	140°4.17	132°57.56 36.15	31°6.33 59.50	69°32.07 49.18	148°19.41 38.41	Avior 234°14.17 -59°35.53 Suhail 222°45.83 -43°32.16
Merr	pass. 13:41	ν2.1' d0.6' m-4.84	ν2.5' d-0.1' m-0.42	ν2.3' d0.0' m-2.34	ν2.2' d-0.1' m1.12	Miaplacidus 221°37.43 -69°49.29
14161.		ν Δ.1 αυ.υ III-4.υ4	ν Δ.Ο -0.1 ΠΕ-0.42	ν Δ.Ο αΟ.Ο ΠΕ-Δ.Ο <del>Υ</del>	ν Δ.Δ. U-U.1 III1.12	Alphard 217°47.33 -8°46.17
_	6114	G114 B	G114 D	CU14 D	GUA B	Regulus 207°33.99 11°50.54
Tue 0	<b>GHA</b> 155° 6.63	GHA Dec	<b>GHA Dec</b> 46°8.78 <b>N</b> 25°59.42	GHA Dec	<b>GHA Dec</b> 163°21.59 \$05°38.29	Dubhe 193°40.16 61°36.80
1	170° 9.10	147°59.75 N09°36.75 163°1.95 37.35	61°11.22 59.34	84°34.36 N21°49.21 99°36.64 49.24	178°23.77 38.17	Denebola 182°24.52 14°25.73
2	185° 11.56	178° 4.15 37.95	76°13.66 59.26	114°38.93 49.27	193°25.96 38.05	Gienah 175°43.18 -17°40.98
3	200° 14.03	193°6.35 · · 38.55	91°16.10 · · 59.19	129°41.21 · · 49.30	208°28.14 · · 37.93	Acrux 172°59.43 -63°14.22   Gacrux 171°51.07 -57°15.17
4	$215^{\circ}16.49$	208°8.55 39.15	106°18.54 59.11	144°43.50 49.33	223°30.33 37.81	Gacrux 171°51.07 -57°15.17   Alioth 166°12.38 55°49.13
5	230° 18.96	223°10.76 39.74	121°20.98 59.03	159°45.78 49.36	238°32.51 37.69	Spica 158°21.96 -11°17.66
6	245°21.42	238°12.98 N09°40.34	136°23.41 N25°58.95	174°48.07 N21°49.39	253°34.70 S05°37.58	Alkaid 152°51.58 49°10.95
7	260°23.88 275°26.35	253°15.19 40.93 268°17.41 41.52	151°25.85 58.87 166°28.28 58.79	189°50.35 49.42	268°36.88 37.46	Hadar 148°35.53 -60°29.50
8 9	275 26.35 290°28.81	268° 17.41 41.52 283° 19.64 • 42.11	166°28.28 58.79 181°30.71 • 58.71	204°52.64 49.46 219°54.92 • 49.49	283°39.06 37.34 298°41.25 · · 37.22	Menkent 147°57.28 -36°29.58
10	305°31.28	298°21.86 42.70	196° 33.14 58.63	234°57.20 49.52	313°43.43 37.10	Arcturus 145°47.62 19°2.84
11	320°33.74	313°24.09 43.28	211°35.57 58.55	249°59.49 49.55	328°45.62 36.98	Rigil Kent. 139°39.88 -60°56.18 Kochab 137°19.30 74°2.72
12	335°36.20	328°26.33 N09°43.87	226°38.00 N25°58.47	265°1.77 N21°49.58	343°47.80 <b>S</b> 05°36.86	Zuben'ubi 136°55.77 -16°8.84
13	350° 38.67	343°28.56 44.45	241°40.43 58.39	280° 4.05 49.61	358°49.99 36.74	Alphecca 126°3.57 26°37.50
14	5°41.13	358°30.81 45.03	256°42.85 58.31	295° 6.33 49.64	13°52.17 36.62	Antares 112°15.71 -26°29.26
15	20° 43.60	13°33.05 · · 45.61	271°45.27 · · 58.23	310°8.61 · · 49.67	28°54.35 · · 36.50	Atria 107°9.95 -69°4.10
16 17	35° 46.06 50° 48.53	28°35.30 46.19 43°37.55 46.76	286° 47.70 58.15 301° 50.12 58.07	325°10.90 49.70 340°13.18 49.73	43°56.54 36.38 58°58.72 36.26	Sabik 102°2.72 -15°45.42
18	65°50.99	58°39.80 N09°47.34	316°52.54 N25°57.99	355°15.46 N21°49.76	74°0.91 S05°36.14	Shaula 96°10.34 -37°7.25
19	80°53.45	73°42.06 47.91	331°54.95 57.91	10°17.74 49.79	89°3.09 36.02	Rasalhague 95°58.54 12°32.27
20	95°55.92	88°44.32 48.48	346°57.37 57.82	25°20.02 49.83	104°5.27 35.90	Eltanin 90° 42.34 51° 28.75   Kaus Aust. 83° 32.56 -34° 22.32
21	110°58.38	103°46.59 · · 49.05	1°59.79 · · 57.74	40°22.30 · · 49.86	119°7.46 · · 35.78	Vega 80°33.38 38°48.09
22	126°0.85	118° 48.86 49.61	17°2.20 57.66	55°24.58 49.89	134°9.64 35.66	Nunki 75°47.83 -26°15.94
23	141°3.31	133°51.13 50.18	32°4.61 57.58	70°26.85 49.92	149°11.82 35.54	Altair 62°0.10 8°55.90
Mer.p	pass. 13:37	$\nu 2.2' \ d0.6' \ \text{m-4.83}$	$\nu 2.4' \ d$ -0.1' m-0.39	$\nu 2.3' \ d0.0' \ \text{m-}2.33$	$ u 2.2' \ d ext{-}0.1' \ \text{m}1.11$	Peacock 53°6.03 -56°39.19
						Deneb 49°26.16 45°21.98
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°39.00 9°59.27 Al Na'ir 27°33.20 -46°50.43
0	156°5.77	148°53.41 N09°50.74	47°7.02 N25°57.50	85°29.13 N21°49.95	164°14.01 <b>S</b> 05°35.42	Fomalhaut 15°14.73 -29°29.47
1	171°8.24	163°55.69 51.31	62°9.43 57.41	100°31.41 49.98	179°16.19 35.30	Scheat 13°45.46 28°13.07
2	186° 10.70	178° 57.97 51.87	77°11.84 57.33 92°14.25 · 57.25	115°33.69 50.01	194°18.38 35.18 209°20.56 · · 35.06	Markab 13°30.11 15°20.33
3 4	201°13.17 216°15.63	194°0.26 · · 52.43 209°2.55 52.98	92°14.25 · · 57.25 107°16.65 57.17	130°35.97 · · 50.04 145°38.24 50.08	209°20.56 · · 35.06 224°22.74 34.94	Feb 24 Mon SHA Mer.pass
5	231° 18.09	224°4.84 53.54	122°19.06 57.08	160°40.52 50.11	239°24.93 34.82	Venus 353°0.60 14:09
6	246°20.56	239°7.14 N09°54.09	137°21.46 N25°57.00	175°42.80 N21°50.14	254°27.11 S05°34.70	Mars 251°2.22 20:56
7	261°23.02	254°9.44 54.64	152°23.86 56.92	190°45.07 50.17	269°29.29 34.58	Jupiter 289°31.89 18:23
8	276°25.49	269°11.74 55.19	167°26.26 56.83	205°47.35 50.20	284°31.48 34.46	Saturn 8°21.66 13:08
9	291°27.95	284°14.05 · · 55.74	182°28.66 · · 56.75	220°49.62 · · 50.23	299°33.66 · · 34.34	Feb 25 Tue SHA Mer.pass
10 11	306°30.42 321°32.88	299°16.36 56.29 314°18.68 56.83	197°31.06 56.66 212°33.45 56.58	235°51.90 50.26 250°54.17 50.30	314°35.84 34.23 329°38.03 34.11	Venus 352° 53.12 14:06
12	336° 35.34	329°21.00 N09°57.38	227°35.85 N25°56.50	265°56.45 N21°50.33	344°40.21 S05°33.99	Mars 251°2.14 20:52
13	351° 37.81	344°23.32 57.92	242°38.24 56.41	280°58.72 50.36	359°42.39 33.87	Jupiter 289°27.72 18:19
14	6°40.27	359°25.65 58.46	257°40.63 56.33	296° 0.99 50.39	14°44.58 33.75	Saturn 8°14.96 13:05
15	21° 42.74	14°27.97 · · 59.00	272°43.02 · · 56.24	311° 3.27 · · · 50.42	29°46.76 · · 33.63	Feb 26 Wed SHA Mer.pass
16	36° 45.20	29°30.31 09°59.53	287° 45.41 56.16	326° 5.54 50.45	44°48.94 33.51	Venus 352°47.63 14:02
17	51°47.66	44°32.64 10°0.07	302°47.80 56.07	341°7.81 50.49	59°51.13 33.39	Mars 251°1.25 20:48
18 19	66° 50.13 81° 52.59	59°34.98 N10°0.60 74°37.33 1.13	317°50.18 N25°55.99 332°52.57 55.90	356°10.09 N21°50.52 11°12.36 50.55	74°53.31 S05°33.27 89°55.49 33.15	Jupiter 289°23.36 18:15 Saturn 8°8.23 13:01
20	96° 55.06	89°39.68 1.66	347° 54.95 55.82	26°14.63 50.58	104°57.68 33.03	
21	111°57.52	104°42.03 · · 2.19	2°57.33 · · 55.73	41°16.90 · · 50.61	119°59.86 · · 32.91	Horizontal parallax
22	126°59.98	119°44.38 2.72	17° 59.71 55.64	56°19.17 50.65	135°2.04 32.79	Venus: 0.4
23	142°2.45	134°46.74 3.24	33°2.09 55.56	71°21.44 50.68	150°4.23 32.67	Mars: 0.2
Mer.p	pass. 13:33	ν2.3' d0.6' m-4.82	ν2.4' d-0.1' m-0.36	ν2.3' d0.0' m-2.32	ν2.2' d-0.1' m1.11	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°42.09	S09°27.01	228°58.89	6.7'	S27°47.19	-4.3'	56.9'
1	191°42.19	26.08	243°24.61	6.7'	27°42.87	-4.5'	57.0'
2	206°42.28 221°42.37	25.16 •• 24.23	257°50.32 272°16.04	6.7' 6.7'	27°38.39 27°33.74	-4.7' -4.8'	57.0' 57.0'
4	236°42.46	23.31	286°41.76	6.7'	27°28.92	-5.0'	57.1'
5	251°42.55	22.38	301°7.49	6.7'	$27^{\circ}23.93$	-5.2'	57.1'
6	266°42.65	S09°21.46	315°33.22	6.7'	\$27°18.78	-5.3'	57.2'
7 8	281°42.74 296°42.83	20.53 19.61	329°58.96 344°24.71	6.8' 6.8'	27°13.46 27°7.97	-5.5' -5.7'	57.2' 57.2'
9	311°42.93	• • 18.68	358° 50.47	6.8'	27°2.31	-5.8'	57.3'
10	326°43.02	17.75	13°16.25	6.8'	$26^{\circ}56.49$	-6.0'	57.3'
11	341°43.12 356°43.21	16.83	27°42.03 42°7.84	6.8'	26°50.50 526°44.35	-6.2'	57.3
12 13	356 43.21 11°43.30	S09°15.90 14.97	42°7.84 56°33.66	6.8' 6.8'	26°38.03	-6.3' -6.5'	57.4' 57.4'
14	26°43.40	14.04	70°59.50	6.9'	26°31.54	-6.6'	57.4'
15	41°43.49	• • 13.12	85°25.36	6.9'	26°24.89	-6.8'	57.5'
16	56°43.59 71°43.69	12.19	99°51.24	6.9'	26°18.08 26°11.10	-7.0'	57.5'
17 18	71°43.69 86°43.78	11.26 \$09°10.33	114°17.14 128°43.07	6.9' 7.0'	526° 3.96	-7.1' -7.3'	57.6' 57.6'
19	101°43.88	9.40	143°9.02	7.0'	25°56.65	-7.5'	57.6'
20	116°43.97	8.47	157°35.00	7.0'	$25^{\circ}49.19$	-7.6'	57.7'
21	131°44.07	• • 7.54	172°1.01	7.0'	25°41.56	-7.8'	57.7'
22 23	146°44.17 161°44.26	6.61 5.68	186°27.04 200°53.11	7.1' 7.1'	25°33.77 25°25.81	-8.0' -8.1'	57.7' 57.8'
23	SD = 16.2'					0.1	31.0
	SD = 16.2'	d = -0.9'		5	D = 15.5'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°44.36	S09°4.75	215° 19.21	7.1'	\$25°17.70	-8.3'	57.8'
1	191°44.46	3.82	229°45.34 244°11.50	7.2'	25° 9.43 25° 1.00	-8.4' -8.6'	57.9'
2	206°44.56 221°44.65	2.89 •• 1.96	244 11.50 258° 37.70	7.2' 7.2'	25°1.00 24°52.41	-8.6° -8.7'	57.9' 57.9'
4	236°44.75	1.03	273°3.94	7.3'	24°43.66	-8.9'	58.0'
5	251°44.85	09°0.10	287°30.21	7.3'	24°34.75	-9.1'	58.0'
6	266°44.95 281°45.05	\$08° 59.17 58.24	301°56.52 316°22.87	7.3'	\$24°25.69 24°16.48	-9.2'	58.0'
7 8	281 45.05 296°45.15	58.24 57.31	310° 22.87 330° 49.26	7.4' 7.4'	24°16.48 24°7.11	-9.4' -9.5'	58.1' 58.1'
9	311°45.25	56.37	345° 15.69	7.5'	23°57.58	-9.7'	58.1
10	326°45.35	55.44	359°42.16	7.5'	23°47.91	-9.8'	58.2'
11	341°45.45 356°45.55	54.51 \$08°53.58	14°8.68 28°35.23	7.6'	23°38.08 523°28.10	-10.0'	58.2'
12 13	350°45.55 11°45.65	508 53.58	28° 35.23 43° 1.84	7.6' 7.6'	23° 17.97	-10.1' -10.3'	58.3' 58.3'
14	26°45.75	51.71	57°28.48	7.7'	23°7.69	-10.4	58.3'
15	41°45.85	• • 50.78	71°55.18	7.7'	22°57.26	-10.6'	58.4'
16 17	56°45.95 71°46.05	49.84 48.91	86°21.91 100°48.70	7.8' 7.8'	22°46.69 22°35.97	-10.7' -10.9'	58.4' 58.4'
18	86°46.16	508° 47.97	115° 15.53	7.9'	\$22°25.10	-10.9	58.5
19	101°46.26	47.04	129°42.41	7.9'	22°14.09	-11.2'	58.5'
20	116°46.36	46.11	144°9.34	8.0'	22°2.93		58.5'
21 22	131°46.46 146°46.56	· · 45.17 44.24	158°36.32 173°3.35	8.0' 8.1'	21°51.64 21°40.20	-11.4' -11.6'	58.6' 58.6'
23	161°46.67	44.24	175 3.35 187°30.42	8.1'	21°28.63	-11.0	58.6'
	SD = 16.2'	d = -0.9'		S	D = 15.8'		
	3D = 10.2	<u>u = -0.9</u>			D = 13.0		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	176°46.77 191°46.87	S08° 42.36 41.43	201°57.55 216°24.73	8.2' 8.2'	\$21°16.91 21°5.06	-11.9' -12.0'	58.7' 58.7'
2	191°46.87 206°46.98	41.43 40.49	216° 24.73 230° 51.96	8.2 8.3'	21°5.06 20°53.07	-12.0 -12.1'	58.7' 58.7'
3	221°47.08	• • 39.56	245° 19.24	8.3'	20°40.95	-12.3'	58.8'
4	236°47.19	38.62	259°46.57	8.4'	20°28.69	-12.4'	58.8'
5	251°47.29 266°47.39	37.68 \$08°36.75	274° 13.95 288° 41.39	8.4' 8.5'	20°16.30 \$20°3.78	-12.5' -12.7'	58.8' 58.9'
6 7	266°47.39 281°47.50	35.81	288°41.39 303°8.88	8.5'	19°51.13	-12.7' -12.8'	58.9'
8	296°47.60	34.87	317°36.41	8.6'	19°38.35	-12.9'	58.9'
9	311°47.71	• • 33.93	332°4.00	8.6'	19°25.44	-13.0'	59.0'
10 11	326°47.82 341°47.92	33.00 32.06	346°31.65 0°59.34	8.7' 8.7'	19°12.41 18°59.25	-13.2' -13.3'	59.0' 59.0'
12	341°47.92 356°48.03	32.06 \$08°31.12	15° 27.09	8.8'	18°59.25 \$18°45.97	-13.4'	59.0
13	11°48.13	30.18	29°54.89	8.9'	18°32.56	-13.5'	59.1'
14	26°48.24	29.24	44°22.74	8.9'	18°19.04	-13.6'	59.1'
15 16	41°48.35 56°48.45	· · 28.30 27.37	58°50.64 73°18.60	9.0' 9.0'	18°5.40 17°51.64	-13.8' -13.9'	59.2' 59.2'
17	71°48.56	26.43	87°46.60	9.0 9.1'	17°37.76	-13.9 -14.0'	59.2'
18	86°48.67	S08°25.49	102° 14.66	9.1'	S17°23.77	-14.1'	59.3'
19	101°48.78	24.55	116°42.77	9.2'	17°9.66	-14.2'	59.3'
20 21	116°48.88 131°48.99	23.61 •• 22.67	131°10.93 145°39.14	9.2' 9.3'	16°55.44 16°41.12	-14.3' -14.4'	59.3' 59.4'
22	131 48.99 146°49.10	21.73	145 39.14 160°7.40	9.3' 9.3'	16° 41.12 16° 26.68	-14.4 -14.5'	59.4 59.4
23	161°49.21	20.79	174°35.71	9.4'	16°12.14	-14.6'	59.4
	SD = 16.1'	d = -0.9'		S	D = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-6%	
24	13:12	13:07	12:13	09:05	21:33		
25	13:03	12:58	12:13	10:01	22:29		
26	12:53	12:48	12:13	10:56	23:22		

# February 27, 28, 01 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	157°4.91	149°49.10 N10°3.76	48°4.47 N25°55.47	86°23.71 N21°50.71	165°6.41 \$05°32.55	
1	172°7.38	164°51.47 4.28	63°6.85 55.39	101°25.98 50.74	180°8.59 32.43	Alpheratz 357°34.99 29°13.73
2	$187^{\circ}9.84$	179°53.84 4.80	78° 9.22 55.30	116°28.25 50.77	195°10.78 32.31	Ankaa 353°7.37 -42°10.33 Schedar 349°31.43 56°40.61
3	$202^{\circ}12.31$	194°56.21 · · 5.32	93°11.59 · · 55.21	131°30.52 · · 50.81	210°12.96 · · 32.19	Schedar 349°31.43 56°40.61 Diphda 348°47.44 -17°51.07
4	$217^{\circ}14.77$	209°58.59 5.83	108° 13.97 55.12	146°32.79 50.84	225°15.14 32.07	Achernar 335°20.45 -57°6.77
5	232° 17.23	225°0.97 6.35	123°16.34 55.04	161°35.06 50.87	240°17.33 31.95	Hamal 327°51.27 23°34.89
6	247° 19.70	240°3.35 N10°6.86	138°18.71 N25°54.95	176°37.33 N21°50.90	255°19.51 \$05°31.83	Polaris 314°9.83 89°22.51
7	262°22.16	255°5.74 7.37	153°21.08 54.86	191°39.59 50.94	270°21.69 31.71	Acamar 315°11.82 -40°12.46
8 9	277° 24.63 292° 27.09	270°8.13 7.88 285°10.52 • 8.38	168°23.44 54.78 183°25.81 •• 54.69	206°41.86 50.97 221°44.13 • 51.00	285°23.87 31.59 300°26.06 · · 31.47	Menkar 314°6.13 4°11.23
10	307°29.55	300°12.92 8.89	198° 28.17 54.60	236°46.40 51.03	315°28.24 31.35	Mirfak 308°28.23 49°57.20
11	322°32.02	315°15.32 9.39	213°30.53 54.51	251°48.66 51.07	330°30.42 31.23	Aldebaran 290°39.47 16°33.59
12	337° 34.48	330°17.73 N10°9.89	228°32.90 N25°54.42	266°50.93 N21°51.10	345°32.61 S05°31.11	Rigel 281°3.68 -8°10.48
13	352°36.95	345°20.14 10.39	243°35.26 54.33	281°53.20 51.13	0°34.79 30.99	Capella 280°21.61 46°1.54
14	$7^{\circ}39.41$	0°22.55 10.89	258° 37.61 54.25	296°55.46 51.16	15°36.97 30.87	Bellatrix 278°22.67 6°22.29 Elnath 278°1.62 28°37.77
15	22°41.87	15°24.97 · · 11.38	273°39.97 · · 54.16	311°57.73 · · 51.20	30°39.15 · · 30.75	Alnilam 275°37.51 -1°11.24
16	37°44.34	30°27.39 11.88	288° 42.33 54.07	326°59.99 51.23	45°41.34 30.63	Betelgeuse 270°51.83 7°24.65
17	52°46.80	45°29.81 12.37	303°44.68 53.98	342°2.26 51.26	60°43.52 30.51	Canopus 263°52.09 -52°42.76
18	67°49.27	60°32.24 N10°12.86	318° 47.04 N25° 53.89	357° 4.52 N21° 51.29	75°45.70 \$05°30.39	Sirius 258°25.95 -16°45.19
19 20	82°51.73 97°54.19	75°34.67 13.35 90°37.10 13.83	333°49.39 53.80 348°51.74 53.71	12° 6.78 51.33 27° 9.05 51.36	90°47.88 30.27 105°50.07 30.15	Adhara 255°5.55 -29°0.55
21	112°56.66	105°39.54 · · 14.32	3°54.09 · · 53.62	42°11.31 · · 51.39	120°52.25 · · 30.03	Procyon 244°50.47 5°9.55
22	127°59.12	120°41.98 14.80	18° 56.43 53.53	57°13.57 51.42	135°54.43 29.91	Pollux 243°16.88 27°57.92
23	143°1.59	135°44.43 15.28	33°58.78 53.44	72°15.84 51.46	150°56.61 29.79	Avior 234°14.19 -59°35.55 Suhail 222°45.84 -43°32.17
Mor	pass. 13:29	ν2.4' d0.5' m-4.81	ν2.4' d-0.1' m-0.33	ν2.3' d0.0' m-2.31	ν2.2' d-0.1' m1.11	Suhail 222°45.84 -43°32.17 Miaplacidus 221°37.46 -69°49.31
ivier.	pass. 13.29	V2.4 UU.3 III-4.01	V2.4 U-0.1 III-0.33	ν2.3 d0.0 III-2.31	ν2.2 <b>u</b> -0.1 III1.11	Alphard 217°47.33 -8°46.18
						Regulus 207°33.98 11°50.54
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.14 61°36.81
0	158°4.05	150°46.88 N10°15.76	49°1.13 N25°53.35	87°18.10 N21°51.49	165°58.80 \$05°29.67	Denebola 182°24.51 14°25.73
1 2	173°6.51 188°8.98	165°49.33 16.24 180°51.79 16.71	64°3.47 53.26 79°5.81 53.17	102°20.36 51.52 117°22.62 51.56	181°0.98 29.55 196°3.16 29.43	Gienah 175° 43.17 -17° 40.99
3	203° 11.44	195°54.25 · · 17.18	94°8.15 · · 53.08	132°24.88 · · 51.59	211°5.34 · · 29.31	Acrux 172°59.41 -63°14.24
4	218° 13.91	210°56.71 17.66	109°10.49 52.99	147°27.14 51.62	226°7.53 29.19	Gacrux 171°51.05 -57°15.19
5	233° 16.37	225°59.18 18.13	124°12.83 52.90	162°29.41 51.65	241°9.71 29.07	Alioth 166°12.36 55°49.14 Spica 158°21.94 -11°17.66
6	248° 18.83	241°1.65 N10°18.59	139°15.17 N25°52.80	177°31.67 N21°51.69	256°11.89 <b>S</b> 05°28.95	Spica 158°21.94 -11°17.66 Alkaid 152°51.56 49°10.95
7	263°21.30	256°4.13 19.06	154° 17.50 52.71	192°33.93 51.72	271°14.07 28.83	Hadar 148°35.49 -60°29.51
8	278°23.76	271°6.61 19.52	169° 19.84 52.62	207°36.18 51.75	286°16.26 28.71	Menkent 147°57.26 -36°29.59
9	293°26.23	286°9.09 · · 19.98	184°22.17 · · 52.53	222°38.44 · · 51.79	301°18.44 · · 28.59	Arcturus 145°47.60 19°2.84
10 11	308°28.69 323°31.15	301°11.58 20.44 316°14.07 20.90	199° 24.50 52.44 214° 26.83 52.35	237°40.70 51.82 252°42.96 51.85	316°20.62 28.47 331°22.80 28.35	Rigil Kent. 139°39.85 -60°56.19
12	338° 33.62	331°16.56 N10°21.36	229°29.16 N25°52.25	267°45.22 N21°51.89	331°22.80 28.35 346°24.99 \$05°28.23	Kochab 137°19.23 74°2.72
13	353°36.08	346°19.06 21.81	244°31.49 52.16	282°47.48 51.92	1°27.17 28.11	Zuben'ubi 136°55.75 -16°8.85
14	8°38.55	1°21.56 22.27	259°33.81 52.07	297°49.74 51.95	16°29.35 27.99	Alphecca 126°3.54 26°37.49 Antares 112°15.69 -26°29.26
15	$23^{\circ}41.01$	16°24.07 · · 22.72	274°36.14 · · 51.97	312°51.99 · · 51.99	31°31.53 · · 27.87	Antares 112°15.69 -26°29.26 Atria 107°9.89 -69°4.11
16	38°43.48	31°26.57 23.17	289°38.46 51.88	327°54.25 52.02	46°33.71 27.75	Sabik 102°2.70 -15°45.43
17	53°45.94	46°29.09 23.61	304°40.79 51.79	342°56.51 52.05	61°35.90 27.63	Shaula 96°10.31 -37°7.25
18	68° 48.40	61°31.60 N10°24.06	319°43.11 N25°51.70	357°58.76 N21°52.09	76°38.08 \$05°27.51	Rasalhague 95°58.52 12°32.26
19	83°50.87	76°34.12 24.50	334°45.43 51.60	13°1.02 52.12	91°40.26 27.39	Eltanin 90°42.31 51°28.74
20 21	98° 53.33 113° 55.80	91°36.65 24.94 106°39.17 •• 25.38	349°47.74 51.51 4°50.06 · · 51.41	28° 3.27 52.15 43° 5.53 •• 52.19	106°42.44 27.27 121°44.62 •• 27.15	Kaus Aust. 83°32.53 -34°22.32
22	128° 58.26	121°41.70 25.82	19°52.38 51.32	58° 7.78 52.22	136°46.81 27.03	Vega 80°33.35 38°48.08
23	144°0.72	136°44.24 26.25	34°54.69 51.23	73°10.04 52.26	151°48.99 26.91	Nunki 75°47.81 -26°15.95
		-				Altair 62°0.08 8°55.89
ivier.	pass. 13:26	ν2.5′ d0.5′ m-4.80	$\nu 2.3' \ d$ -0.1' m-0.31	ν2.3' d0.0' m-2.31	$\nu 2.2' \ d$ -0.1' m1.11	Peacock 53°6.00 -56°39.18 Deneb 49°26.14 45°21.97
						Enif 33°38.99 9°59.27
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°33.19 -46°50.42
0	159°3.19	151°46.78 N10°26.69	49°57.00 N25°51.13	88°12.29 N21°52.29	166°51.17 S05°26.79	Fomalhaut 15°14.72 -29°29.47
1 2	174°5.65 189°8.12	166° 49.32 27.12 181° 51.87 27.55	64°59.31 51.04 80°1.62 50.94	103°14.55 52.32 118°16.80 52.36	181°53.35 26.67 196°55.53 26.55	Scheat 13°45.45 28°13.07
3	204° 10.58	196°54.42 · · 27.97	95°3.93 · · 50.85	133°19.05 · · 52.39	196°55.53 26.55 211°57.72 · · 26.43	Markab 13°30.11 15°20.33
4	219° 13.04	211°56.97 28.40	110°6.24 50.75	148°21.31 52.42	226°59.90 26.31	Feb 27 Thu SHA Mer.pass
5	234° 15.51	226°59.53 28.82	125°8.55 50.66	163°23.56 52.46	242°2.08 26.19	Venus 352°44.19 13:59
6	249° 17.97	242°2.09 N10°29.24	140°10.85 N25°50.56	178°25.81 N21°52.49	257°4.26 \$05°26.07	Mars 250° 59.56 20:44
7	264°20.44	257°4.65 29.66	155° 13.16 50.47	193°28.06 52.53	272°6.44 25.94	Jupiter 289°18.80 18:12
8	279°22.90	272°7.22 30.08	170°15.46 50.37	208°30.32 52.56	287°8.63 25.82	Saturn 8°1.50 12:58
9	294°25.36	287°9.79 · · 30.50	185°17.76 · · 50.28	223°32.57 · · 52.59	302°10.81 · · 25.70	Feb 28 Fri SHA Mer.pass
10	309°27.83	302°12.37 30.91	200°20.06 50.18	238°34.82 52.63 253°37.07 52.66	317°12.99 25.58 332°15.17 25.46	Venus 352°42.83 13:55
11 12	324° 30.29 339° 32.76	317°14.95 31.32 332°17.53 N10°31.73	215°22.36 50.08 230°24.65 N25°49.99	253°37.07 52.66 268°39.32 N21°52.70	332°15.17 25.46 347°17.35 \$05°25.34	Mars 250° 57.08 20:41
13	354° 35.22	347°20.12 32.14	245°26.95 49.89	283°41.57 52.73	2°19.53 25.22	Jupiter 289°14.05 18:08
14	9° 37.68	2°22.71 32.54	260°29.24 49.79	298°43.82 52.76	17°21.72 25.10	Saturn 7°54.75 12:54
15	24°40.15	17°25.30 · · 32.95	275°31.54 · · 49.70	313°46.07 · · 52.80	32°23.90 · · 24.98	Mar 01 Sat SHA Mer.pass
16	39° 42.61	32°27.90 33.35	290° 33.83 49.60	328°48.32 52.83	47°26.08 24.86	Venus 352°43.59 13:51
17	54° 45.08	47°30.51 33.75	305°36.12 49.50	343°50.57 52.87	62°28.26 24.74	Mars 250°53.82 20:37
18	69° 47.54	62°33.11 N10°34.15	320°38.41 N25°49.41	358°52.81 N21°52.90	77°30.44 \$05°24.62	Jupiter 289°9.11 18:04
19	84°50.00	77°35.72 34.54	335°40.69 49.31	13°55.06 52.94	92°32.62 24.50	Saturn 7°47.98 12:51
20 21	99°52.47 114°54.93	92°38.34 34.94 107°40.95 · · 35.33	350°42.98 49.21 5°45.26 • 49.11	28°57.31 52.97 43°59.56 • 53.00	107°34.81 24.38 122°36.99 •• 24.26	Horizontal parallax
22	129°57.40	122° 43.57 35.72	20°47.55 49.02	59°1.80 53.04	137°39.17 24.14	Venus: 0.4
23	144°59.86	137°46.20 36.10	35°49.83 48.92	74° 4.05 53.07	152°41.35 24.02	Mars: 0.2
Mer	pass. 13:22	ν2.5′ d0.4′ m-4.78	ν2.3' d-0.1' m-0.28	ν2.3' d0.0' m-2.30	ν2.2' d-0.1' m1.11	
IVICI.	puss. 15.44	ν Δ.σ UU.T III-4.10	ν 2.5 u-0.1 III-0.20	ν Δ.Ο   α Ο.Ο   α Π-Δ.ΟΟ	ν Δ. Δ - U. I III I. I I	

	Sun						
h		<u>n</u>			Moon		
Thu	GHA	Dec	GHA	$\nu$	Dec	d 14.0'	HP
0 1	176°49.32 191°49.43	\$08°19.84 18.90	189°4.07 203°32.48	9.4' 9.5'	\$15°57.49 15°42.73	-14.8' -14.9'	59.4' 59.5'
2	206°49.54	17.96	218° 0.94	9.5'	15° 27.88	-15.0'	59.5'
3	221°49.65	• • 17.02	232°29.44	9.6'	15°12.92	-15.1'	59.5'
4	236°49.76	16.08	246°58.00	9.6'	$14^{\circ}57.86$	-15.2'	59.6'
5	251°49.87	15.14	261°26.60	9.6'	14°42.71	-15.3'	59.6'
6 7	266°49.98 281°50.09	S08°14.20 13.25	275°55.25 290°23.94	9.7' 9.7'	\$14°27.46 14°12.11	-15.3' -15.4'	59.6' 59.6'
8	296°50.20	12.31	304°52.68	9.8'	14 12.11 13°56.67	-15.4 -15.5'	59.7'
9	311°50.31	• • 11.37	319°21.46	9.8'	13°41.14	-15.6'	59.7'
10	326°50.42	10.42	333°50.29	9.9'	13°25.52	-15.7'	59.7'
11	341°50.53	9.48	348°19.16	9.9'	13°9.81	-15.8'	59.7'
12 13	356°50.64 11°50.75	S08°8.54 7.59	2°48.08 17°17.03	10.0' 10.0'	\$12°54.01 12°38.13	-15.9' -16.0'	59.8' 59.8'
14	26°50.87	6.65	31°46.03	10.0'	12° 22.17	-16.0'	59.8'
15	41°50.98	• • 5.71	46°15.07	10.1'	12°6.13	-16.1'	59.8'
16	56°51.09	4.76	60°44.15	10.1'	11°50.00	-16.2'	59.9'
17	71°51.20 86°51.32	3.82 \$08°2.87	75°13.27 89°42.42	10.2'	11°33.80 \$11°17.52	-16.3'	59.9'
18 19	86°51.32 101°51.43	1.93	89°42.42 104°11.62	10.2' 10.2'	11°1.17	-16.4' -16.4'	59.9' 59.9'
20	116°51.54	0.98	118°40.85	10.2	10°44.74	-16.4 -16.5'	60.0'
21	131°51.66	08°0.04	133°10.12	10.3'	10°28.25	-16.6'	60.0'
22	146°51.77	$07^{\circ}59.09$	147°39.42	10.3'	10°11.68	-16.6'	60.0'
23	161°51.89	58.15	162°8.76	10.4'	09°55.05	-16.7'	60.0'
	SD = 16.1'	d = -0.9'		SI	O = 16.2'		
F!	CIIA	D	CUA		D	.,	LID.
Fri 0	<b>GHA</b> 176°52.00	Dec \$07°57.20	<b>GHA</b> 176°38.12	u 10.4'	Dec \$09°38.35	d -16.8'	<b>HP</b> 60.0'
1	191°52.11	56.26	191°7.53	10.4	09°21.58	-16.8	60.1
2	206°52.23	55.31	$205^{\circ}36.96$	10.5'	$09^{\circ}4.76$	-16.9'	60.1'
3	221°52.34	• • 54.36	220°6.42	10.5'	08°47.87	-16.9'	60.1'
4	236°52.46 251°52.57	53.42 52.47	234°35.92 249°5.44	10.5'	08°30.92 08°13.92	-17.0'	60.1' 60.1'
5 6	251°52.57 266°52.69	52.47 \$07°51.52	249°5.44 263°34.99	10.5' 10.6'	507°56.87	-17.1' -17.1'	60.1
7	281°52.81	50.58	278°4.56	10.6'	07°39.76	-17.2'	60.2'
8	296°52.92	49.63	292°34.17	10.6'	$07^{\circ}22.59$	-17.2'	60.2'
9	311°53.04	• • 48.68	307°3.79	10.6'	07°5.38	-17.3'	60.2'
10	326°53.16 341°53.27	47.73	321°33.44 336°3.11	10.7'	06°48.12 06°30.82	-17.3'	60.2' 60.2'
11 12	341 53.27 356°53.39	46.78 \$07°45.84	350°32.80	10.7' 10.7'	506°13.47	-17.3' -17.4'	60.2
13	11°53.51	44.89	5°2.52	10.7'	05°56.08	-17.4	60.3'
14	26°53.62	43.94	19°32.25	10.7'	$05^{\circ}38.65$	-17.5'	60.3'
15	41°53.74	• • 42.99	34°2.00	10.8'	05°21.18	-17.5'	60.3'
16 17	56°53.86 71°53.98	42.04 41.09	48°31.77 63°1.55	10.8' 10.8'	05°3.67 04°46.13	-17.5' -17.6'	60.3' 60.3'
18	86°54.10	\$07°40.14	77°31.35	10.8	504°28.55	-17.6'	60.3
19	101°54.22	39.19	92°1.16		04°10.95		60.3'
20	116°54.33	38.24	106°30.98	10.8'	$03^{\circ}53.31$	-17.7'	60.4'
21	131°54.45	• • 37.29	121°0.81	10.8'	03°35.65	-17.7'	60.4
22 23	146°54.57 161°54.69	36.34 35.39	135°30.66 150°0.51	10.9' 10.9'	03°17.96 03°0.25	-17.7' -17.7'	60.4' 60.4'
23			150 0.51			-17.7	00.4
	SD = 16.1'	d = -0.9'		SI	O = 16.4'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	176°54.81	S07°34.44	164°30.37	10.9'	S02°42.52	-17.8'	60.4'
1	191°54.93	33.49	179°0.24	10.9'	02°24.76	-17.8'	60.4'
2	206°55.05 221°55.17	32.54 •• 31.59	193°30.11 207°59.99	10.9' 10.9'	02°6.99 01°49.20	-17.8' -17.8'	60.4' 60.4'
3 4	236°55.29	30.64	207 59.99 222°29.87	10.9	01°49.20	-17.8'	60.4
5	251°55.41	29.69	236°59.75	10.9'	$01^{\circ}13.59$	-17.8'	60.4'
6	266°55.54	S07°28.74	251°29.63	10.9'	S00°55.76	-17.8'	60.4'
7 8	281°55.66 296°55.78	27.78 26.83	265°59.51 280°29.39	10.9' 10.9'	00°37.93 00°20.09	-17.8' -17.8'	60.5' 60.5'
9	296 55.78 311° 55.90	25.83	280°29.39 294°59.27	10.9'	500°2.25	-17.8' -17.8'	60.5
10	326°56.02	24.93	309°29.14	10.9'	N00°15.60	17.8	60.5
11	341°56.14	23.98	323°59.01	10.9'	00°33.45	17.8'	60.5'
12	356°56.27	S07°23.02	338°28.86	10.9'	N00°51.30	17.8'	60.5
13 14	11°56.39 26°56.51	22.07 21.12	352°58.72 7°28.56	10.8' 10.8'	01°9.14 01°26.98	17.8' 17.8'	60.5' 60.5'
14 15	41°56.64	20.16	7 28.50 21°58.39	10.8	01 26.98 01°44.82	17.8'	60.5
16	56°56.76	19.21	36°28.21	10.8'	02°2.64	17.8'	60.5
17	71°56.88	18.26	$50^{\circ}58.02$	10.8'	02°20.45	17.8'	60.5'
18	86°57.01	S07°17.30	65°27.81	10.8'	N02°38.26	17.8'	60.5'
19 20	101°57.13 116°57.25	16.35 15.39	79°57.59 94°27.35	10.8' 10.7'	02°56.04 03°13.82	17.8' 17.8'	60.5' 60.5'
21	131° 57.38	14.44	94 27.35 108°57.09	10.7	03°31.57	17.6 17.7'	60.5
22	146°57.50	13.49	123°26.81	10.7'	03°49.30	17.7'	60.5'
23	161°57.63	12.53	137°56.52	10.7'	04°7.02	17.7'	60.5'
	CD 1C 1/	d = -1.0'	_	CI	D = 16.5'		
	SD = 16.1'	a = -1.0		31	J = 10.5		

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

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

		Sun		Moon			ı	
Day		Eqn.of	Time	Mer.	Mer.	Pass.	Age	ı
	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	29-1	ı
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	2-1%	
	27	12:43	12:37	12:13	11:48	-:-		ı
	28	12:32	12:26	12:12	12:39	00:14		ı
	01	12:21	12:15	12:12	13:29	01:04		ı

# March 02, 03, 04 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	160°2.32	152°48.83 N10°36.49	50°52.11 N25°48.82	89°6.30 N21°53.11	167°43.53	l
1	175°4.79	167°51.46 36.87	65°54.39 48.72	104°8.54 53.14	182°45.71 23.78	Alpheratz 3
2	190°7.25	182°54.10 37.26	80° 56.67 48.62	119°10.79 53.18	197°47.89 23.66	Ankaa
3	205°9.72	197°56.74 · · 37.63	95° 58.95 · · 48.52	134°13.04 · · 53.21	212°50.08 · · 23.54	Schedar 3
4	220° 12.18	212°59.38 38.01	111°1.22 48.43	149°15.28 53.25	227°52.26 23.42	Diphda 3
5	235° 14.64	228°2.03 38.39	126°3.50 48.33	164°17.53 53.28	242°54.44 23.30	Achernar 3
6	250° 17.11	243°4.68 N10°38.76	141°5.77 N25°48.23	179°19.77 N21°53.32	257°56.62 \$05°23.18	Hamal 3
7	265° 19.57	258°7.34 39.13	156°8.04 48.13	194°22.01 53.35	272°58.80 23.06	Polaris 3
8	280°22.04	273°9.99 39.50	171°10.31 48.03	209°24.26 53.38	288°0.98 22.94	Acamar 3
9	295°24.50	288°12.66 · · 39.87	186° 12.58 · · 47.93	224°26.50 · · 53.42	303°3.16 · · 22.82	Menkar
10	310°26.96	303°15.32 40.23	201°14.85 47.83	239°28.74 53.45	318°5.35 22.70	Mirfak 3
11	325°29.43	318° 17.99 40.60	216°17.12 47.73	254°30.99 53.49	333°7.53 22.58	Aldebaran 2
12	340°31.89	333°20.67 N10°40.96	231°19.38 N25°47.63	269°33.23 N21°53.52	348°9.71 S05°22.46	Rigel
13	355°34.36	348°23.35 41.32	246°21.65 47.53	284°35.47 53.56	3°11.89 22.34	Capella 2
14	10°36.82	3°26.03 41.67	261°23.91 47.43	299°37.71 53.59	18°14.07 22.22	Bellatrix 2
15	25°39.28	18°28.71 · · 42.03	276°26.17 · · 47.33	314°39.95 · · 53.63	33°16.25 · · 22.09	Elnath Alnilam 2
16	40°41.75	33°31.40 42.38	291°28.43 47.23	329°42.20 53.66	48°18.43 21.97	Betelgeuse 2
17	55°44.21	48°34.10 42.73	306°30.69 47.13	344°44.44 53.70	63°20.61 21.85	Canopus 2
18	70°46.68	63°36.79 N10°43.08	321°32.95 N25°47.03	359°46.68 N21°53.73	78°22.80 <b>S</b> 05°21.73	Sirius 2
19	85°49.14	78°39.49 43.42	336° 35.20 46.92	14°48.92 53.77	93°24.98 21.61	Adhara
20	100°51.60	93°42.20 43.77	351°37.46 46.82	29°51.16 53.80	108°27.16 21.49	Procyon 2
21	115°54.07	108°44.91 · · 44.11	6°39.71 · · 46.72	44°53.40 · · 53.84	123°29.34 · · 21.37	Pollux 2
22	130° 56.53	123°47.62 44.45	21°41.97 46.62	59°55.64 53.87	138°31.52 21.25	Avior 2
23	145°59.00	138°50.34 44.79	36°44.22 46.52	74°57.88 53.91	153°33.70 21.13	Suhail 2
Mer.	pass. 13:18	$\nu$ 2.6′ d0.4′ m-4.76	ν2.3' d-0.1' m-0.25	ν2.2' d0.0' m-2.29	ν2.2' d-0.1' m1.11	Miaplacidus 2
						Alphard 2
						Regulus 2
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 1
0	161°1.46	153°53.06 N10°45.12	51°46.47 N25°46.42	90°0.11 N21°53.94	168°35.88	Denebola 1
1	176°3.92 191°6.39	168° 55.78 45.46	66° 48.71 46.31	105°2.35 53.98	183°38.06 20.89	Gienah 1
2		183°58.51 45.79	81°50.96 46.21	120° 4.59 54.01	198°40.24 20.77	Acrux 1
3	206°8.85 221°11.32	199°1.24 · · 46.12 214°3.97 46.45	96°53.21 · · 46.11	135°6.83 · · 54.05	213°42.43 · · 20.65 228°44.61 20.53	Gacrux 1
4	221 11.32 236°13.78		111°55.45 46.01 126°57.70 45.90	150° 9.07 54.09 165° 11.30 54.12		Alioth 1
5 6	251° 16.25	229°6.71 46.77 244°9.46 N10°47.09	126°57.70 45.90 141°59.94 N25°45.80	165°11.30 54.12 180°13.54 N21°54.16	243°46.79 20.41 258°48.97 \$05°20.29	Spica 1
7	266° 18.71	259°12.20 47.42	141 59.94 N25 45.80 157°2.18 45.70	195°15.78 54.19	273°51.15 20.17	Alkaid 1
8	200 16.71 281°21.17	274°14.95 47.73	172°4.42 45.59	210°18.01 54.23	288°53.33 20.05	Hadar 1
9	296°23.64	289°17.71 · · 48.05	187°6.66 · · 45.49	225°20.25 · · 54.26	303°55.51 · · 19.93	Menkent 1
10	311°26.10	304°20.47 48.36	202°8.89 45.39	240°22.48 54.30	318°57.69 19.81	Arcturus 1
11	326°28.57	319°23.23 48.68	217°11.13 45.28	255°24.72 54.33	333°59.87 19.69	Rigil Kent.
12	341°31.03	334°25.99 N10°48.99	232°13.36 N25°45.18	270°26.95 N21°54.37	349°2.05 S05°19.57	Kochab 1
13	356° 33.49	349°28.76 49.29	247°15.60 45.08	285°29.19 54.40	4°4.23 19.45	Zuben'ubi 1
14	11°35.96	4°31.54 49.60	262°17.83 44.97	300°31.42 54.44	19°6.42 19.32	Alphecca
15	26°38.42	19°34.31 · · 49.90	277°20.06 · · 44.87	315°33.65 · · 54.48	34°8.60 · · 19.20	Antares 1
16	41°40.89	34°37.09 50.21	292°22.29 44.76	330°35.89 54.51	49°10.78 19.08	Atria
17	56° 43.35	49°39.88 50.50	307°24.52 44.66	345°38.12 54.55	64°12.96 18.96	Sabik
18	71°45.81	64°42.67 N10°50.80	322°26.74 N25°44.55	0°40.35 N21°54.58	79°15.14 <b>S</b> 05°18.84	Shaula
19	86°48.28	79° 45.46 51.10	337°28.97 44.45	15°42.59 54.62	94°17.32 18.72	Rasalhague
20	101°50.74	94°48.26 51.39	352°31.19 44.34	30°44.82 54.65	109°19.50 18.60	Eltanin
21	116°53.21	109°51.06 · · 51.68	7°33.42 · · 44.24	45°47.05 · · 54.69	124°21.68 · · 18.48	Kaus Aust.
22	131°55.67	124°53.86 51.97	22°35.64 44.13	60°49.28 54.73	139°23.86 18.36	Vega Nunki
23	146°58.13	139°56.67 52.25	37°37.86 44.03	75°51.51 54.76	154°26.04 18.24	Altair
Morr	pass. 13:14	ν2.7' d0.3' m-4.74	ν2.2' d-0.1' m-0.23	ν2.2' d0.0' m-2.29	ν2.2' d-0.1' m1.11	Peacock
ivier.p	Dass. 15:14	V2.1 d0.3 m-4.14	ν2.2 α-0.1 III-0.23	ν2.2 d0.0 III-2.29	ν2.2 α-0.1 m1.11	Deneb
						Enif
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir
0	162°0.60	154°59.48 N10°52.54	52°40.08 N25°43.92	90°53.74 N21°54.80	169°28.22 \$05°18.12	Fomalhaut
1	177°3.06	170°2.30 52.82	67°42.30 43.82	105°55.97 54.83	184°30.40 18.00	Scheat
2	192°5.53	185°5.12 53.10	82°44.51 43.71	120°58.20 54.87	199°32.58 17.88	Markab
3	207°7.99	200°7.94 · · 53.38	97°46.73 · · 43.60	136° 0.43 · · 54.91	214°34.76 · · 17.76	
4	222°10.46	215°10.77 53.65	112°48.94 43.50	151°2.66 54.94	229°36.95 17.64	Mar 02 Sun
5	237° 12.92	230°13.60 53.92	127°51.16 43.39	166° 4.89 54.98	244°39.13 17.52	Venus 3
6	252° 15.38	245°16.43 N10°54.19	142°53.37 N25°43.28	181°7.12 N21°55.01	259°41.31 S05°17.40	Mars 2
7	267° 17.85	260°19.27 54.46	157°55.58 43.18	196° 9.35 55.05	274°43.49 17.28	Jupiter
8	282°20.31	275°22.11 54.73	172°57.79 43.07	211°11.58 55.09	289°45.67 17.15	Saturn
9	297°22.78	290°24.96 · · 54.99	188°0.00 · · 42.96	226°13.81 · · 55.12	304°47.85 · · 17.03	Mar 03 Mon
10	312°25.24	305°27.81 55.25	203°2.20 42.86	241°16.03 55.16	319°50.03 16.91	Venus 3
11	327°27.70	320°30.66 55.51	218°4.41 42.75	256°18.26 55.20	334°52.21 16.79	Mars 2
12	342°30.17	335°33.52 N10°55.77	233°6.61 N25°42.64	271°20.49 N21°55.23	349°54.39	Jupiter 2
13	357°32.63 12°35.10	350°36.38 56.03 5°39.25 56.28	248°8.81 42.53 263°11.02 42.42	286°22.72 55.27	4°56.57 16.55 19°58.75 16.43	Saturn
14 15	27°35.10			301°24.94 55.31 316°27.17 · · 55.34		M- 04 T
15 16	42° 40.02		278°13.22 · · 42.32 293°15.42 42.21			Mar 04 Tue
16 17	42° 40.02 57° 42.49	35°44.99 56.78 50°47.86 57.02	308° 17.61 42.10	331°29.39 55.38 346°31.62 55.41	50°3.11 16.19 65°5.29 16.07	Venus 3
18	72° 44.95	65°50.75 N10°57.27	308°17.61 42.10 323°19.81 N25°41.99	1°33.84 N21°55.45	80°7.47 S05°15.95	Mars 2
18	72 44.95 87° 47.42	80°53.63 57.51	338°22.01 41.88	1 33.84 N21 55.45 16°36.07 55.49	95°9.65 15.83	Jupiter 2
20	102°49.88	95°56.52 57.75	353°24.20 41.77	31°38.29 55.52	110°11.83 15.71	Saturn
21	102 49.88 117°52.35	110°59.41 · · 57.98	8°26.39 · · 41.67	46°40.52 · · 55.56	125°14.01 · · 15.59	Horizonta
22	132°54.81	126°2.31 58.22	23°28.58 41.56	61°42.74 55.60	140°16.19 15.47	
23	147°57.27	141°5.21 58.45	38°30.78 41.45	76°44.97 55.63	155°18.37 15.35	
Mer.	pass. 13:10	ν2.8′ d0.3′ m-4.72	ν2.2' d-0.1' m-0.20	ν2.2' d0.0' m-2.28	ν2.2' d-0.1' m1.11	

	Stars	
	SHA	Dec
Alpheratz	357°35.00	29° 13.72
Ankaa	353°7.37	-42°10.32
Schedar Diphda	349°31.44 348°47.45	56° 40.60 -17° 51.07
Achernar	335°20.47	-57°6.76
Hamal	$327^{\circ}51.28$	23°34.89
Polaris	314°11.31	89°22.51
Acamar Menkar	315°11.84 314°6.15	-40° 12.46 4° 11.23
Mirfak	308°28.25	49°57.19
Aldebaran	290°39.49	$16^{\circ}33.59$
Rigel	281°3.70	-8° 10.48
Capella Bellatrix	280°21.64 278°22.68	46°1.54 6°22.29
Elnath	278°22.08	28° 37.77
Alnilam	275°37.53	-1°11.24
Betelgeuse	270°51.85	7°24.65
Canopus	263°52.12 258°25.97	-52°42.77
Sirius Adhara	258° 25.97 255° 5.57	-16°45.19 -29°0.56
Procyon	244°50.49	5°9.55
Pollux	243°16.89	27°57.93
Avior	234°14.21	-59°35.56
Suhail Miaplacidus	222°45.85 221°37.48	-43°32.19 -69°49.32
Alphard	221 37.48 217°47.33	-69 49.32 -8°46.18
Regulus	207°33.98	11°50.54
Dubhe	193°40.14	$61^{\circ}36.83$
Denebola	182°24.50	14°25.73
Gienah Acrux	175°43.16 172°59.40	-17°41.00 -63°14.26
Gacrux	172 59.40 171°51.04	-57° 15.21
Alioth	166°12.34	55°49.15
Spica	158°21.93	-11° 17.67
Alkaid	152°51.54	49° 10.96
Hadar Menkent	148°35.47 147°57.24	-60° 29.52 -36° 29.60
Arcturus	145°47.59	19°2.84
Rigil Kent.	139°39.82	-60°56.20
Kochab	137°19.17 136°55.73	74°2.73 -16°8.86
Zuben'ubi Alphecca	130 55.73 126°3.52	-10 8.80 26°37.49
Antares	$112^{\circ}15.67$	-26°29.27
Atria	107°9.84	-69°4.11
Sabik Shaula	102°2.68 96°10.29	-15°45.43 -37°7.25
Rasalhague	95°58.50	12°32.26
Eltanin	90°42.28	51°28.73
Kaus Aust.	83°32.51	-34°22.32
Vega Nunki	80°33.33 75°47.79	38° 48.07 -26° 15.94
Altair	62°0.07	-20 15.94 8°55.89
Peacock	53°5.98	-56°39.17
Deneb	$49^{\circ}26.13$	$45^{\circ}21.95$
Enif	33°38.99	9°59.26
Al Na'ir Fomalhaut	27°33.18 15°14.72	-46°50.41 -29°29.46
Scheat	13°45.46	28° 13.06
Markab	13°30.11	15°20.32
Mar 02 Sun	SHA	Mer.pass
Venus	352°46.50	13:46
Mars	250°49.79	20:33
Jupiter Saturn	289°3.97 7°41.21	18:01 12:47
Mar 03 Mon Venus	<b>SHA</b> 352°51.60	Mer.pass 13:42
Mars	250°45.01	20:30
Jupiter	288°58.65	17:57
Saturn	7°34.42	12:44
Mar 04 Tue	SHA	Mer.pass
Venus Mars	352°58.88 250°39.48	13:37 20:26
Jupiter	288°53.14	17:54
Saturn	7°27.62	12:40
Horizor	ıtal parallax	
	Venus:	0.4
	Mars:	0.2

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°57.75	S07°11.58	$152^{\circ}26.20$	10.7'	N04°24.70	17.7'	60.5'
1	191°57.88	10.62	166°55.86	10.6'	04°42.37	17.6'	60.5'
2 3	206°58.00 221°58.13	9.67 · · 8.71	181°25.49 195°55.10	10.6' 10.6'	05°0.00 05°17.61	17.6' 17.6'	60.5' 60.5'
4	236°58.26	7.75	210°24.69	10.6'	05°35.18	17.5	60.5'
5	251°58.38	6.80	224°54.24	10.5'	$05^{\circ}52.72$	17.5'	60.5'
6	266°58.51	S07°5.84	239°23.77	10.5'	N06°10.23	17.5'	60.5'
7 8	281°58.64 296°58.76	4.89 3.93	253°53.27 268°22.73	10.5' 10.4'	06°27.70 06°45.13	17.4' 17.4'	60.5' 60.5'
9	311°58.89	2.97	282°52.17	10.4	07°2.52	17.3	60.5
10	326°59.02	2.02	$297^{\circ}21.57$	10.4'	$07^{\circ}19.86$	17.3'	60.5'
11	341°59.14	1.06	311°50.93	10.3'	07°37.16	17.3'	60.5
12 13	356°59.27 11°59.40	\$07°0.10 06°59.15	326°20.26 340°49.56	10.3' 10.3'	N07°54.42 08°11.63	17.2' 17.2'	60.5' 60.4'
14	26°59.53	58.19	355°18.81	10.3	08°28.78	17.1'	60.4
15	41°59.66	• • 57.23	9°48.03	10.2'	08°45.89	17.1'	60.4'
16	56°59.78	56.27	24°17.21	10.1'	09°2.94	17.0'	60.4'
17 18	71°59.91 87°0.04	55.32 \$06°54.36	38°46.34 53°15.43	10.1' 10.0'	09°19.94 N09°36.88	16.9' 16.9'	60.4' 60.4'
19	102° 0.17	53.40	67°44.48	10.0	09°53.75	16.8	60.4
20	117° 0.30	52.44	82°13.49	10.0'	10°10.57	16.8'	60.4'
21	132°0.43	• • 51.48	96°42.45	9.9'	10°27.33	16.7'	60.4'
22 23	147° 0.56 162° 0.69	50.52 49.57	111°11.36 125°40.22	9.9' 9.8'	10°44.01 11°0.64	16.6' 16.6'	60.4' 60.4'
23			123 40.22			10.0	00.4
	SD = 16.1'	d = -1.0'		SE	O = 16.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°0.82	S06°48.61	$140^{\circ}9.04$	9.8'	N11°17.19	16.5'	60.3'
1	192°0.95	47.65	154°37.80	9.7'	11°33.67	16.4'	60.3'
2 3	207° 1.08 222° 1.21	46.69 •• 45.73	169°6.52 183°35.18	9.7' 9.6'	11°50.08 12°6.42	16.3' 16.3'	60.3' 60.3'
4	237° 1.34	44.77	198°3.80	9.6'	12°0.42	16.2	60.3
5	252° 1.47	43.81	212°32.35	9.5'	12°38.86	16.1'	60.3'
6	267° 1.60	S06°42.85	227°0.86	9.4'	N12°54.97	16.0'	60.3'
7 8	282°1.74 297°1.87	41.89 40.93	241°29.31 255°57.70	9.4' 9.3'	13°10.99 13°26.93	15.9' 15.9'	60.3' 60.2'
9	312° 2.00	40.93 · · 39.97	255 57.70 270°26.03	9.3 9.3'	13 20.93 13°42.78	15.9 15.8'	60.2
10	327° 2.13	39.01	284°54.31	9.2'	13°58.55	15.7'	60.2
11	342° 2.27	38.05	299°22.53	9.2'	14°14.23	15.6'	60.2'
12	357°2.40 12°2.53	S06°37.09	313°50.69 328°18.79	9.1'	N14°29.81 14°45.31	15.5'	60.2'
13 14	27° 2.66	36.12 35.16	328° 18.79 342° 46.83	9.0' 9.0'	14 45.31 15°0.71	15.4' 15.3'	60.2' 60.2'
15	42° 2.80	34.20	357°14.80	8.9'	15°16.02	15.2'	60.1
16	57° 2.93	33.24	11°42.72	8.9'	$15^{\circ}31.23$	15.1'	60.1'
17	72°3.06	32.28 \$06°31.32	26°10.57	8.8'	15°46.34 N16°1.35	15.0'	60.1'
18 19	87°3.20 102°3.33	30.35	40°38.36 55°6.08	8.7' 8.7'	16°16.25	14.9' 14.8'	60.1' 60.1'
20	117° 3.47	29.39	69°33.74	8.6'	16°31.05		60.1
21	132°3.60	• • 28.43	84°1.33	8.5'	$16^{\circ}45.75$	14.6'	60.0'
22	147°3.74 162°3.87	27.47	98°28.86 112°56.32	8.5' 8.4'	17°0.34 17°14.82	14.5'	60.0'
23		26.51	112 50.32			14.4'	60.0'
	SD = 16.1'	d = -1.0'		SL	O = 16.5'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	$177^{\circ}4.01$	S06°25.54	127°23.71	8.3'	N17°29.19	14.3'	60.0'
1	192°4.14	24.58	141°51.04	8.3'	17°43.44	14.1'	60.0'
2 3	207° 4.28 222° 4.41	23.62	156°18.30 170°45.49	8.2' 8.1'	17°57.58 18°11.61	14.0' 13.9'	59.9' 59.9'
4	237° 4.55	21.69	170 45.49 185°12.61	8.1	18°25.51	13.8'	59.9'
5	252°4.68	20.73	199°39.66	8.0'	18°39.30	13.7'	59.9'
6	267°4.82	S06°19.76	214°6.65	7.9'	N18°52.97	13.5'	59.9'
7 8	282° 4.96 297° 5.09	18.80 17.83	228°33.56 243°0.41	7.8' 7.8'	19°6.51 19°19.93	13.4' 13.3'	59.8' 59.8'
9	312° 5.23	16.87	243 0.41 257°27.18	7.0 7.7'	19 19.93 19°33.23	13.2'	59.8'
10	327°5.37	15.91	271°53.89	7.6'	19°46.40	13.0'	59.8'
11	342° 5.51	14.94	286°20.52	7.6'	19°59.44	12.9'	59.8'
12 13	357° 5.64 12° 5.78	\$06°13.98 13.01	300°47.08 315°13.58	7.5' 7.4'	N20°12.34 20°25.12	12.8' 12.6'	59.7' 59.7'
13 14	12 5.78 27° 5.92	12.05	315 13.58 329°40.00	7.4 7.4'	20°25.12 20°37.76	12.5	59.7' 59.7'
15	42°6.06	• • 11.08	344°6.36	7.3'	20°50.27	12.4'	59.7'
16	57°6.20	10.12	358°32.64	7.2'	21°2.64	12.2'	59.6'
17 18	72° 6.33 87° 6.47	9.15 \$06°8.19	12°58.86 27°25.00	7.1' 7.1'	21°14.88 N21°26.97	12.1' 12.0'	59.6' 59.6'
18 19	87°6.47 102°6.61	506°8.19 7.22	27°25.00 41°51.07	7.1° 7.0'	N21°26.97 21°38.92	12.0	59.6'
20	117°6.75	6.26	56°17.08	6.9'	21°50.73	11.7'	59.6'
21	132°6.89	• • 5.29	70°43.02	6.9'	22°2.40	11.5'	59.5'
22 23	147°7.03 162°7.17	4.32 3.36	85°8.88 99°34.68	6.8' 6.7'	22°13.92 22°25.30	11.4' 11.2'	59.5' 59.5'
23			99 J4.06			11.2	J9.3
	SD = 16.1'	d = -1.0'		SL	D = 16.4'		

N 72° 04:5' N 70° 05:00 68° 05:10	9 06:17 5 06:15 0 06:14 4 06:13	07:25 07:17 07:10 07:05	17:01 17:09 17:15	Civil 18:09 18:10	Naut. 19:28 19:21
N 70° 05:0	06:15 0 06:14 4 06:13	07:17 07:10	17:09	18:10	
68° 05:1	06:14 4 06:13	07:10			19:21
	4 06:13		17:15	40 44	
		07:05		18:11	19:16
66° 05:1	7 06:12		17:21	18:12	19:12
64° 05:1		07:00	17:25	18:13	19:08
62° 05:2		06:56	17:29	18:14	19:05
60° 05:2	2 06:10	06:52	17:33	18:15	19:03
N 58° 05:2	4 06:10	06:49	17:36	18:15	19:01
56° 05:2	6 06:09	06:46	17:39	18:16	18:59
54° 05:2	7 06:08	06:43	17:41	18:17	18:58
52° 05:2	8 06:07	06:41	17:44	18:17	18:56
50° 05:2	9 06:07	06:39	17:46	18:18	18:55
45° 05:3	1 06:05	06:34	17:50	18:20	18:54
N 40° 05:3	2 06:03	06:30	17:54	18:21	18:53
35° 05:3	2 06:01	06:27	17:58	18:23	18:52
30° 05:3	2 06:00	06:24	18:01	18:25	18:52
20° 05:3	05:56	06:18	18:06	18:28	18:54
N 10° 05:2		06:13	18:11	18:32	18:56
0° 05:2	4 05:48	06:09	18:15	18:36	19:00
<b>S</b> 10° 05:1	8 05:43	06:04	18:20	18:41	19:06
20° 05:1	05:36	05:59	18:25	18:47	19:13
30° 05:0		05:52	18:31	18:55	19:23
35° 04:5	3 05:23	05:49	18:34	19:00	19:30
40° 04:4	4 05:17	05:45	18:38	19:06	19:38
45° 04:3	4 05:10	05:40	18:43	19:13	19:49
<b>S</b> 50° 04:2	1 05:01	05:34	18:48	19:21	20:02
52° 04:1	4 04:57	05:32	18:51	19:26	20:08
54° 04:0	7 04:52	05:29	18:54	19:30	20:15
56° 03:5	9 04:47	05:26	18:57	19:35	20:23
58° 03:4		05:22	19:00	19:41	20:33
<b>S</b> 60° 03:3	8 04:34	05:18	19:04	19:48	20:44

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-21%
02	12:09	12:03	12:12	14:19	01:54	
03	11:57	11:50	12:12	15:11	02:45	
04	11:44	11:37	12:12	16:06	03:38	

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	162°59.74	156°8.11 N10°58.68	53°32.96 N25°41.34	91°47.19 N21°55.67	170°20.55 S05°15.22
1	178°2.20	171°11.02 58.91	68°35.15 41.23	106°49.41 55.71	185°22.73 15.10
2	193°4.67	186°13.93 59.13	83°37.34 41.12	121°51.63 55.74	200°24.91 14.98
3	208°7.13	201°16.84 · · 59.36	98°39.52 · · 41.01	136°53.86 · · 55.78	215°27.09 · · 14.86
4	223°9.59	216°19.76 59.58	113°41.71 40.90	151°56.08 55.82	230°29.28 14.74
5	238° 12.06	231°22.68 10°59.80	128° 43.89 40.79	166°58.30 55.85	245°31.46 14.62
6	253° 14.52	246°25.61 N11°0.01	143°46.07 N25°40.68	182°0.52 N21°55.89	260°33.64 S05°14.50
7	268° 16.99	261°28.54 0.23	158°48.25 40.57	197°2.74 55.93	275°35.82 14.38
8	283° 19.45	276°31.47 0.44	173°50.43 40.46	212°4.96 55.97	290°38.00 14.26
9	298°21.91	291°34.41 · · 0.65	188°52.61 · · 40.35	227°7.18 · · 56.00	305°40.18 · · 14.14
10	313°24.38	306°37.35 0.86	203°54.79 40.24	242°9.40 56.04	320°42.36 14.02
11	328°26.84	321°40.30 1.06	218° 56.96 40.12	257°11.62 56.08	335°44.54 13.90
12	343°29.31	336°43.25 N11°1.26	233°59.14 N25°40.01	272°13.84 N21°56.11	350°46.72 S05°13.78
13	358° 31.77	351°46.20 1.46	249°1.31 39.90	287°16.06 56.15	5°48.90 13.66
14	13°34.24	6°49.16 1.66	264°3.48 39.79	302°18.28 56.19	20°51.08 13.54
15	28°36.70	21°52.12 · · 1.86	279°5.65 · · 39.68	317°20.50 · · 56.22	35°53.26 · · 13.42
16	43°39.16	36°55.08 2.05	294°7.82 39.57	332°22.72 56.26	50°55.44 13.29
17	58°41.63	51°58.05 2.24	309°9.99 39.45	347°24.94 56.30	65°57.62 13.17
18	73°44.09	67°1.02 N11°2.43	324°12.16 N25°39.34	2°27.15 N21°56.34	80°59.80 S05°13.05
19	88° 46.56	82°4.00 2.61	339°14.33 39.23	17°29.37 56.37	96°1.98 12.93
20	103°49.02	97°6.98 2.80	354°16.49 39.12	32°31.59 56.41	111°4.16 12.81
21	118°51.48	112°9.96 · · 2.98	9°18.65 · · 39.01	47°33.80 · · 56.45	126°6.34 · · 12.69
22	133°53.95	127° 12.95 3.16	24°20.82 38.89	62°36.02 56.49	141°8.52 12.57
23	148°56.41	142°15.94 3.33	39°22.98 38.78	77°38.24 56.52	156°10.70 12.45
	pass. 13:06	ν2.9' d0.2' m-4.69	$\nu$ 2.2' d-0.1' m-0.17	ν2.2' d0.0' m-2.27	ν2.2' d-0.1' m1.11
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	163°58.88	157°18.93 N11°3.51	54°25.14 N25°38.67	92°40.45 N21°56.56	171°12.88
1	179°1.34	172°21.93 3.68	69°27.30 38.55	107°42.67 56.60	186°15.06 12.21
2	194°3.81	187°24.94 3.85	84°29.45 38.44	122°44.88 56.63	201°17.24 12.09
3	209°6.27	202°27.94 · · 4.02	99°31.61 · · 38.33	137°47.10 · · 56.67	216°19.42 · · 11.97
4	224°8.73	217°30.95 4.18	114°33.76 38.21	152°49.31 56.71	231°21.60 11.85
5	239°11.20	232°33.97 4.34	129°35.92 38.10	167°51.53 56.75	246°23.78 11.73
6	254° 13.66	247°36.98 N11°4.50	144°38.07 N25°37.99	182°53.74 N21°56.78	261°25.96
7	$269^{\circ}16.13$	262°40.00 4.66	159° 40.22 37.87	197°55.95 56.82	276°28.14 11.48
8	284° 18.59	277°43.03 4.82	174°42.37 37.76	212°58.17 56.86	291°30.32 11.36
9	299°21.05	292°46.06 · · 4.97	189°44.52 · · 37.64	228°0.38 · · 56.90	306°32.50 · · 11.24
10	314°23.52	307°49.09 5.12	204°46.67 37.53	243°2.59 56.94	321°34.68 11.12
11	329°25.98	322°52.13 5.27	219°48.82 37.41	258° 4.80 56.97	336°36.86 11.00
12	344°28.45	337°55.17 N11°5.41	234°50.96 N25°37.30	273°7.02 N21°57.01	351°39.04 <b>S</b> 05°10.88
13	$359^{\circ}30.91$	352°58.21 5.56	249°53.11 37.18	288° 9.23 57.05	6°41.22 10.76
14	14°33.38	8°1.26 5.70	264°55.25 37.07	303°11.44 57.09	21°43.40 10.64
15	29°35.84	23°4.31 · · 5.84	279°57.39 · · 36.95	318°13.65 · · 57.12	36°45.58 · · 10.52
16	44°38.30	38°7.37 5.97	294°59.53 36.84	333°15.86 57.16	51°47.76 10.40
17	59°40.77	53°10.42 6.11	310°1.67 36.72	348°18.07 57.20	66°49.94 10.28
18	74°43.23	68°13.49 N11°6.24	325°3.81 N25°36.61	3°20.28 N21°57.24	81°52.12 S05°10.16
19	89°45.70	83°16.55 6.37	340°5.95 36.49	18°22.49 57.28	96°54.30 10.04
20	104°48.16	98° 19.62 6.49	355°8.08 36.38	33°24.70 57.31	111°56.48 9.91
21	119°50.63	113°22.70 · · 6.62	10° 10.22 · · · 36.26	48°26.91 · · 57.35	126°58.66 · · 9.79
22	134°53.09	128°25.78 6.74	25°12.35 36.14	63°29.12 57.39	142°0.84 9.67
23	149°55.55	143°28.86 6.86	40° 14.48 36.03	78°31.33 57.43	157°3.01 9.55
Mer.	pass. 13:02	ν3.0′ d0.2′ m-4.66	ν2.2' d-0.1' m-0.15	ν2.2' d0.0' m-2.26	ν2.2' d-0.1' m1.11
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	164°58.02	158°31.94 N11°6.97	55°16.61 N25°35.91	93°33.53 N21°57.47	172°5.19 S05°9.43
1	180°0.48	173°35.03 7.09	70°18.74 35.79	108°35.74 57.50	187°7.37 9.31
2	195°2.95	188° 38.12 7.20	85°20.87 35.68	123°37.95 57.54	202°9.55 9.19
3	210°5.41	203°41.22 · · 7.31	100°23.00 · · 35.56	138°40.16 · · 57.58	217°11.73 · · · 9.07
4	225°7.87	218° 44.32 7.41	115°25.13 35.44	153°42.36 57.62	232°13.91 8.95 N
5	240° 10.34	233° 47.42 7.52	130°27.25 35.33	168°44.57 57.66	247°16.09 8.83
6	255° 12.80	248°50.53 N11°7.62	145°29.38 N25°35.21	183°46.78 N21°57.70	262°18.27 S05°8.71
7	270° 15.27	263°53.64 7.72	160°31.50 35.09	198°48.98 57.73	277°20.45 8.59
8	285° 17.73	278°56.76 7.82	175° 33.62 34.97	213°51.19 57.77	292°22.63 8.47
9	300°20.20	293°59.88 · · 7.91	190°35.74 · · 34.85	228°53.39 · · 57.81	307°24.81 · · 8.35
10	315°22.66	309°3.00 8.00	205° 37.86 34.74	243°55.60 57.85	322°26.99 8.22
11	330°25.12	324°6.12 8.09	220°39.98 34.62	258°57.80 57.89	337°29.17 8.10
12	345°27.59	339°9.25 N11°8.18	235°42.10 N25°34.50	274°0.01 N21°57.93	352°31.35
13	0°30.05	354°12.39 8.27	250°44.21 34.38	289°2.21 57.96	7°33.53 7.86
14	15° 32.52	9°15.52 8.35	265°46.33 34.26	304°4.42 58.00	22°35.71 7.74 \_
15	30°34.98	24°18.67 · · 8.43	280°48.44 · · 34.14	319°6.62 · · 58.04	37°37.89 · · 7.62
16	45°37.44	39°21.81 8.51	295°50.55 34.03	334°8.82 58.08	52°40.07 7.50
17	60°39.91	54°24.96 8.58	310°52.66 33.91	349°11.03 58.12	67°42.25 7.38
18	75°42.37	69°28.11 N11°8.65	325°54.77 N25°33.79	4°13.23 N21°58.16	82°44.43 S05°7.26
19	90°44.84	84°31.27 8.72	340°56.88 33.67	19°15.43 58.19	97°46.61 7.14
20	105°47.30	99°34.42 8.79	355°58.99 33.55	34°17.63 58.23	112°48.79 7.02
21	120°49.77	114°37.59 · · 8.85	11°1.10 · · 33.43	49°19.84 · · 58.27	127°50.97 · · 6.90
22 23	135° 52.23 150° 54.69	129°40.75 8.92 144°43.92 8.98	26°3.20 33.31 41°5.31 33.19	64°22.04 58.31 79°24.24 58.35	142°53.15 6.78
					157°55.33 6.65
Mer.p	pass. 12:58	ν3.1′ d0.1′ m-4.63	ν2.1' d-0.1' m-0.12	ν2.2' d0.0' m-2.26	ν2.2' d-0.1' m1.11
					<del>_</del>

Stars SHA

357°35.00 353°7.38

349°31 45

348°47.45

Alpheratz

Ankaa Schedar

Diphda

**Dec** 29°13.71

-42°10.31

56°40.58 -17°51.06

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h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°7.31	<b>S</b> 06°2.39	114°0.41	6.7'	N22°36.53	11.1'	59.5'
1	192°7.45	1.42	128°26.08	6.6'	22°47.61	10.9'	59.4
2	207°7.59 222°7.73	06° 0.46 05° 59.49	142°51.67 157°17.20	6.5' 6.5'	22°58.54 23°9.31	10.8' 10.6'	59.4' 59.4'
4	237°7.87	58.52	171°42.66	6.4	23°19.94	10.5	59.4'
5	252°8.01	57.56	186°8.06	6.3'	23°30.40	10.3'	59.3'
6	267°8.15	S05°56.59	200°33.40	6.3'	N23°40.72	10.2'	59.3'
7	282°8.29	55.62	214°58.67	6.2'	23°50.88 24°0.87	10.0'	59.3'
8 9	297°8.44 312°8.58	54.65 •• 53.69	229°23.87 243°49.02	6.1' 6.1'	24° 10.87 24° 10.71	9.8' 9.7'	59.3' 59.2'
10	327°8.72	52.72	258°14.10	6.0'	24° 20.39	9.5'	59.2'
11	342°8.86	51.75	272°39.12	6.0'	$24^{\circ}29.91$	9.4'	59.2'
12	357°9.00	S05°50.78	287°4.08	5.9'	N24°39.27	9.2'	59.2'
13 14	12°9.15 27°9.29	49.82 48.85	301°28.99 315°53.83	5.8' 5.8'	24°48.46 24°57.48	9.0' 8.9'	59.1' 59.1'
14 15	42° 9.43	48.85	330°18.62	5.8 5.7'	24 57.48 25°6.34	8.9 8.7'	59.1'
16	57°9.57	46.91	344°43.35	5.7'	25°15.04	8.5'	59.1'
17	72°9.72	45.94	359°8.03	5.6'	$25^{\circ}23.56$	8.4'	59.0'
18	87°9.86	S05°44.97	13°32.66	5.6'	N25°31.92	8.2'	59.0'
19 20	102°10.00 117°10.15	44.00 43.04	27°57.23 42°21.75	5.5' 5.5'	25°40.11 25°48.12	8.0' 7.8'	59.0' 58.9'
21	132° 10.29	• • 42.07	56°46.23	5.4'	25°55.97	7.6 7.7'	58.9'
22	147° 10.44	41.10	71°10.65	5.4'	26°3.64	7.5'	58.9'
23	$162^{\circ}10.58$	40.13	85°35.03	5.3'	$26^{\circ}11.14$	7.3'	58.9'
	SD = 16.1'	d = -1.0'		SI	D = 16.2'		
<b>-</b>						,	
Thu 0	<b>GHA</b> 177° 10.72	Dec \$05°39.16	<b>GHA</b> 99°59.36	u 5.3'	<b>Dec</b> N26°18.46	d 7.1'	<b>HP</b> 58.8'
1	177 10.72 192° 10.87	38.19	99 59.50 114°23.65	5.2'	26°25.61	7.1 7.0'	58.8'
2	$207^{\circ}11.01$	37.22	128°47.90	5.2'	26°32.59	6.8'	58.8'
3	222°11.16	• • 36.25	143°12.10	5.2'	26°39.39	6.6'	58.8'
4	237°11.30 252°11.45	35.28 34.31	157°36.27 172°0.40	5.1' 5.1'	26°46.01 26°52.45	6.4' 6.3'	58.7'
5 6	267°11.60	505°33.34	172 0.40 186°24.49	5.1'	20 52.45 N26°58.71	6.1	58.7' 58.7'
7	282°11.74	32.37	200°48.55	5.0'	27°4.80	5.9'	58.7'
8	297°11.89	31.40	215°12.58	5.0'	$27^{\circ}10.70$	5.7'	58.6'
9	312° 12.03	• • 30.43	229°36.57	5.0'	27°16.43	5.5'	58.6'
10 11	327° 12.18 342° 12.33	29.46 28.48	244°0.54 258°24.48	4.9' 4.9'	27°21.97 27°27.34	5.4' 5.2'	58.6' 58.5'
12	357° 12.47	S05°27.51	272°48.39	4.9'	N27°32.52	5.0'	58.5
13	12°12.62	26.54	287°12.28	4.9'	27°37.52	4.8'	58.5'
14	27° 12.77	25.57	301°36.15	4.8'	27°42.33	4.6'	58.5'
15	42° 12.91 57° 13.06	• • 24.60	316°0.00 330°23.83	4.8'	27°46.97 27°51.42	4.5' 4.3'	58.4'
16 17	72° 13.06	23.63 22.66	330°23.83 344°47.65	4.8' 4.8'	27°51.42 27°55.69	4.3	58.4' 58.4'
18	87° 13.36	S05°21.68	359°11.45	4.8'	N27°59.77	3.9'	58.4'
19	102°13.51	20.71	13°35.24	4.8'	$28^{\circ}3.67$	3.7'	58.3'
20	117° 13.65	19.74	27°59.03	4.8'	28°7.38	3.5'	58.3'
21 22	132°13.80 147°13.95	· · 18.77 17.80	42°22.80 56°46.57	4.8' 4.8'	28°10.91 28°14.26	3.3' 3.2'	58.3' 58.2'
23	162° 14.10	16.82	71°10.33	4.8'	28°17.42	3.0'	58.2
	SD = 16.1'	d = -1.0'		SI	D = 16.0'		
		<u>u = 1.0</u>					
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	177°14.25 192°14.40	\$05°15.85 14.88	85°34.10 99°57.86	4.8' 4.8'	N28°20.40 28°23.19	2.8' 2.6'	58.2' 58.2'
2	192° 14.40 207° 14.55	14.88	99°57.86 114°21.63	4.8'	28° 25.80	2.6	58.2 58.1'
3	222° 14.70	. 12.93	128°45.40	4.8'	28°28.22	2.2'	58.1
4	237° 14.85	11.96	143°9.18	4.8'	28°30.46	2.1'	58.1'
5	252°14.99 267°15.14	10.99 \$05°10.01	157°32.97	4.8'	28°32.52	1.9'	58.1'
6 7	267° 15.14 282° 15.30	505°10.01 9.04	171°56.77 186°20.59	4.8' 4.8'	N28°34.39 28°36.07	1.7' 1.5'	58.0' 58.0'
8	297° 15.45	8.07	200°44.42	4.8'	28°37.57	1.3'	58.0'
9	312°15.60	• • 7.09	215°8.26	4.9'	28°38.89	1.1'	57.9'
10	327° 15.75	6.12	229°32.13	4.9'	28°40.02	1.0'	57.9'
11 12	342°15.90 357°16.05	5.15 \$05°4.17	243°56.02 258°19.94	4.9' 4.9'	28°40.98 N28°41.74	0.8' 0.6'	57.9' 57.9'
13	12° 16.20	3.20	258 19.94 272°43.88	4.9 5.0'	28° 42.33	0.6	57.9 57.8'
14	27° 16.35	2.22	287°7.85	5.0'	28°42.73	0.2	57.8'
15	42°16.50	• • 1.25	301°31.85	5.0'	28°42.95	0.0'	57.8'
16	57°16.65	05°0.28	315°55.89	5.1'	28°42.99	-0.1'	57.8'
17 18	72° 16.81 87° 16.96	04°59.30 \$04°58.33	330°19.95 344°44.06	5.1' 5.1'	28°42.85 N28°42.53	-0.3' -0.5'	57.7' 57.7'
19	102° 17.11	57.35	359°8.21	5.2'	28°42.03	-0.5' -0.7'	57.7'
20	117° 17.26	56.38	13°32.39	5.2'	28°41.35	-0.9'	57.6'
21	132° 17.42	• • 55.40	27°56.62	5.3'	28°40.49	-1.0'	57.6'
22 23	147° 17.57 162° 17.72	54.43 53.45	42°20.90 56°45.22	5.3' 5.4'	28°39.46 28°38.24	-1.2' -1.4'	57.6' 57.6'
23			JU 45.22			-1.4	31.0
	SD = 16.1'	d = -1.0'		51	D = 15.9'		

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

Lat.		Moonris	e		Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°	05:29			03:24		
64°	06:24			02:30		
62°	06:58	06:46		01:58	04:13	05.00
60°	07:22	07:31	07:57	01:34	03:28	05:08
N 58°	07:42	08:00	08:37	01:15	02:59	04:28
56°	07:59	08:23	09:05	00:59	02:36	04:00
54° 52°	08:13	08:42	09:27	00:45	02:18	03:38
52 50°	08:25 08:36	08:58 09:12	09:45 10:00	00:34 00:23	02:03 01:49	03:20 03:05
45°	08:59	09:12	10:00	00:23	01:49	03.03
N 40°	09:18	10:02	10:56	00.01	01:00	02:34
35°	09:16	10:02	11:16		00:42	02:10
30°	09:33	10:21	11:33		00:42	01:34
20°	10:10	11:04	12:01		00:01	01:05
N 10°	10:31	11:27	12:26	23:38		00:41
0°	10:50	11:49	12:49	23:18		00:18
<b>S</b> 10°	11:09	12:11	13:12	22:57	23:55	
20°	11:30	12:35	13:37	22:35	23:31	
30°	11:54	13:02	14:06	22:09	23:02	•• ••
35°	12:08	13:19	14:23	21:54	22:45	23:44
40°	12:25	13:38	14:44	21:37	22:26	23:24
45°	12:44	14:01	15:08	21:16	22:02	23:00
<b>S</b> 50°	13:10	14:31	15:40	20:50	21:32	22:28
52°	13:22	14:46	15:56	20:37	21:16	22:12
54°	13:36	15:04	16:14	20:23	20:59	21:54
56°	13:52	15:25	16:37	20:06	20:38	21:31
58°	14:12	15:51	17:06	19:46	20:11	21:02
<b>S</b> 60°	14:36	16:29	17:51	19:21	19:33	20:17

	Sun Moon				Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	31-54%
05	11:31	11:24	12:11	17:04	04:34	
06	11:17	11:10	12:11	18:03	05:33	
07	11:03	10:56	12:11	19:04	06:34	

h	Aries	Ven	us	M	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	165° 57.16		N11°9.03	56° 7.41		94°26.44	N21°58.39	172°57.51	S05°6.53			
1	180° 59.62	174°50.28	9.09	71° 9.51	32.95	109°28.64	58.43	187°59.69	6.41	Alpheratz	357°34.99	29°13.70
2	196°2.09	189°53.46	9.14	86°11.61	32.83	124°30.84	58.47	203°1.87	6.29	Ankaa	353°7.38	-42°10.30
3	211°4.55	204°56.64	• • 9.19	101°13.71	• • 32.71	139°33.04	• • 58.50	218°4.04	• • 6.17	Schedar	349°31.45	56°40.57
4	226°7.01	219°59.83	9.24	116°15.81	32.59	154°35.24	58.54	233°6.22	6.05	Diphda	348° 47.45	-17°51.05
5	241°9.48	235°3.02	9.28	131°17.91	32.47	169°37.44	58.58	248°8.40	5.93	Achernar	335°20.50	-57°6.73
6	256° 11.94	250°6.22	N11°9.33	146°20.00	N25°32.35	184°39.64	N21°58.62	263°10.58	S05°5.81	Hamal	327°51.29	23°34.88
7	271°14.41	265°9.42	9.37	161°22.10	32.23	199°41.84	58.66	278°12.76	5.69	Polaris	314°13.46	89°22.49 -40°12.45
8	286° 16.87	$280^{\circ}12.62$	9.40	176°24.19	32.10	214°44.04	58.70	293°14.94	5.57	Acamar	315°11.87	4°11.23
9	301°19.34	$295^{\circ}15.83$	• • 9.44	191°26.28	• • 31.98	229°46.23	• • 58.74	308°17.12	• • 5.45	Menkar Mirfak	314°6.16 308°28.28	4 11.23 49°57.18
10	316°21.80	$310^{\circ}19.04$	9.47	206°28.38	31.86	244°48.43	58.78	323°19.30	5.33	Aldebaran	290°39.50	16°33.58
11	331°24.26	$325^{\circ}22.25$	9.50	221°30.47	31.74	259°50.63	58.82	338°21.48	5.21	Rigel	290 39.30 281°3.72	-8°10.48
12	346° 26.73	340°25.47	N11°9.53	236°32.56	N25°31.62	274°52.83	N21°58.86	353°23.66	S05°5.09	Capella	280° 21.67	46° 1.54
13	1°29.19	355°28.69	9.55	251°34.64	31.50	289°55.02	58.89	8°25.84	4.96	Bellatrix	278° 22.70	6°22.29
14	16°31.66	10°31.91	9.57	266°36.73	31.37	304°57.22	58.93	23°28.02	4.84	Elnath	278°1.66	28°37.77
15	31°34.12	25°35.14	• • 9.59	281°38.82	• • 31.25	319°59.42	• • 58.97	38°30.20	• • 4.72	Alnilam	275°37.55	-1°11.25
16	46° 36.58	40°38.37	9.61	296°40.90	31.13	335°1.61	59.01	53°32.38	4.60	Betelgeuse	270°51.87	7°24.65
17	61°39.05	55°41.61	9.63	311°42.98	31.01	350°3.81	59.05	68° 34.56	4.48	Canopus	263°52.17	-52°42.78
18	76°41.51		N11°9.64	326°45.07	N25°30.88	5°6.00	N21°59.09	83°36.74	S05°4.36	Sirius	258° 25.99	-16°45.20
19	91°43.98	85°48.09	9.65	341°47.15	30.76	20°8.20	59.13	98°38.92	4.24	Adhara	255°5.59	-29°0.57
20	106°46.44	100°51.34	9.65	356°49.23	30.64	35°10.39	59.17	113°41.10	4.12	Procyon	244° 50.50	5°9.54
21	121°48.91	115°54.58	• • 9.66	11°51.31	• • 30.52	50°12.59	• • 59.21	128° 43.27	• • 4.00	Pollux	243°16.90	27°57.93
22	136°51.37	130°57.84	9.66	26°53.38	30.39	65°14.78	59.25	143°45.45	3.88	Avior	$234^{\circ}14.25$	-59°35.59
23	151°53.83	146°1.09	9.66	41°55.46	30.27	80°16.98	59.29	158°47.63	3.76	Suhail	222°45.86	-43°32.22
Mer.	pass. 12:54	$\nu$ 3.2′ d0.1′	′ m-4.59	$\nu 2.1' \ d-0$	.1' m-0.10	$\nu 2.2' \ d0.$	.0′ m-2.25	$\nu 2.2' \ d-0.0$	1' m1.10	Miaplacidus	221°37.52	-69°49.36
										Alphard	217°47.33	-8°46.20
_			_		_		_		_	Regulus	207°33.98	11°50.54
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°40.12	61°36.85
0	166° 56.30		N11°9.66	56°57.54	N25°30.15	95°19.17	N21°59.33	173°49.81	S05°3.64	Denebola	182°24.48	14°25.73
1	181°58.76	176°7.62	9.65	71°59.61	30.02	110°21.36	59.37	188°51.99	3.52	Gienah	175°43.14	$-17^{\circ}41.02$
2	197°1.23	191°10.89	9.64	87° 1.69	29.90	125°23.56	59.40	203°54.17	3.40	Acrux	172°59.35	-63°14.30
3	212°3.69	206° 14.16	• • 9.63	102°3.76	• • 29.77	140°25.75	• • 59.44	218° 56.35	• • 3.27	Gacrux	171°50.99	-57°15.24
4	227°6.15	221°17.43	9.62	117°5.83	29.65	155°27.94	59.48	233°58.53	3.15	Alioth	$166^{\circ}12.30$	55°49.17
5	242°8.62	236° 20.71	9.60	132°7.90	29.53	170°30.13	59.52	249°0.71	3.03	Spica	158°21.89	-11°17.68
6	257°11.08	251°23.99 266°27.27	N11°9.58	147°9.97	N25°29.40	185°32.33 200°34.52	N21°59.56	264°2.89	\$05°2.91	Alkaid	152°51.49	$49^{\circ}10.97$
7 8	272° 13.55 287° 16.01	200 27.27 281°30.56	9.56	162°12.04 177°14.10	29.28	200 34.52 215°36.71	59.60	279°5.07 294°7.25	2.79	Hadar	148°35.39	-60°29.55
9	302° 18.48	296° 33.85	9.54 •• 9.51	177 14.10 192°16.17	29.15 •• 29.03	230°38.90	59.64 •• 59.68	309° 9.43	2.67 · · 2.55	Menkent	147°57.19	-36°29.63
10	317° 20.94	311° 37.15	9.48	207°18.23	28.90	245°41.09	59.72	324° 11.61	2.43	Arcturus	145°47.55	19°2.84
11	332°23.40	326° 40.45	9.46	207 16.23 222°20.29	28.78	260°43.28	59.72	339°13.79	2.43	Rigil Kent.	139°39.73	-60°56.23
12	347° 25.87		N11°9.42	237°22.36	N25°28.65	275°45.47	N21°59.80	354° 15.96	S05°2.19	Kochab	137° 19.07	74° 2.75
13	2°28.33	356° 47.06	9.38	252°24.42	28.53	290°47.66	59.84	9° 18.14	2.07	Zuben'ubi	136°55.68	-16°8.87
14	17°30.80	11°50.37	9.34	267°26.48	28.40	305°49.85	59.88	24°20.32	1.95	Alphecca	126°3.47	26°37.49
15	32°33.26	26° 53.68	• • 9.30	282°28.54	. 28.28	320°52.04	21°59.92	39°22.50	. 1.83	Antares	112° 15.61	-26°29.27
16	47°35.72	41°57.00	9.26	297°30.59	28.15	335°54.23	21°59.96	54°24.68	1.71	Atria	107°9.71	-69°4.11
17	62°38.19	57°0.31	9.21	312°32.65	28.02	350°56.42	0.00	69°26.86	1.58	Sabik	102°2.62	-15°45.43
18	77° 40.65		N11°9.16	327°34.71	N25°27.90	5°58.60	N22°0.04	84°29.04	S05°1.46	Shaula	96° 10.22	-37°7.25
19	92°43.12	87°6.96	9.11	342°36.76	27.77	21°0.79	0.08	99°31.22	1.34	Rasalhague	95° 58.45	12°32.25
20	107° 45.58	102°10.29	9.05	357°38.81	27.65	36°2.98	0.12	114°33.40	1.22	Eltanin	90°42.22	51°28.73
21	122°48.05	117° 13.63	• • 9.00	12°40.87	• • 27.52	51°5.17	0.16	129° 35.58	. 1.10	Kaus Aust.	83°32.45	-34°22.31
22	137°50.51	132° 16.96	8.94	27°42.92	27.39	66°7.35	0.20	144°37.76	0.98	Vega	80°33.28	38°48.06
23	152° 52.97	147°20.30	8.87	42°44.97	27.27	81°9.54	0.24	159° 39.94	0.86	Nunki	75°47.74 62°0.03	-26°15.94
N 4	10.50		/ 4.55	0.1/ / 0	1/ 0.07		0/ 0.04	0.0/ 1.0	1/ 110	Altair		8°55.89
Mer.p	pass. 12:50	$\nu$ 3.3′ <i>d</i> -0.0	m-4.55	$\nu$ 2.1′ d-0	.1′ m-0.07	$\nu$ 2.2' d0.	.0′ m-2.24	$\nu 2.2' \ d-0.$	1′ m1.10	Peacock Deneb	53°5.91 49°26.09	-56°39.14 45°21.94
										Enif	33° 38.96	9°59.26
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir		-46°50.37
0	167°55.44	$162^{\circ}23.65$	N11°8.81	57°47.02	N25°27.14	96°11.73	N22°0.28	174°42.12	\$05°0.74	Fomalhaut	15° 14.70	-29°29.44
1	182°57.90	$177^{\circ}26.99$	8.74	72°49.06	27.01	111°13.91	0.32	$189^{\circ}44.30$	0.62	Scheat	13° 45.44	28°13.04
2	198°0.37	192°30.34	8.67	87°51.11	26.88	126°16.10	0.36	204°46.47	0.50	Markab	13°30.09	15°20.32
3	213°2.83	207°33.70	• • 8.60	102°53.16	• • 26.76	141°18.28	• • 0.40	$219^{\circ}48.65$	• • 0.38			
4	228°5.29	222°37.06	8.52	117°55.20	26.63	156°20.47	0.44	234°50.83	0.26	Mar 08 Sat	SHA	Mer.pass
5	243°7.76	$237^{\circ}40.42$	8.45	132°57.24	26.50	171°22.65	0.48	249°53.01	0.14	Venus	353° 49.94	13:18
6	258° 10.22	252°43.78	N11°8.36	147°59.29	N25°26.37	186°24.84	N22°0.52	264°55.19	S05°0.02	Mars	250° 10.25	20:13
7	273° 12.69	267°47.15	8.28	163° 1.33	26.25	201°27.02	0.56	279°57.37	04°59.90	Jupiter	288°29.28	17:40
8	288° 15.15	282°50.52	8.20	178°3.37	26.12	216°29.21	0.60	294°59.55	59.78	Saturn	7°0.35	12:26
9	303° 17.62	297°53.89	• • 8.11	193°5.41	• • 25.99	231°31.39	• • 0.64	310°1.73	• • 59.65	Mar 09 Sun	SHA	Mer.pass
10	318°20.08	312°57.27	8.02	208°7.44	25.86	246°33.57	0.68	325°3.91	59.53	Venus	354°8.06	13:13
11	333°22.54	328°0.65	7.92	223°9.48	25.73	261°35.76	0.72	340°6.09	59.41	Mars	250°1.24	20:09
12	348°25.01		N11°7.83	238°11.52		276°37.94	N22°0.76	355°8.27	S04°59.29	Jupiter	288° 22.87	17:36
13	3°27.47	358°7.42	7.73	253°13.55	25.48	291°40.12	0.80	10° 10.45	59.17	Saturn	6°53.51	12:23
14	18° 29.94	13° 10.81	7.63	268°15.59	25.35	306°42.31	0.84	25° 12.62	59.05			
15	33°32.40	28° 14.20	7.52	283°17.62	• • 25.22	321°44.49	0.88	40°14.80	. 58.93	Mar 10 Mon	SHA	Mer.pass
16	48° 34.86	43° 17.60	7.42	298°19.65	25.09	336°46.67	0.92	55° 16.98	58.81	Venus	354°28.21	13:07
17	63°37.33	58°21.00	7.31	313°21.68	24.96	351°48.85	0.96	70° 19.16	58.69	Mars	249°51.58	20:06
18 19	78° 39.79 93° 42.26	73°24.40 88°27.81	N11°7.19 7.08	328°23.71 343°25.74	N25°24.83 24.70	6°51.03 21°53.21	N22°1.00 1.04	85°21.34 100°23.52	\$04°58.57	Jupiter	288° 16.29	17:33
	93° 42.26 108° 44.72	103°31.22		343°25.74 358°27.76		36°55.39		100°23.52 115°25.70	58.45	Saturn	6°46.68	12:19
20 21	108° 44.72 123° 47.18	103°31.22 118°34.63	6.96 • • 6.84	358°27.76 13°29.79	24.57 •• 24.44	36°55.39 51°57.57	1.08 •• 1.12	115°25.70 130°27.88	58.33 •• 58.21	Horizor	ntal parallax	
22	123 47.18 138°49.65	118 34.03 133°38.05	6.72	28°31.81	24.44	51 57.57 66°59.75	1.16	130 27.88 145°30.06	58.09	1.0201	Venus:	0.5
23	153° 52.11	148°41.47	6.60	43°33.84	24.18	82°1.93	1.20	160°32.24	57.97		Mars:	0.2
Mer.p	pass. 12:46	$\nu$ 3.3′ d-0.1	′ m-4.50	$\nu 2.0' d-0$	.1′ m-0.05	$\nu$ 2.2′ d0.	.0′ m-2.24	$\nu 2.2' \ d-0$	1′ m1.10			

h	Su	n		Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.87	S04°52.48	71°9.59	5.4'	N28° 36.85	-1.6'	57.5'
1	192°18.03	51.50	85°34.01	5.5'	28°35.28	-1.7'	57.5'
2	207°18.18	50.53	99°58.48	5.5'	28°33.54	-1.9'	57.5'
3	222°18.33	• • 49.55	114°23.01	5.6'	28°31.63	-2.1'	57.5'
4	237°18.49	48.58	128° 47.60	5.6'	28°29.54	-2.3'	57.4'
5	252°18.64	47.60	143° 12.25	5.7'	28°27.27	-2.4'	57.4'
6	267°18.80 282°18.95	\$04° 46.62 45.65	157°36.95 172°1.72	5.8' 5.8'	N28°24.84 28°22.23	-2.6' -2.8'	57.4' 57.4'
7 8	282 18.95 297°19.10	45.65 44.67	172 1.72 186° 26.55	5.8 5.9'	28° 22.23 28° 19.45	-2.8 -2.9'	57.4 57.3'
9	312°19.26	• • 43.70	200°51.45	6.0'	28° 16.51	-3.1'	57.3'
10	327°19.41	42.72	215° 16.41	6.0'	28° 13.39	-3.3'	57.3'
11	342°19.57	41.74	229°41.45	6.1'	$28^{\circ}10.11$	-3.4'	57.3'
12	357°19.72	S04°40.77	244°6.55	6.2'	N28°6.67	-3.6'	57.2'
13	12°19.88	39.79	258°31.73	6.3'	28°3.05	-3.8'	57.2'
14	27°20.03	38.81	272°56.98	6.3'	27°59.27	-3.9'	57.2'
15 16	42°20.19 57°20.35	· · 37.84 36.86	287°22.30 301°47.70	6.4' 6.5'	27°55.33 27°51.23	-4.1' -4.3'	57.2' 57.1'
17	72°20.50	35.88	316° 13.18	6.6'	27°46.96	-4.3 -4.4'	57.1'
18	87°20.66	S04°34.91	330°38.74	6.6'	N27°42.54	-4.6'	57.1
19	102°20.81	33.93	345°4.38	6.7'	27° 37.95	-4.7'	57.1'
20	117°20.97	32.95	359°30.11	6.8'	27°33.21	-4.9'	57.0'
21	132°21.13	•• 31.97	13°55.91	6.9'	27°28.31	-5.1'	57.0'
22	147°21.28	31.00	28° 21.80	7.0'	27°23.26	-5.2'	57.0'
23	162°21.44	30.02	42°47.78	7.1'	27° 18.05	-5.4'	57.0'
	SD = 16.1'	d = -1.0'		S	D = 15.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°21.60	S04°29.04	57° 13.84	7.2'	N27° 12.68	-5.5'	56.9'
1	192°21.75	28.06	71°39.99	7.2'	27°7.17	-5.7'	56.9'
2	207°21.91	27.09	86°6.23	7.3'	$27^{\circ}1.50$	-5.8'	56.9'
3	222°22.07	• • 26.11	100°32.56	7.4'	26°55.69	-6.0'	56.9'
4	237°22.23	25.13	114°58.99	7.5'	26°49.73	-6.1'	56.8'
5 6	252°22.38 267°22.54	24.15 \$04°23.17	129°25.50 143°52.11	7.6' 7.7'	26° 43.61 N26° 37.36	-6.3' -6.4'	56.8' 56.8'
7	282°22.70	22.20	143 52.11 158° 18.81	7.7 7.8'	26°30.96	-0.4 -6.5'	56.8'
8	297°22.86	21.22	172° 45.60	7.8 7.9'	26°24.41	-6.7'	56.7
9	312°23.02	20.24	187° 12.49	8.0'	26° 17.73	-6.8'	56.7'
10	327°23.18	19.26	201°39.48	8.1'	26° 10.90	-7.0'	56.7'
11	342°23.34	18.28	$216^{\circ}6.57$	8.2'	26°3.93	-7.1'	56.7'
12	357°23.49	S04°17.30	230° 33.75	8.3'	N25°56.83	-7.2'	56.6'
13	12°23.65	16.32	245°1.03	8.4'	25°49.59	-7.4'	56.6'
14 15	27°23.81 42°23.97	15.35 •• 14.37	259°28.41 273°55.88	8.5' 8.6'	25°42.21 25°34.70	-7.5' -7.6'	56.6' 56.6'
16	57°24.13	13.39	288°23.46	8.7'	25° 27.06	-7.8'	56.5'
17	72°24.29	12.41	302°51.14	8.8'	25° 19.28	-7.9'	56.5
18	87°24.45	S04°11.43	317° 18.92	8.9'	N25°11.38	-8.0'	56.5'
19	102°24.61	10.45	331°46.80	9.0'	25°3.35	-8.2'	56.5'
20	117°24.77	9.47	346° 14.78	9.1'	$24^{\circ}55.19$	-8.3'	56.5'
21	132°24.93	• • 8.49	0°42.86	9.2'	24°46.90	-8.4'	56.4'
22	147°25.09	7.51	15° 11.04	9.3'	24°38.49	-8.5'	56.4
23	162°25.25	6.53	29°39.33	9.4'	24°29.96	-8.7'	56.4'
	SD = 16.1'	d = -1.0'		S	D = 15.5'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°25.41	S04°5.55	44°7.72	9.5'	N24°21.30	-8.8'	56.4'
1	192°25.57	4.57	58° 36.21	9.6'	24°12.52	-8.9'	56.3'
2 3	207°25.73 222°25.90	3.59 · · 2.61	73°4.80 87°33.50	9.7' 9.8'	24°3.63 23°54.62	-9.0' -9.1'	56.3' 56.3'
3 4	222°25.90 237°26.06	1.63	87°33.50 102°2.30	9.8'	23° 45.49	-9.1' -9.2'	56.3'
5	252°26.22	04°0.65	116° 31.20	10.0'	23°36.25	-9.4	56.3'
6	267°26.38	S03°59.67	131°0.20	10.1'	N23°26.89	-9.5'	56.2'
7	282°26.54	58.69	145°29.31	10.2'	23° 17.42	-9.6'	56.2'
8	297°26.70	57.71	159° 58.52	10.3'	23°7.84	-9.7'	56.2'
9	312°26.87	• • 56.73	174° 27.83	10.4	22°58.16	-9.8'	56.2'
10 11	327°27.03 342°27.19	55.75 54.77	188° 57.25 203° 26.76	10.5' 10.6'	22°48.36 22°38.46	-9.9' -10.0'	56.1' 56.1'
11	342°27.19 357°27.35	54.77 \$03°53.79	203°26.76 217°56.38	10.6	22° 38.46 N22° 28.45	-10.0	56.1'
13	12°27.52	52.81	232°26.10	10.7	22° 18.34	-10.1	56.1
14	27°27.68	51.83	246° 55.92	10.9	22°8.12	-10.2	56.1
15	42°27.84	• • 50.85	261°25.85	11.0'	21°57.81	-10.4'	56.0'
16	57°28.01	49.86	275°55.87	11.1'	21°47.39	-10.5'	56.0'
17	72°28.17	48.88	290°25.99	11.2'	21°36.88	-10.6'	56.0'
18	87°28.33	\$03°47.90	304°56.22	11.3'	N21°26.27	-10.7'	56.0'
19 20	102°28.50 117°28.66	46.92 45.94	319°26.54 333°56.96	11.4' 11.5'	21°15.57 21°4.77	-10.8' -10.9'	56.0' 55.9'
20	117 28.66 132°28.82	45.94 •• 44.96	333°56.96 348°27.49	11.6'	21°4.77 20°53.88	-10.9 -11.0'	55.9' 55.9'
22	147°28.99	43.98	2°58.11	11.7	20° 53.86 20° 42.89	-11.0 -11.1'	55.9'
23	162°29.15	42.99	17° 28.82	11.8'	20°31.82	-11.2	55.9'
	SD = 16.1'	d = -1.0'		S	D = 15.4'		
					20.1		

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

Lat.		Moonris	е		Moonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°			10:50			08:10
64°			11:36			07:23
62°		10:06	12:06		07:03	06:53
60°	09:05	10:45	12:28	06:05	06:24	06:29
N 58°	09:43	11:12	12:46	05:26	05:56	06:11
56°	10:10	11:33	13:02	04:59	05:35	05:55
54° 52°	10:31 10:49	11:50 12:05	13:15 13:26	04:38	05:17 05:02	05:41
52 50°	10:49	12:05	13:26	04:20 04:05	05:02	05:29 05:19
45°	11:34	12:44	13:57	03:34	04:48	03.19
N 40°						
35°	11:58 12:17	13:05 13:22	14:14 14:28	03:11 02:51	04:00 03:42	04:39 04:24
30°	12:17	13:37	14:40	02:31	03:42	04:24
20°	13:02	14:02	15:01	02:05	03:20	03:48
N 10°	13:26	14:24	15:19	01:41	02:37	03:28
0°	13:48	14:44	15:36	01:18	02:16	03:10
S 10°	14:11	15:04	15:53	00:55	01:54	02:51
20°	14:35	15:26	16:11	00:30	01:31	02:31
30°	15:03	15:51	16:31	00:01	01:04	02:08
35°	15:19	16:05	16:43		00:48	01:54
40°	15:38	16:22	16:57		00:29	01:38
45°	16:01	16:42	17:13		00:07	01:19
<b>S</b> 50°	16:31	17:07	17:32	23:38		00:55
52°	16:46	17:19	17:42	23:23		00:43
54°	17:03	17:33	17:52	23:07		00:30
56°	17:23	17:49	18:04	22:47		00:14
58°	17:48	18:08	18:17	22:22	23:56	
<b>S</b> 60°	18:22	18:31	18:33	21:48	23:34	

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-83%	
08	10:49	10:41	12:11	20:02	07:33		
09	10:34	10:26	12:10	20:57	08:30		
10	10:18	10:11	12:10	21:48	09:23		

h	Aries	Venus	S	M	ars	Jup	oiter	Sat	urn		Stars	
т	CIIA	CUA		CIIA	D	CHA	D	CIIA	D		CLIA	D
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	168° 54.58		√11°6.47	58° 35.86	N25°24.05		N22°1.24	175°34.42	S04°57.85	Alpheratz	357°34.99	29°13.70
1	183°57.04	178°48.32	6.34	73°37.88	23.92	112°6.29	1.29	190°36.60	57.73	Ankaa	353°7.37	-42°10.28
2	198°59.50	193°51.75	6.21	88°39.90	23.79	127°8.47	1.33	205°38.77	57.60	Schedar	349°31.46	56°40.56
3	214°1.97		• • 6.07	103°41.92	• • 23.66	142°10.65	• • 1.37	220°40.95	• • 57.48	Diphda	348°47.45	-17°51.05
4	229°4.43	223°58.62	5.93	118°43.94	23.53	157°12.83	1.41	235°43.13	57.36	Achernar	335°20.51	-57°6.72
5	244°6.90	239°2.06	5.79	133°45.96	23.40	172°15.00	1.45	250° 45.31	57.24	Hamal	327°51.30	23°34.88
6	259°9.36		V11°5.65	148° 47.97	N25°23.27	187°17.18	N22°1.49	265° 47.49	S04°57.12	Polaris	$314^{\circ}14.77$	89°22.48
7	274° 11.83	269°8.94	5.50	163°49.99	23.13	202°19.36	1.53	280°49.67	57.00	Acamar	315°11.88	-40°12.44
8	289° 14.29	284°12.39	5.35	178°52.00	23.00	217°21.54	1.57	295°51.85	56.88	Menkar	314°6.17	4°11.23
9	304° 16.75	299°15.84	• • 5.20	193°54.02	• • 22.87	232°23.71	· · 1.61	310°54.03	• • 56.76	Mirfak	308°28.30	49°57.18
10	319° 19.22	314°19.30	5.05	208° 56.03	22.74	247°25.89	1.65	325°56.21	56.64	Aldebaran	290°39.51	$16^{\circ}33.59$
11 12	334°21.68 349°24.15	329°22.76 344°26.22	4.89 \110°4.73	223°58.04 239°0.05	22.61 N25°22.48	262°28.06 277°30.24	1.69 N22°1.73	340°58.39 356°0.57	56.52 \$04°56.40	Rigel	281°3.73	-8°10.48
13	4° 26.61	359°29.68	4.73	254°2.06	22.34	292°32.42	1.77	11°2.75	56.28	Capella	280°21.68	$46^{\circ}1.54$
14	19° 29.07	14°33.15	4.41	269°4.07	22.34	307°34.59	1.77	26°4.92	56.16	Bellatrix	278°22.71	6°22.29
15	34° 31.54		• • 4.24	284°6.07	22.08	322°36.77	. 1.86	41°7.10	56.04	Elnath	278°1.67	28°37.77
16	49° 34.00	44° 40.09	4.07	299°8.08	21.95	337°38.94	1.90	56°9.28	55.92	Alnilam	275°37.56	-1°11.25
17	64° 36.47	59° 43.57	3.90	314° 10.08	21.81	352°41.12	1.94	71°11.46	55.80	Betelgeuse	270°51.88	7°24.65
18	79° 38.93		V11°3.72	329°12.09	N25°21.68	7°43.29	N22°1.98	86°13.64	S04°55.68	Canopus	263°52.19	-52°42.78
19	94°41.39	89°50.53	3.55	344°14.09	21.55	22°45.46	2.02	101°15.82	55.56	Sirius	258°26.00	-16°45.21
20	109°43.86	104°54.02	3.37	359° 16.09	21.41	37°47.64	2.06	116° 18.00	55.43	Adhara	255°5.61	-29°0.57
21	124°46.32		• • 3.18	14° 18.09	21.28	52°49.81	2.10	131°20.18	• • 55.31	Procyon	244°50.50	5°9.54
22	139° 48.79	135°1.00	3.00	29°20.09	21.15	67°51.98	2.14	146°22.36	55.19	Pollux	243°16.91	27°57.94
23	154° 51.25	150°4.49	2.81	44°22.09	21.01	82°54.16	2.18	161°24.54	55.07	Avior	234°14.27	-59°35.60
										Suhail	222°45.87	-43°32.23
Wer.	pass. 12:42	$\nu$ 3.4′ d-0.1′	m-4.45	$\nu$ 2.0′ $d$ -0.	.1′ m-0.02	$\nu$ 2.2′ d0.	0′ m-2.23	$\nu$ 2.2' d-0	.1′ m1.10	Miaplacidus	221°37.55	-69°49.37
										Alphard	217°47.34	-8°46.20
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°33.98	11°50.54
0	169°53.71		√11°2.62	59°24.09	N25°20.88	97°56.33	N22°2.22	176° 26.72	S04°54.95	Dubhe Denebola	193°40.11 182°24.47	61°36.86 14°25.73
1	184°56.18	180°11.49	2.43	74°26.08	20.75	112°58.50	2.27	191°28.90	54.83	Gienah	182°24.47 175°43.13	-17°41.03
2	199°58.64	195°15.00	2.23	89°28.08	20.61	128° 0.67	2.31	206°31.07	54.71		175 43.13 172°59.34	-17 41.03 -63°14.31
3	$215^{\circ}1.11$	210°18.50	• • 2.03	104°30.07	• • 20.48	143°2.84	• • 2.35	221°33.25	• • 54.59	Gacrux	172 59.54 171°50.98	-03 14.31 -57°15.26
4	230°3.57	225°22.01	1.83	119°32.06	20.34	158° 5.01	2.39	236°35.43	54.47	Alioth	166° 12.28	55°49.18
5	245°6.04	240°25.53	1.63	134°34.06	20.21	173°7.19	2.43	251°37.61	54.35	Spica	158°21.88	-11°17.69
6	260°8.50	255°29.04	√11°1.42	149°36.05	N25°20.07	188° 9.36	N22°2.47	266°39.79	S04°54.23	Alkaid	150° 21.86° 152° 51.47	49°10.98
7	$275^{\circ}10.96$	270°32.56	1.21	164°38.04	19.94	203°11.53	2.51	281°41.97	54.11	Hadar	148°35.36	-60°29.57
8	290°13.43	285°36.08	1.00	179°40.03	19.81	218°13.70	2.55	296°44.15	53.99	Menkent	140° 55.30	-36° 29.64
9	$305^{\circ}15.89$	300°39.61	• • 0.79	194°42.01	• • 19.67	233°15.87	• • 2.59	311°46.33	• • 53.87	Arcturus	145°47.53	19°2.84
10	$320^{\circ}18.36$	315°43.14	0.57	209°44.00	19.54	248°18.04	2.64	326°48.51	53.75	Rigil Kent.	139°39.70	-60°56.24
11	335°20.82	330°46.67	0.35	224°45.99	19.40	263°20.20	2.68	341°50.69	53.63	Kochab	137°19.01	74°2.75
12	350°23.28		√11°0.13	239°47.97	N25°19.26	278°22.37	N22°2.72	356°52.87	S04°53.51	Zuben'ubi	136°55.66	-16°8.88
13	5°25.75		10°59.90	254°49.95	19.13	293°24.54	2.76	$11^{\circ}55.05$	53.39	Alphecca	126°3.45	26° 37.49
14	20°28.21	15°57.28	59.67	269°51.94	18.99	308°26.71	2.80	26°57.22	53.27	Antares	112°15.58	-26°29.28
15	35° 30.68		• 59.44	284°53.92	• • 18.86	323°28.88	• • 2.84	41°59.40	• • 53.15	Atria	107°9.65	-69°4.12
16	50° 33.14	46°4.36	59.21	299°55.90	18.72	338°31.05	2.88	57°1.58	53.03	Sabik	102°2.60	-15°45.44
17	65° 35.60	61°7.91	58.98	314°57.88	18.59	353°33.21	2.93	72°3.76	52.90	Shaula	$96^{\circ}10.19$	-37°7.26
18	80°38.07		10°58.74	329°59.86	N25°18.45	8°35.38	N22°2.97	87°5.94	S04°52.78	Rasalhague	95°58.43	12°32.25
19	95° 40.53	91°15.02	58.50	345°1.83	18.31	23°37.55	3.01	102°8.12	52.66	Eltanin	90°42.19	51°28.72
20	110°43.00	106° 18.57	58.25	0°3.81	18.18	38°39.71	3.05	117° 10.30	52.54	Kaus Aust.	83°32.42	$-34^{\circ}22.31$
21	125° 45.46		• 58.01	15°5.79	17.00	53°41.88	• • 3.09	132° 12.48	• • 52.42	Vega	80°33.25	38°48.06
22	140°47.92	136°25.69	57.76	30°7.76	17.90	68°44.05	3.13	147°14.66	52.30	Nunki	75°47.71	$-26^{\circ}15.94$
23	155°50.39	151°29.26	57.51	45°9.73	17.77	83°46.21	3.17	162°16.84	52.18	Altair	62°0.01	8°55.88
Mer.	pass. 12:38	$\nu$ 3.5′ $d$ -0.2′	m-4.40	$\nu 2.0' \ d-0$	.1′ m0.00	$\nu$ 2.2′ d0.	0′ m-2.22	$\nu$ 2.2′ d-0	.1' m $1.10$	Peacock	53°5.88	$-56^{\circ}39.13$
										Deneb	49°26.07	45°21.93
<b>T</b> 1	CIIA	CUA	Da-	CIIA	D	CUA	D	CHA	D	Enif	33°38.95	9°59.26
Thu 0	<b>GHA</b> 170° 52.85	<b>GHA</b> 166°32.83 <b>N</b> 1	<b>Dec</b> 10°57.26	<b>GHA</b> 60°11.71	<b>Dec</b> N25°17.63	<b>GHA</b> 98°48.38	<b>Dec</b> N22°3.22	<b>GHA</b> 177° 19.02	Dec SO4°52.06	Al Na'ir	27°33.13	-46°50.36
1	170 52.85 185°55.32	181°36.40	57.20	75° 13.68	17.49	98 48.38 113°50.54	3.26	177 19.02 192°21.20	51.94	Fomalhaut	15°14.69	-29°29.43
2	200° 57.78	181 36.40 196°39.97	57.00 56.74	75 13.08 90°15.65	17.49 17.35	113 50.54 128°52.71	3.20	207°23.37	51.94	Scheat	13°45.43	28°13.04
3	216°0.24		• 56.48	105° 17.62	17.22	143°54.87	• • 3.34	222°25.55	• 51.70	Markab	13°30.08	15°20.31
4	231°2.71	226°47.13	56.21	105 17.02 120° 19.58	17.22	158°57.04	3.38	237°27.73	51.70	Mar 11 Tue	SHA	Mer.pass
5	246°5.17	241°50.71	55.95	135° 21.55	16.94	173° 59.20	3.42	252°29.91	51.46	Venus	354°50.32	13:02
6	261°7.64		10°55.68		N25°16.80		N22°3.47	267°32.09		Mars	249°41.28	20:03
7	276° 10.10	271°57.88	55.41	165°25.48	16.66	204° 3.53	3.51	282°34.27	51.22	Jupiter	288°9.53	17:29
8	291° 12.56	287°1.47	55.13	180° 27.45	16.53	219° 5.69	3.55	297°36.45	51.10	Saturn	6°39.84	12:16
9	306° 15.03		• 54.85	195°29.41	• • 16.39	234° 7.85	3.59	312°38.63	• • 50.98			
10	321°17.49	317°8.65	54.57	210°31.37	16.25	249°10.02	3.63	327°40.81	50.86	Mar 12 Wed	SHA	Mer.pass
11	336° 19.96	332° 12.25	54.29	225°33.33	16.11	264°12.18	3.67	342°42.99	50.74	Venus	355°14.28	12:56
12	351°22.42		10°54.01	240°35.29	N25°15.97	279°14.34	N22°3.72	357° 45.17	S04°50.62	Mars	249°30.37	20:00
13	$6^{\circ}24.88$	2°19.46	53.72	255°37.25	15.83	294°16.50	3.76	12°47.35	50.50	Jupiter Saturn	288°2.61	17:26
14	$21^{\circ}27.35$	17°23.06	53.43	$270^{\circ}39.21$	15.69	309°18.66	3.80	27°49.52	50.37	Saturn	6°33.00	12:12
15	36° 29.81		• 53.13	285°41.17	•• 15.56	324°20.82	• • 3.84	42°51.70	•• 50.25	Mar 13 Thu	SHA	Mer.pass
16	51°32.28	47°30.28	52.84	$300^{\circ}43.12$	15.42	339°22.98	3.88	57° 53.88	50.13		355°39.97	12:51
17	66°34.74	62°33.89	52.54	315°45.08	15.28	354°25.14	3.93	72°56.06	50.01	Mars	$249^{\circ}18.85$	19:57
18	81°37.20	77°37.51 N1		330°47.03	N25°15.14		N22°3.97	87°58.24	S04°49.89	Jupiter	$287^{\circ}55.52$	17:22
19	96° 39.67	92°41.13	51.94	345°48.99	15.00	24°29.47	4.01	103°0.42	49.77	Saturn	6°26.16	12:09
20	111°42.13	107°44.75	51.63	0°50.94	14.86	39°31.62	4.05	118°2.60	49.65	Haute	ntal parallax	
21	126° 44.60		• 51.32	15°52.89	• • 14.72	54°33.78	• • 4.09	133°4.78	• • 49.53	Horizon	Venus:	0.5
22	141°47.06	137°52.00	51.01	30°54.84	14.58	69°35.94	4.14	148°6.96	49.41		venus: Mars:	0.5
23	156° 49.52	152°55.63	50.70	45°56.79	14.44	84°38.10	4.18	163°9.14	49.29		ividi5.	0.2
Mer.۱	pass. 12:34	$\nu$ 3.6′ d-0.3′	m-4.34	$\nu$ 2.0′ d-0	.1′ m0.03	$\nu$ 2.2′ d0.	0′ m-2.22	$\nu$ 2.2′ d-0	.1' m $1.11$			

011 —	011-010 =	+0.0445 360	Δ. –	-011 -		300	
h	Su	n			Moon		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°29.32	S03°42.01	31°59.64	11.9'	N20°20.66	-11.3'	55.9'
1	192°29.48	41.03	46°30.55	12.0'	20°9.41	-11.3'	55.8'
2	207°29.64 222°29.81	40.05 •• 39.07	61°1.56 75°32.66	12.1' 12.2'	19°58.07 19°46.65	-11.4' -11.5'	55.8' 55.8'
3 4	222 29.81 237°29.97	38.09	90°3.86	12.2	19 40.05 19°35 14	-11.5	55.8'
5	252°30.14	37.10	104°35.15	12.4	19° 23.56	-11.7	55.8'
6	267°30.30	S03°36.12	119°6.54	12.5'	N19°11.89	-11.7'	55.7'
7	282°30.47	35.14	133°38.02	12.6'	19°0.14	-11.8'	55.7'
8	297°30.63	34.16	148°9.59	12.7'	18°48.32	-11.9'	55.7'
9	312°30.80	• • 33.17	162°41.26	12.8'	18°36.41	-12.0'	55.7'
10 11	327°30.97 342°31.13	32.19 31.21	177°13.01 191°44.86	12.8' 12.9'	18°24.43 18°12.38	-12.1' -12.1'	55.7' 55.6'
12	357°31.30	503°30.23	206°16.79	13.0'	N18° 0.25	-12.1	55.6'
13	12°31.46	29.24	220°48.82	13.1'	17°48.06	-12.3'	55.6'
14	27°31.63	28.26	235°20.93	13.2'	17°35.79	-12.3'	55.6'
15	42°31.80	•• 27.28	249°53.13	13.3'	17°23.45	-12.4'	55.6'
16	57°31.96	26.30	264°25.42	13.4'	17°11.04	-12.5'	55.5'
17 18	72°32.13 87°32.30	25.31 \$03°24.33	278°57.79 293°30.24	13.5' 13.5'	16°58.56 N16°46.02	-12.5' -12.6'	55.5' 55.5'
19	102°32.46	23.35	308°2.78	13.6'	16°33.42	-12.7'	55.5'
20	117°32.63	22.36	322°35.41	13.7'	16°20.75	-12.7'	55.5'
21	132°32.80	21.38	337°8.11	13.8'	16°8.02	-12.8'	55.4'
22	147°32.96	20.40	351°40.90	13.9'	15°55.23	-12.9'	55.4'
23	162°33.13	19.41	6°13.77	13.9'	15°42.38	-12.9'	55.4'
	SD = 16.1'	d = -1.0'		SI	O = 15.2'		
Wed 0	<b>GHA</b> 177°33.30	<b>Dec</b> \$03°18.43	<b>GHA</b> 20°46.72	u 14.0'	Dec N15°29.47	d -13.0'	<b>HP</b> 55.4'
1	177 33.30 192°33.47	17.45	35°19.74	14.1'	15° 16.50	-13.0'	55.4'
2	207°33.63	16.46	49°52.85	14.2'	15°3.47	-13.1	55.4'
3	222°33.80	• • 15.48	64°26.03	14.3'	14°50.39	-13.1'	55.3'
4	237°33.97	14.50	78°59.29	14.3'	14°37.26	-13.2'	55.3'
5	252°34.14	13.51	93°32.62	14.4'	14°24.07	-13.2'	55.3'
6 7	267°34.31 282°34.47	S03°12.53 11.55	108°6.02 122°39.50	14.5' 14.6'	N14°10.84 13°57.55	-13.3' -13.3'	55.3' 55.3'
8	297°34.64	10.56	137°13.06	14.6	13°44.21	-13.4'	55.3'
9	312°34.81	• • 9.58	151°46.68	14.7'	13°30.82	-13.4'	55.2'
10	327°34.98	8.59	166°20.37	14.8'	13°17.39	-13.5'	55.2'
11	342°35.15	7.61	180°54.14	14.8'	13°3.91	-13.5'	55.2'
12	357°35.32	\$03°6.63	195°27.97	14.9'	N12°50.38	-13.6'	55.2'
13 14	12°35.49 27°35.66	5.64 4.66	210°1.87 224°35.83	15.0' 15.0'	12°36.81 12°23.20	-13.6' -13.7'	55.2' 55.1'
15	42°35.83	• • 3.67	239°9.86	15.1'	12 23.20 12°9.55	-13.7'	55.1'
16	57°36.00	2.69	253°43.96	15.2'	11°55.85	-13.7'	55.1'
17	72°36.17	1.71	$268^{\circ}18.11$	15.2'	$11^{\circ}42.12$	-13.8'	55.1'
18	87°36.33	503°0.72	282°52.34	15.3'	N11°28.35	-13.8'	55.1'
19	102°36.50	02°59.74	297°26.62		11°14.53		55.1'
20 21	117°36.67 132°36.85	58.75 •• 57.77	312°0.96 326°35.36	15.4' 15.5'	11°0.69 10°46.80	-13.9' -13.9'	55.1' 55.0'
22	147°37.02	56.78	341°9.82	15.5'	10°40.80	-13.9 -14.0'	55.0'
23	162°37.19	55.80	355°44.34	15.6'	10°18.94	-14.0'	55.0'
	SD = 16.1'	d = -1.0'		SI	D = 15.1'		
	<u> </u>	<u>u = 1.0</u>					
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°37.36 192°37.53	\$02°54.81	10°18.91 24°53.54	15.6'	N10°4.95 09°50.94	-14.0'	55.0'
1 2	192°37.53 207°37.70	53.83 52.84	24°53.54 39°28.23	15.7' 15.7'	09°50.94 09°36.89	-14.0' -14.1'	55.0' 55.0'
3	207 37.70 222°37.87	51.86	54°2.96	15.8'	09°30.89	-14.1	54.9'
4	237°38.04	50.87	68°37.75	15.8'	09°8.71	-14.1'	54.9'
5	252°38.21	49.89	83°12.59	15.9'	08°54.58	-14.2'	54.9'
6	267°38.38	S02°48.90	97°47.48	15.9'	N08°40.42	-14.2'	54.9'
7	282°38.55	47.92	112°22.42	16.0'	08°26.24	-14.2'	54.9'
8 9	297°38.72 312°38.90	46.93 •• 45.95	126°57.41 141°32.44	16.0' 16.1'	08°12.03 07°57.80	-14.2' -14.3'	54.9' 54.8'
10	312 38.90 327°39.07	44.96	156°7.52	16.1	07 57.60 07°43.55	-14.3'	54.8'
11	342°39.24	43.98	170°42.65	16.2	07°29.27	-14.3'	54.8'
12	357°39.41	S02°42.99	185°17.81	16.2'	N07°14.98	-14.3'	54.8'
13	12°39.58	42.01	199°53.02	16.3	07°0.66	-14.3'	54.8'
14 15	27°39.76	41.02	214°28.28	16.3'	06°46.33	-14.4'	54.8'
15 16	42°39.93 57°40.10	· · 40.04 39.05	229°3.57 243°38.90	16.3' 16.4'	06°31.97 06°17.60	-14.4' -14.4'	54.8' 54.7'
17	72°40.10	39.05 38.06	243 38.90 258°14.28	16.4	06 17.60 06°3.22	-14.4' -14.4'	54.7'
18	87°40.45	S02°37.08	272°49.69	16.4	N05°48.81	-14.4'	54.7'
19	102°40.62	36.09	287°25.13	16.5'	05°34.40	-14.4'	54.7'
20	117°40.79	35.11	302°0.61	16.5'	05°19.97	-14.4'	54.7'
21	132°40.96	• • 34.12	316°36.13	16.5	05°5.53	-14.5'	54.7'
22	147°41.14	33.14	331°11.68	16.6'	04°51.07	-14.5'	54.7'
23	162°41.31	32.15	345°47.26	16.6'	04°36.61	-14.5'	54.6'
	SD = 16.1'	d = -1.0'		SI	O = 15.0'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	11-13	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	90-98%	
11	10:03	09:55	12:10	22:34	10:11		
12	09:47	09:39	12:10	23:18	10:56		
13	09:31	09:22	12:09	23:58	11:38		

# March 14, 15, 16 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	171°51.99	167°59.26 N10°50.38	60°58.74 N25°14.30	99°40.26 N22°4.22	178°11.32 S04°49.17	
1	186°54.45	183°2.89 50.06	76°0.68 14.16	114°42.42 4.26	193°13.50 49.05	Alpheratz 357°34.99 29°13.69
2	201°56.92	198°6.53 49.74	91°2.63 14.01	129°44.58 4.30	208° 15.67 48.93	Ankaa 353°7.38 -42°10.27
3	216° 59.38	213°10.17 · · 49.41	106°4.57 · · 13.87	144°46.73 · · 4.35	223°17.85 · · 48.81	Schedar 349°31.47 56°40.55
4	232°1.84	228° 13.81 49.09	121°6.52 13.73	159°48.89 4.39	238° 20.03 48.69	Diphda 348°47.45 -17°51.04 Achernar 335°20.52 -57°6.70
5	247°4.31	243°17.45 48.76	136°8.46 13.59	174°51.05 4.43	253°22.21 48.57	Hamal 327°51.31 23°34.87
6	262°6.77	258°21.10 N10°48.43	151°10.40 N25°13.45	189°53.21 N22°4.47	268°24.39 <b>S</b> 04°48.45	Polaris 314°16.13 89°22.48
7	277°9.24	273°24.75 48.09	166°12.34 13.31	204°55.36 4.51	283°26.57 48.33	Acamar 315°11.90 -40°12.43
8	292°11.70	288°28.40 47.75	181°14.28 13.17	219°57.52 4.56	298°28.75 48.21	Menkar 314°6.19 4°11.23
9	307° 14.17 322° 16.63	303°32.05 · · 47.41 318°35.71 47.07	196°16.22 · · 13.03	234°59.67 · · 4.60	313°30.93 · · 48.09 328°33.11 47.97	Mirfak 308°28.32 49°57.17
10 11	337° 19.09	318°35.71 47.07 333°39.37 46.73	211°18.16 12.88 226°20.10 12.74	250° 1.83 4.64 265° 3.99 4.68	328° 33.11 47.97 343° 35.29 47.85	Aldebaran 290°39.53 16°33.58
12	352°21.56	348°43.03 N10°46.38	241°22.03 N25°12.60	280°6.14 N22°4.73	358°37.47 <b>S</b> 04°47.73	Rigel 281°3.75 -8°10.48
13	7°24.02	3°46.69 46.03	256°23.97 12.46	295°8.30 4.77	13°39.65 47.61	Capella 280°21.71 46°1.54
14	22°26.49	18°50.35 45.68	271°25.90 12.31	310°10.45 4.81	28°41.83 47.49	Bellatrix 278°22.73 6°22.29
15	37°28.95	33°54.02 · · 45.32	286°27.84 · · 12.17	325°12.61 · · 4.85	43°44.00 · · 47.37	Elnath 278°1.69 28°37.77 Alnilam 275°37.57 -1°11.25
16	52°31.41	48°57.69 44.96	301°29.77 12.03	340°14.76 4.90	58° 46.18 47.25	Alnilam 275°37.57 -1°11.25 Betelgeuse 270°51.89 7°24.65
17	67°33.88	64°1.36 44.60	316°31.70 11.89	355°16.91 4.94	73°48.36 47.12	Canopus 263°52.22 -52°42.78
18	82°36.34	79°5.04 N10°44.24	331°33.63 N25°11.74	10°19.07 N22°4.98	88°50.54 <b>S</b> 04°47.00	Sirius 258°26.02 -16°45.21
19	97°38.81	94°8.72 43.87	346°35.56 11.60	25°21.22 5.02	103°52.72 46.88	Adhara 255° 5.63 -29° 0.58
20	112°41.27	109°12.40 43.51	1°37.49 11.46	40°23.37 5.07	118°54.90 46.76	Procyon 244°50.52 5°9.54
21 22	127°43.73 142°46.20	124°16.08 · · 43.14 139°19.76 42.76	16°39.41 · · 11.31 31°41.34 · · 11.17	55°25.53 · · 5.11 70°27.68 5.15	133° 57.08 · · 46.64 148° 59.26	Pollux 243°16.93 27°57.94
23	157° 48.66	154°23.45 42.39	31°41.34 11.17 46°43.26 11.03	85°29.83 5.19	148°59.26 46.52 164°1.44 46.40	Avior 234°14.30 -59°35.61
_						Suhail 222°45.88 -43°32.24
Mer	pass. 12:30	$\nu$ 3.6′ <i>d</i> -0.3′ m-4.28	$ u 1.9' \ d$ -0.1' m0.05	$\nu 2.2' \ d0.0' \ \text{m-}2.21$	$ u 2.2' \ d$ -0.1' m1.11	Miaplacidus 221°37.59 -69°49.39
						Alphard 217°47.35 -8°46.20
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.98 11°50.54 Dubhe 193°40.11 61°36.88
0	172°51.13	169°27.13 N10°42.01	61°45.19 N25°10.88	100°31.98 N22°5.24	179°3.62 <b>S</b> 04°46.28	Denebola 182°24.47 14°25.73
1	187°53.59	184°30.83 41.63	76°47.11 10.74	115°34.13 5.28	194°5.80 46.16	Gienah 175°43.12 -17°41.03
2	202°56.05	199°34.52 41.24	91°49.03 10.59	130°36.28 5.32	209°7.98 46.04	Acrux 172°59.33 -63°14.33
3	217° 58.52	214°38.21 · · 40.86	106° 50.96 · · 10.45	145°38.43 · · 5.36	224°10.15 · · 45.92	Gacrux 171°50.97 -57°15.28
4 5	233°0.98 248°3.45	229°41.91 40.47 244°45.61 40.08	121°52.88 10.31 136°54.80 10.16	160°40.59 5.41 175°42.74 5.45	239°12.33 45.80 254°14.51 45.68	Alioth 166°12.26 55°49.19
6	263°5.91	259°49.31 N10°39.68	151°56.71 N25°10.02	175 42.74 5.45 190°44.89 N22°5.49	269°16.69 S04°45.56	Spica 158°21.87 -11°17.70
7	278°8.37	274°53.01 39.29	166°58.63 9.87	205°47.04 5.53	284°18.87 45.44	Alkaid 152°51.45 49°10.99
8	293° 10.84	289°56.72 38.89	182°0.55 9.73	220°49.19 5.58	299°21.05 45.32	Hadar 148°35.34 -60°29.58
9	308°13.30	305°0.43 · · 38.49	197°2.46 •• 9.58	235°51.33 · · 5.62	314°23.23 · · 45.20	Menkent 147°57.16 -36°29.65 Arcturus 145°47.51 19°2.84
10	323° 15.77	320°4.14 38.08	212°4.38 9.44	250°53.48 5.66	329°25.41 45.08	Rigil Kent. 139°39.68 -60°56.26
11	338° 18.23	335°7.85 37.68	227°6.29 9.29	265°55.63 5.70	344°27.59 44.96	Kochab 137°18.96 74°2.76
12	353°20.69	350°11.56 N10°37.27	242°8.20 N25°9.15	280°57.78 N22°5.75	359°29.77 S04°44.84	Zuben'ubi 136°55.65 -16°8.88
13	8°23.16	5°15.28 36.86 20°19.00 36.44	257°10.12 9.00	295°59.93 5.79 311°2.08 5.83	14°31.95 44.72 29°34.13 44.60	Alphecca 126°3.43 26°37.49
14 15	23°25.62 38°28.09	20°19.00 36.44 35°22.72 · · 36.03	272°12.03 8.85 287°13.94 • 8.71	311° 2.08 5.83 326° 4.22 · · 5.87	29°34.13 44.60 44°36.31 • 44.48	Antares 112°15.56 -26°29.28
16	53° 30.55	50°26.44 35.61	302°15.84 8.56	341°6.37 5.92	59°38.49 44.36	Atria 107°9.60 -69°4.12
17	68°33.01	65°30.16 35.19	317°17.75 8.42	356° 8.52 5.96	74°40.66 44.24	Sabik 102°2.58 -15°45.44 Shaula 96°10.17 -37°7.26
18	83°35.48	80°33.89 N10°34.76	332°19.66 N25°8.27	11°10.67 N22°6.00	89°42.84 <b>S</b> 04°44.12	Shaula 96°10.17 -37°7.26 Rasalhague 95°58.41 12°32.25
19	98°37.94	95°37.62 34.34	347°21.56 8.12	26°12.81 6.05	104°45.02 44.00	Eltanin 90°42.16 51°28.72
20	113°40.41	110°41.35 33.91	2°23.47 7.98	41°14.96 6.09	119° 47.20 43.88	Kaus Aust. 83°32.40 -34°22.31
21	128° 42.87	125°45.08 · · 33.48	17°25.37 · · 7.83	56°17.10 · · 6.13	134°49.38 · · 43.76	Vega 80°33.23 38°48.05
22	143°45.33	140°48.81 33.04	32°27.28 7.68	71°19.25 6.18	149°51.56 43.64	Nunki 75°47.69 -26°15.94
23	158°47.80	155°52.55 32.61	47°29.18 7.53	86°21.40 6.22	164°53.74 43.52	Altair 61°59.99 8°55.88
Mer	pass. 12:27	u3.7′ <i>d</i> -0.4′ m-4.22	$\nu 1.9' \; d\text{-}0.1' \; \text{m}0.07$	$\nu 2.2' \ d0.0' \ \text{m-}2.20$	$ u 2.2' \ d  0.1' \ \text{m} 1.11$	Peacock 53°5.85 -56°39.13
						Deneb 49°26.05 45°21.92
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.94 9°59.25 Al Na'ir 27°33.12 -46°50.35
0	173°50.26	170°56.28 N10°32.17	62°31.08 N25°7.39	101°23.54 N22°6.26	179°55.92 <b>S</b> 04°43.40	Al Na'ir 27°33.12 -46°50.35 Fomalhaut 15°14.69 -29°29.42
1	$188^{\circ}52.73$	$186^{\circ}0.02$ $31.72$	77°32.98 7.24	116°25.68 6.30	194°58.10 43.28	Scheat 13°45.43 28°13.03
2	203°55.19	201°3.77 31.28	92°34.88 7.09	131°27.83 6.35	210°0.28 43.16	Markab 13°30.08 15°20.31
3	218° 57.65	216°7.51 · · 30.83	107°36.78 · · 6.94	146°29.97 · · 6.39	225°2.46 · · 43.04	
4	234°0.12	231°11.25 30.39	122°38.67 6.80	161°32.12 6.43	240°4.64 42.92	Mar 14 Fri SHA Mer.pass
5	249°2.58	246°15.00 29.93	137° 40.57 6.65	176°34.26 6.48	255°6.82 42.80	Venus 356°7.27 12:45
6	264°5.05	261°18.75 N10°29.48	152°42.47 N25°6.50	191°36.40 N22°6.52	270°9.00 \$04°42.68	Mars 249°6.75 19:54
7 8	279°7.51 294°9.97	276°22.50 29.02 291°26.25 28.57	167° 44.36 6.35 182° 46.25 6.20	206°38.55 6.56 221°40.69 6.61	285°11.17 42.56 300°13.35 42.44	Jupiter 287°48.27 17:19 Saturn 6°19.33 12:05
9	309° 12.44	306°30.01 · · 28.10	182 46.25 6.20 197°48.15 · · 6.06	236°42.83 · · 6.65	315° 15.53 · · 42.32	
10	324° 14.90	321°33.76 27.64	212°50.04 5.91	251°44.98 6.69	330°17.71 42.20	Mar 15 Sat SHA Mer.pass
11	$339^{\circ}17.37$	336° 37.52 27.17	227°51.93 5.76	266°47.12 6.73	345°19.89 42.08	Venus 356°36.01 12:39
12	354° 19.83	351°41.28 N10°26.71	242°53.82 N25°5.61	281°49.26 N22°6.78	0°22.07 <b>S</b> 04°41.96	Mars 248°54.06 19:50 Jupiter 287°40.86 17:15
13	9°22.29	6°45.04 26.23	257°55.71 5.46	296°51.40 6.82	15°24.25 41.84	Saturn 6°12.49 12:02
14	24°24.76	21°48.80 25.76	272°57.60 5.31	311°53.54 6.86	30°26.43 41.72	
15 16	39° 27.22 54° 29.69	36°52.57 · · 25.29 51°56.33 24.81	287°59.48 · · 5.16 303°1.37 5.01	326°55.68 · · 6.91 341°57.82 6.95	45°28.61 · · 41.60 60°30.79 41.48	Mar 16 Sun SHA Mer.pass
17	69°32.15	67°0.10 24.33	318°3.25 4.86	356°59.96 6.99	75°32.97 41.36	Venus 357° 6.02 12:33 Mars 248° 40.82 19:47
18	84° 34.61	82°3.87 N10°23.84	333°5.14 N25°4.71	12°2.10 N22°7.04	90°35.15 S04°41.24	Jupiter 287°33.28 17:12
19	99°37.08	97°7.64 23.36	348°7.02 4.56	27°4.24 7.08	105°37.33 41.12	Saturn 6°5.66 11:59
20	114°39.54	112°11.42 22.87	3°8.90 4.41	42°6.38 7.12	120°39.51 41.00	
21	129° 42.01	127°15.19 · · 22.38	18°10.78 · · 4.26	57°8.52 · · 7.17	135°41.69 · · 40.88	Horizontal parallax
22	144° 44.47	142°18.97 21.89	33°12.66 4.11	72°10.66 7.21	150° 43.87 40.76	Venus: 0.5 Mars: 0.1
23	159°46.93	157°22.74 21.39	48°14.54 3.96	87°12.80 7.25	165°46.05 40.64	171013. 0.1
Mer	pass. 12:23	ν3.7' d-0.4' m-4.16	ν1.9' d-0.1' m0.10	ν2.1' d0.0' m-2.20	ν2.2' d-0.1' m1.12	

h	Su	n	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	177° 41.48	S02°31.16	0°22.87	16.6'	N04°22.14	-14.5'	54.6'	
1	192°41.66 207°41.83	30.18 29.19	14°58.52 29°34.19	16.7'	04°7.65 03°53.16	-14.5' -14.5'	54.6'	
2	207 41.83 222° 42.00	. 28.21	29 34.19 44°9.89	16.7' 16.7'	03°38.66	-14.5'	54.6' 54.6'	
4	237° 42.18	27.22	58° 45.62	16.8'	03°24.16	-14.5'	54.6'	
5	252° 42.35	26.23	73°21.37	16.8'	03°9.65	-14.5'	54.6'	
6	267° 42.53 282° 42.70	\$02°25.25 24.26	87°57.15 102°32.95	16.8' 16.8'	N02°55.13 02°40.62	-14.5' -14.5'	54.6' 54.5'	
7 8	282 42.70 297° 42.87	24.20	102 32.95 117°8.77	16.8	02 40.62 02°26.09	-14.5'	54.5'	
9	312° 43.05	22.29	131° 44.62	16.9'	02°11.57	-14.5'	54.5'	
10	327° 43.22	21.30	146°20.49	16.9'	01°57.05	-14.5'	54.5'	
11 12	342°43.40 357°43.57	20.32 \$02°19.33	160° 56.38 175° 32.28	16.9' 16.9'	01°42.52 N01°28.00	-14.5' -14.5'	54.5' 54.5'	
13	12° 43.75	18.34	175 32.28 190°8.21	16.9	01°13.47	-14.5'	54.5'	
14	27° 43.92	17.36	204°44.15	17.0'	00°58.95	-14.5'	54.5'	
15	42°44.10	• • 16.37	219°20.11	17.0'	00°44.43	-14.5'	54.4'	
16 17	57° 44.27 72° 44.45	15.38 14.40	233°56.08 248°32.06	17.0' 17.0'	00°29.92 00°15.41	-14.5' -14.5'	54.4' 54.4'	
18	87° 44.62	502°13.41	263°8.06	17.0'	N00°0.91	-14.5'	54.4	
19	102° 44.80	12.42	277° 44.07	17.0'	S00°13.59	14.5'	54.4'	
20	117° 44.97	11.44	292°20.09	17.0'	00°28.08	14.5'	54.4'	
21 22	132° 45.15 147° 45.32	· · 10.45 9.46	306°56.12 321°32.16	17.0' 17.0'	00°42.57 00°57.04	14.5'	54.4'	
23	147 45.32 162° 45.50	9.46 8.48	321 32.10 336°8.20	17.0 17.1'	00 57.04 01°11.51	14.5' 14.5'	54.4' 54.4'	
_	SD = 16.1'	d = -1.0'			D = 14.9'			
				3D = 14.9				
Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	177° 45.67 192° 45.85	S02°7.49 6.50	350° 44.25 5° 20.31	17.1' 17.1'	\$01°25.96 01°40.41	14.4'	54.3'	
1 2	192°45.85 207°46.03	6.50 5.51	5°20.31 19°56.37	17.1' 17.1'	01°40.41 01°54.84	14.4' 14.4'	54.3' 54.3'	
3	222° 46.20	• • 4.53	34°32.44	17.1'	02°9.26	14.4'	54.3'	
4	237° 46.38	3.54	49°8.50	17.1'	02°23.66	14.4'	54.3'	
5 6	252° 46.55 267° 46.73	2.55 \$02°1.57	63°44.57 78°20.64	17.1' 17.1'	02°38.06 502°52.43	14.4' 14.4'	54.3' 54.3'	
7	282°46.91	02° 0.58	92°56.71	17.1	03°6.79	14.4	54.3	
8	297° 47.08	01°59.59	107°32.78	17.1'	03°21.14	14.3'	54.3'	
9	312° 47.26	• • 58.60	122°8.84	17.1'	03°35.46	14.3'	54.3'	
10 11	327°47.44 342°47.61	57.62 56.63	136°44.90 151°20.96	17.1' 17.1'	03°49.77 04°4.06	14.3' 14.3'	54.2' 54.2'	
12	357° 47.79	50.03 S01°55.64	165°57.01	17.1	S04°18.33	14.2	54.2	
13	12° 47.97	54.66	180°33.05	17.0'	04°32.58	14.2'	54.2'	
14	27° 48.15	53.67	195°9.09	17.0'	04°46.81	14.2'	54.2'	
15 16	42° 48.32 57° 48.50	· · 52.68 51.69	209°45.11 224°21.13	17.0' 17.0'	05°1.02 05°15.20	14.2' 14.2'	54.2' 54.2'	
17	72°48.68	50.71	238°57.14	17.0'	05°29.36	14.1'	54.2'	
18	87° 48.86	S01°49.72	253°33.14	17.0'	S05°43.50	14.1'	54.2'	
19	102°49.03	48.73	268°9.12	17.0'	05°57.61	14.1'	54.2' 54.2'	
20 21	117°49.21 132°49.39	47.74 •• 46.76	282°45.09 297°21.04	16.9	06°11.69 06°25.75	14.1' 14.0'	54.2' 54.2'	
22	147° 49.57	45.77	311°56.98	16.9'	06°39.78	14.0'	54.1'	
23	162°49.74	44.78	$326^{\circ}32.91$	16.9'	$06^{\circ}53.78$	14.0'	54.1'	
	SD = 16.1'	d = -1.0'		SI	D = 14.8'			
•						,		
Sun 0	<b>GHA</b> 177° 49.92	<b>Dec</b> \$01°43.79	<b>GHA</b> 341°8.81	u 16.9'	<b>Dec</b> \$07°7.75	d 13.9'	<b>HP</b> 54.1'	
1	177 49.92 192°50.10	42.81	355° 44.70	16.9	07°21.69	13.9'	54.1'	
2	207° 50.28	41.82	10°20.57	16.8'	07°35.61	13.9'	54.1'	
3	222°50.46 237°50.64	• • 40.83	24°56.42 39°32.24	16.8' 16.8'	07°49.49 08°3.34	13.8' 13.8'	54.1' 54.1'	
4 5	252° 50.64	39.84 38.85	39°32.24 54°8.05	16.8	08° 3.34 08° 17.15	13.8'	54.1' 54.1'	
6	267° 50.99	S01°37.87	68°43.83	16.8	S08°30.94	13.7'	54.1'	
7	282°51.17	36.88	83°19.59	16.7'	08°44.68	13.7'	54.1'	
8 9	297°51.35 312°51.53	35.89 •• 34.90	97°55.32 112°31.03	16.7' 16.7'	08°58.40 09°12.07	13.7' 13.6'	54.1' 54.1'	
10	312°51.53 327°51.71	33.92	112°31.03 127°6.71	16.7	09°12.07 09°25.71	13.6'	54.1' 54.1'	
11	342°51.89	32.93	141°42.36	16.6'	09°39.32	13.6'	54.1'	
12	357° 52.07	S01°31.94	156° 17.98	16.6'	S09°52.88	13.5'	54.1'	
13 14	12° 52.25 27° 52.43	30.95 29.96	170°53.58 185°29.14	16.6' 16.5'	10°6.40 10°19.89	13.5' 13.4'	54.1' 54.0'	
14 15	42° 52.43	29.96	185° 29.14 200° 4.67	16.5'	10°19.89 10°33.33	13.4'	54.0'	
16	57° 52.78	27.99	$214^{\circ}40.17$	16.5'	$10^{\circ}46.74$	13.4'	54.0'	
17	72°52.96	27.00	229°15.63	16.4	11°0.10	13.3'	54.0'	
18 19	87°53.14 102°53.32	\$01°26.01 25.02	243°51.06 258°26.46	16.4' 16.4'	\$11°13.42 11°26.69	13.3' 13.2'	54.0' 54.0'	
20	102 53.32 117°53.50	25.02 24.04	258 20.40 273°1.82	16.4	11 20.09 11°39.92	13.2'	54.0'	
21	132° 53.68	• • 23.05	287°37.14	16.3'	11°53.11	13.1'	54.0'	
22	147°53.86	22.06	302°12.43	16.2'	12°6.24	13.1'	54.0'	
23	162°54.04	21.07	316°47.67	16.2'	12°19.34	13.0'	54.0'	
	SD = 16.1'	d = -1.0'		SI	D = 14.8'			

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

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

		Sun	Sun Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%
14	09:14	09:06	12:09	-:-	12:18	
15	08:57	08:49	12:09	00:38	12:58	
16	08:40	08:32	12:09	01:17	13:37	

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	174°49.40	172°26.52 N10°20.89	63°16.42 N25°3.81	102°14.94 N22°7.30	180°48.22
1	189°51.86	187°30.30 20.39	78° 18.30 3.66	117°17.08 7.34	195°50.40 40.40
2	204°54.33	202°34.08 19.89	93°20.18 3.51	132°19.22 7.38	210°52.58 40.28
3	219°56.79	217°37.87 · · 19.39	108°22.05 · · 3.36	147°21.35 · · 7.43	225°54.76 · · 40.16
4	234° 59.26	232°41.65 18.88	123°23.93 3.21	162°23.49 7.47	240°56.94 40.04
5	250°1.72	247°45.44 18.37	138°25.80 3.06	177°25.63 7.51	255°59.12 39.92
6	265°4.18	262°49.23 N10°17.86	153°27.67 N25°2.90	192°27.76 N22°7.56	271°1.30 S04°39.80
7	280°6.65	277°53.02 17.34	168° 29.54 2.75	207°29.90 7.60	286°3.48 39.68
8	295°9.11	292°56.81 16.83	183°31.42 2.60	222°32.04 7.64	301°5.66 39.56
9	310° 11.58	308°0.60 · · 16.31	198°33.29 · · 2.45	237°34.17 · · 7.69	316°7.84 · · 39.44
10	325° 14.04	323°4.40 15.78	213°35.16 2.30	252°36.31 7.73	331°10.02 39.32
11	340° 16.50	338°8.19 15.26	228° 37.02 2.14	267°38.44 7.78	346°12.20 39.20
12	355° 18.97	353°11.99 N10°14.73	243°38.89 N25°1.99	282°40.58 N22°7.82	1°14.38 <b>S</b> 04°39.08
13	10°21.43	8° 15.79 14.21	258°40.76 1.84	297°42.71 7.86	16°16.56 38.96
14	25°23.90	23°19.58 13.68	273°42.62 1.69	312°44.85 7.91	31°18.74 38.84
15	40°26.36	38°23.39 · · 13.14	288°44.49 · · 1.53	327°46.98 · · 7.95	46°20.92 · · 38.72
16	55°28.82	53°27.19 12.61	303°46.35 1.38	342°49.12 7.99	61°23.10 38.60
17	70°31.29	68°30.99 12.07	318° 48.21 1.23	357°51.25 8.04	76°25.28 38.48
18	85°33.75	83°34.80 N10°11.53	333°50.08 N25°1.08	12°53.39 N22°8.08	91°27.46 \$04°38.36
19	100°36.22	98°38.60 10.99	348° 51.94 0.92	27°55.52 8.12	106°29.64 38.24
20	115°38.68	113°42.41 10.44	3°53.80 0.77	42°57.65 8.17	121°31.82 38.12
21	130°41.14	128°46.22 · · 9.89	18°55.66 · · 0.62	57°59.78 · · 8.21	136°34.00 · · 38.00
22	145°43.61	143°50.03 9.34	33°57.51 0.46	73°1.92 8.26	151°36.17 37.88
23	160° 46.07	158°53.84 8.79	48°59.37 0.31	88° 4.05 8.30	166°38.35 37.76
	pass. 12:19	$\frac{150^{\circ} 55.64^{\circ} 0.79^{\circ}}{\nu 3.8' \ d - 0.5' \ m - 4.09}$	$\frac{1.9' \text{ d-0.2' m0.12}}{\nu 1.9' \text{ d-0.2' m0.12}}$	$\frac{0.95}{\nu^2.1' d0.0' \text{ m-}2.19}$	$\nu$ 2.2' d-0.1' m1.12
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	175°48.54	173°57.65 N10°8.24	64°1.23 N25°0.15	103°6.18 N22°8.34	181°40.53 <b>S</b> 04°37.64
1	190°51.00	189°1.46 7.68	79°3.08 25°0.00	118° 8.31 8.39	196°42.71 37.52
2	205°53.46	204°5.28 7.12	94°4.94 24°59.85	133°10.44 8.43	211°44.89 37.40
3	220°55.93	219°9.09 · · 6.56	109°6.79 · · 59.69	148°12.58 · · 8.47	226°47.07 · · 37.28
4	235°58.39	234°12.91 6.00	124°8.64 59.54	163°14.71 8.52	241°49.25 37.16
5	251°0.86	249°16.73 5.43	139° 10.50 59.38	178°16.84 8.56	256°51.43 37.04
6	266°3.32	264°20.55 N10°4.87	154°12.35 N24°59.23	193°18.97 N22°8.61	271°53.61 <b>S</b> 04°36.92
7	281°5.78	279°24.37 4.30	169° 14.20 59.07	208°21.10 8.65	286°55.79 36.80
8	296°8.25	294°28.19 3.72	184° 16.05 58.92	223°23.23 8.69	301°57.97 36.68
9	311° 10.71	309°32.01 · · 3.15	199° 17.89 · · 58.76	238°25.36 · · 8.74	317°0.15 · · 36.56
10	326° 13.18	324°35.83 2.57	214° 19.74 58.61	253°27.49 8.78	332°2.33 36.44
11	341°15.64	339°39.66 1.99	229° 21.59 58.45	268°29.61 8.83	347°4.51 36.32
12	356° 18.11	354°43.48 N10°1.41	244°23.43 N24°58.29	283°31.74 N22°8.87	2°6.69 \$04°36.20
13	11°20.57	9°47.31 0.83	259°25.28 58.14	298°33.87 8.91	17°8.87 36.08
14	26°23.03	24°51.13 10°0.24	274°27.12 57.98	313°36.00 8.96	32°11.05 35.96
15	41°25.50	39°54.96 09°59.66	289°28.96 · · 57.83	328°38.13 · · 9.00	47°13.23 · · 35.84
16	56°27.96	54°58.79 59.07	304°30.81 57.67	343°40.26 9.05	62°15.41 35.72
17	71°30.43	70°2.62 58.47	319°32.65 57.51	358°42.38 9.09	77°17.59 35.60
18	86°32.89	85°6.45 N09°57.88	334°34.49 N24°57.36	13°44.51 N22°9.13	92°19.77 \$04°35.48
19	101°35.35	100°10.28 57.28	349°36.33 57.20	28°46.64 9.18	107°21.95 35.36
	101 35.35 116° 37.82		4°38.17 57.04	43°48.76 9.22	122°24.13 35.24
20 21	131° 40.28	115°14.12 56.68 130°17.95 · · 56.08	19°40.00 · · 56.89	58°50.89 · · 9.27	137°26.31 · · 35.12
22	131 40.28 146° 42.75	145°21.78 55.48	34°41.84 56.73	73°53.02 9.31	152°28.49 35.00
	140 42.75 161°45.21				
23		160°25.62 54.87	49°43.67 56.57		167°30.67 34.88
Mer.p	pass. 12:15	ν3.8' d-0.6' m-4.04	ν1.9' d-0.2' m0.14	ν2.1' d0.0' m-2.19	ν2.2' d-0.1' m1.12
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	$176^{\circ}47.67$	175°29.46 N09°54.27	64°45.51 N24°56.41	103°57.27 N22°9.40	182°32.85 <b>S</b> 04°34.76
1	191°50.14	190°33.29 53.66	79° 47.34 56.26	118°59.39 9.44	197°35.03 34.64
2	206° 52.60	205°37.13 53.05	94°49.18 56.10	134° 1.52 9.49	212°37.21 34.52
3	221°55.07	220°40.97 · · 52.43	109°51.01 · · 55.94	149° 3.64 · · 9.53	227°39.39 · · 34.40
4	236° 57.53	235°44.81 51.82	124°52.84 55.78	164° 5.77 9.57	242°41.57 34.29
5	252°0.00	250°48.65 51.20	139° 54.67 55.62	179°7.89 9.62	257°43.75 34.17
6	267°2.46	265°52.49 N09°50.58	154°56.50 N24°55.47	194°10.01 N22°9.66	272°45.93 \$04°34.05
7	282°4.92	280°56.33 49.95	169°58.33 55.31	209°12.14 9.71	287°48.11 33.93
8	297°7.39	296°0.17 49.33	185°0.16 55.15	224°14.26 9.75	302°50.29 33.81
9	312°9.85	311°4.01 · · 48.70	200°1.98 · · 54.99	239°16.38 · · 9.80	317°52.47 · · 33.69
10	327° 12.32	326°7.86 48.07	215°3.81 54.83	254°18.51 9.84	332°54.65 33.57
11	342° 14.78	341°11.70 47.44	230°5.63 54.67	269°20.63 9.88	347°56.83 33.45
12	357° 17.24	356°15.54 N09°46.81	245°7.46 N24°54.51	284°22.75 N22°9.93	2°59.01 \$04°33.33
13	12° 19.71	11°19.39 46.18	260°9.28 54.35	299°24.87 9.97	18°1.19 33.21
14	27°22.17	26°23.24 45.54	275°11.10 54.20	314°27.00 10.02	33°3.37 33.09
15	42°24.64	41°27.08 · · 44.90	290°12.93 · · 54.04	329°29.12 · · 10.06	48°5.55 · · 32.97
16	57°27.10	56°30.93 44.26	305°14.75 53.88	344°31.24 10.11	63°7.73 32.85
17	72°29.56	71°34.78 43.61	320°16.57 53.72	359°33.36 10.15	78°9.91 32.73
18	87°32.03	86°38.62 N09°42.97	335°18.39 N24°53.56	14°35.48 N22°10.19	93°12.09 \$04°32.61
19	102°34.49	101°42.47 42.32	350°20.20 53.40	29°37.60 10.24	108°14.27 32.49
20	117°36.96	116° 46.32 41.67	5°22.02 53.24	44°39.72 10.28	123°16.45 32.37
21	132°39.42	131°50.17 · · 41.02	20°23.84 · · 53.07	59°41.84 · · 10.33	138°18.63 · · 32.25
22	132 39.42 147°41.89	146°54.02 40.37	35°25.65 52.91	74°43.96 10.37	153°20.81 32.13
23	162° 44.35	161°57.87 39.71	50°27.47 52.75	89°46.08 10.42	168°22.99 32.01
Mer.p	ass. 12:11	u3.8′ <i>d</i> -0.6′ m-4.13	$\nu 1.8' \ d$ -0.2' m0.17	$ u 2.1' \ d0.0' \ \text{m-}2.18$	$ u 2.2' \ d$ -0.1' m1.13

Stars SHA

357°34.99 353°7.38

349°31 47

348°47.45

 $335^{\circ}20.54$ 

Alpheratz

Ankaa Schedar

Diphda Achernar **Dec** 29° 13.68

-42°10.26

56° 40.53 -17° 51.04

-57°6.69

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h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°54.22	S01°20.08	331°22.88	16.2'	S12°32.38	13.0'	54.0'
1	192°54.40	19.10	345°58.04	16.1'	12°45.38	12.9'	54.0'
2 3	207°54.58 222°54.76	18.11 •• 17.12	0°33.17 15°8.25	16.1' 16.0'	12°58.32 13°11.22	12.9' 12.8'	54.0' 54.0'
4	237°54.94	16.13	29° 43.29	16.0'	13°24.06	12.8'	54.0'
5	252°55.12	15.14	44° 18.28	15.9'	$13^{\circ}36.86$	12.7'	54.0'
6	267°55.31	S01°14.16	58°53.23	15.9'	\$13°49.60	12.7'	54.0'
7 8	282°55.49 297°55.67	13.17 12.18	73°28.14 88°3.00	15.9' 15.8'	14°2.29 14°14.92	12.6' 12.6'	54.0' 54.0'
9	312°55.85	. 11.19	102°37.81	15.8'	14°27.50	12.5'	54.0'
10	327°56.03	10.20	$117^{\circ}12.57$	15.7'	$14^{\circ}40.02$	12.5'	54.0'
11	342°56.21	9.21 \$01°8.23	131° 47.28	15.7' 15.6'	14°52.49	12.4'	54.0'
12 13	357°56.39 12°56.57	7.24	146°21.95 160°56.56	15.6'	\$15°4.90 15°17.25	12.4' 12.3'	54.0' 54.0'
14	27°56.75	6.25	175°31.12	15.5'	15°29.55	12.2'	54.0'
15	42°56.93	• • 5.26	190°5.63	15.5'	15°41.78	12.2'	54.0'
16	57°57.12	4.27	204°40.08 219°14.49	15.4'	15°53.95 16°6.06	12.1'	54.0'
17 18	72°57.30 87°57.48	3.28 S01°2.30	219° 14.49 233° 48.83	15.3' 15.3'	S16° 18.11	12.0' 12.0'	54.0' 54.0'
19	102°57.66	1.31	248°23.12	15.2'	16°30.10	11.9'	54.0'
20	117°57.84	$01^{\circ}0.32$	262°57.36	15.2'	$16^{\circ}42.02$	11.9'	54.0'
21	132°58.02	00°59.33	277°31.54	15.1'	16°53.88	11.8'	54.0'
22 23	147°58.20 162°58.39	58.34 57.35	292°5.66 306°39.72	15.1' 15.0'	17°5.67 17°17.40	11.7' 11.7'	54.0' 54.0'
23	SD = 16.1'		- 330 33.12		0 = 14.7'	11.1	37.0
	שט = 10.1′	d = -1.0'		5L	) = 14. <i>l</i> ′		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	177°58.57	S00°56.37	321°13.73	14.9'	S17°29.06	11.6'	54.0'
1	192°58.75 207°58.93	55.38 54.39	335°47.67 350°21.55	14.9' 14.8'	17° 40.65 17° 52.17	11.5' 11.5'	54.0' 54.0'
2	207 58.93 222°59.11	54.39	4°55.38	14.8'	17°52.17 18°3.62	11.5	54.0'
4	237°59.30	52.41	19°29.14	14.7'	18° 15.00	11.3'	54.0'
5	252°59.48	51.42	34°2.84	14.6'	$18^{\circ}26.31$	11.2'	54.0'
6	267°59.66 282°59.84	500° 50.44	48°36.47 63°10.04	14.6'	\$18° 37.55 18° 48.71	11.2'	54.0'
7 8	282°59.84 298°0.03	49.45 48.46	77° 43.55	14.5' 14.4'	18° 48.71 18° 59.80	11.1' 11.0'	54.0' 54.0'
9	313°0.21	• • 47.47	92° 16.99	14.4'	19° 10.82	10.9'	54.0'
10	328°0.39	46.48	106° 50.36	14.3'	19°21.76	10.9'	54.0'
11	343°0.57 358°0.76	45.49	121°23.67 135°56.92	14.2'	19°32.62 \$19°43.41	10.8'	54.0'
12 13	358° 0.76 13° 0.94	\$00° 44.51 43.52	135°56.92 150°30.09	14.2' 14.1'	19°54.12	10.7' 10.6'	54.0' 54.0'
14	28°1.12	42.53	165°3.20	14.0'	20°4.75	10.5	54.0'
15	43°1.31	• • 41.54	179°36.23	14.0'	20° 15.29	10.5'	54.0'
16	58°1.49 73°1.67	40.55 39.56	194°9.20 208°42.10	13.9' 13.8'	20°25.76 20°36.15	10.4'	54.0' 54.0'
17 18	88°1.86	500°38.58	208 42.10 223°14.93	13.8'	20°36.15 \$20°46.45	10.3' 10.2'	54.0'
19	103°2.04	37.59	237° 47.69	13.7'	20°56.67	10.1'	54.1'
20	118°2.22	36.60	252° 20.37	10.0	21°6.80	10.0'	54.1'
21 22	133°2.40 148°2.59	· · 35.61 34.62	266° 52.99 281° 25.53	13.5' 13.5'	21°16.85 21°26.81	10.0' 9.9'	54.1' 54.1'
23	163°2.77	33.63	201 25.55 295°58.00	13.4	21°26.61 21°36.69	9.9 9.8'	54.1'
	SD = 16.1'	d = -1.0'			0 = 14.7'		
	JD — 10.1	u = -1.0		JL.	· = 14.7		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°2.96	S00°32.65	310°30.40 325°2.72	13.3'	\$21°46.47 21°56.17	9.7'	54.1'
1 2	193°3.14 208°3.32	31.66 30.67	325°2.72 339°34.97	13.2' 13.2'	21°56.17 22°5.78	9.6' 9.5'	54.1' 54.1'
3	223°3.51	• • 29.68	354°7.15	13.1'	22° 15.29	9.4	54.1'
4	238°3.69	28.69	8°39.25	13.0'	22°24.72	9.3'	54.1'
5 6	253°3.87 268°4.06	27.70 \$00°26.72	23°11.28 37°43.23	13.0' 12.9'	22°34.05 522°43.29	9.2' 9.1'	54.1' 54.1'
7	283°4.24	25.73	52° 15.10	12.9	22° 52.43	9.1	54.1'
8	298°4.43	24.74	66°46.90	12.7'	23°1.48	9.0'	54.2
9	313°4.61	• • 23.75	81° 18.63	12.6'	23° 10.43	8.9'	54.2'
10 11	328°4.79 343°4.98	22.76 21.77	95°50.27 110°21.85	12.6' 12.5'	23°19.29 23°28.04	8.8' 8.7'	54.2' 54.2'
12	343 4.98 358°5.16	\$00°20.79	110 21.85 124°53.34	12.5	\$23°36.70	8.6	54.2
13	13°5.35	19.80	139°24.76	12.3'	$23^{\circ}45.26$	8.5'	54.2'
14	28°5.53	18.81	153° 56.10	12.3'	23°53.71	8.4'	54.2'
15 16	43°5.71 58°5.90	· · 17.82 16.83	168° 27.36 182° 58.55	12.2' 12.1'	24°2.07 24°10.32	8.3' 8.1'	54.2' 54.2'
17	73°6.08	15.84	102 30.33 197°29.65	12.1	24 10.32 24° 18.46	8.0'	54.2'
18	88°6.27	S00°14.86	212°0.68	12.0'	S24°26.50	7.9'	54.3'
19	103°6.45	13.87	226° 31.64	11.9'	24° 34.44	7.8'	54.3'
20 21	118°6.64 133°6.82	12.88 •• 11.89	241°2.51 255°33.31	11.8' 11.7'	24° 42.27 24° 49.99	7.7' 7.6'	54.3' 54.3'
22	133 0.82 148°7.01	10.90	255 33.31 270°4.03	11.7 11.6'	24 49.99 24°57.61	7.6 7.5'	54.3'
23	163°7.19	9.92	284°34.67	11.6'	25°5.11	7.4'	54.3'
	SD = 16.1'	d = -1.0'		SE	0 = 14.8'		
					-		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-81%	
17	08:23	08:14	12:08	01:58	14:18		
18	08:06	07:57	12:08	02:40	15:02		
19	07:48	07:39	12:08	03:24	15:48		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	177° 46.81	177°1.72 N09°39.05	65°29.28 N24°52.59	104°48.20 N22°10.46	183°25.17 <b>S</b> 04°31.89	
1	192°49.28	192°5.57 38.39	80°31.09 52.43	119°50.32 10.51	198°27.35 31.77	Alpheratz 357°34.99 29°13.67
2	207°51.74	207°9.42 37.73	95°32.91 52.27	134°52.44 10.55	213°29.53 31.65	Ankaa 353°7.38 -42°10.25
3	222°54.21	222°13.28 · · 37.07	110°34.72 · · 52.11	149°54.55 · · 10.60	228°31.71 · · 31.54	Schedar 349°31.47 56°40.52
4	$237^{\circ}56.67$	237° 17.13 36.40	125°36.53 51.95	164°56.67 10.64	243°33.89 31.42	Diphda 348°47.45 -17°51.03 Achernar 335°20.55 -57°6.68
5	$252^{\circ}59.13$	252°20.98 35.74	140°38.34 51.79	179°58.79 10.68	258°36.07 31.30	Achernar 335°20.55 -57°6.68 Hamal 327°51.32 23°34.86
6	268°1.60	267°24.83 N09°35.07	155°40.14 N24°51.62	195°0.91 N22°10.73	273°38.25 \$04°31.18	Polaris 314°18.12 89°22.45
7	283°4.06	282°28.69 34.40	170°41.95 51.46	210° 3.02 10.77	288°40.43 31.06	Acamar 315°11.93 -40°12.41
8	298°6.53	297°32.54 33.72	185° 43.76 51.30	225°5.14 10.82	303°42.61 30.94	Menkar 314°6.20 4°11.23
9	313°8.99	312°36.39 · · 33.05	200°45.57 · · 51.14	240°7.26 · · 10.86	318°44.79 · · 30.82	Mirfak 308°28.35 49°57.15
10 11	328° 11.45 343° 13.92	327° 40.25 32.37 342° 44.10 31.69	215° 47.37 50.98 230° 49.17 50.81	255° 9.37 10.91 270° 11.49 10.95	333°46.97 30.70 348°49.15 30.58	Aldebaran 290°39.56 16°33.58
12	358° 16.38	357°47.96 N09°31.01	245°50.98 N24°50.65	285°13.61 N22°11.00	3°51.33 \$04°30.46	Rigel 281°3.78 -8°10.48
13	13° 18.85	12°51.81 30.33	260° 52.78 50.49	300°15.72 11.04	18°53.51 30.34	Capella 280°21.75 46°1.53
14	28° 21.31	27°55.67 29.64	275° 54.58 50.33	315°17.84 11.09	33°55.69 30.22	Bellatrix 278°22.76 6°22.29
15	43°23.78	42°59.52 · · 28.95	290°56.38 · · 50.16	330°19.95 · · 11.13	48°57.87 · · 30.10	Elnath 278°1.72 28°37.77
16	58°26.24	58°3.38 28.26	305°58.18 50.00	345°22.07 11.18	64°0.05 29.98	Alnilam 275°37.60 -1°11.25
17	73°28.70	73°7.23 27.57	320°59.98 49.84	0°24.18 11.22	79°2.23 29.86	Betelgeuse 270°51.92 7°24.65 Canopus 263°52.28 -52°42.79
18	88°31.17	88°11.09 N09°26.88	336°1.78 N24°49.67	15°26.30 N22°11.26	94°4.41 <b>S</b> 04°29.74	Sirius 258°26.05 -16°45.21
19	103°33.63	103°14.94 26.19	351°3.58 49.51	30°28.41 11.31	109°6.59 29.63	Adhara 255°5.66 -29°0.59
20	118°36.10	118°18.80 25.49	6°5.37 49.35	45°30.52 11.35	124°8.77 29.51	Procyon 244°50.54 5°9.54
21	133° 38.56	133°22.65 · · 24.79	21°7.17 · · 49.18	60°32.64 · · 11.40	139°10.95 · · 29.39	Pollux 243°16.96 27°57.94
22 23	148° 41.02 163° 43.49	148°26.51 24.09 163°30.37 23.39	36°8.96 49.02 51°10.76 48.85	75°34.75 11.44 90°36.86 11.49	154°13.14 29.27 169°15.32 29.15	Avior 234°14.35 -59°35.64
23	103 43.49	163°30.37 23.39				Suhail 222°45.91 -43°32.26
Mer.	pass. 12:07	u3.9 $'$ <i>d</i> -0.7 $'$ m-4.18	$ u 1.8' \ d$ -0.2' m0.19	$ u 2.1' \ d0.0' \ \text{m-}2.17$	$ u 2.2' \ d$ -0.1' m1.13	Miaplacidus 221°37.64 -69°49.42
						Alphard 217°47.36 -8°46.21
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.99 11°50.55
0	178°45.95	178°34.22 N09°22.69	66°12.55 N24°48.69	105°38.98 N22°11.53	184°17.50 <b>S</b> 04°29.03	Dubhe 193°40.13 61°36.90 Denebola 182°24.46 14°25.73
1	193°48.42	193°38.08 21.98	81°14.34 48.52	120°41.09 11.58	199°19.68 28.91	Gienah 175°43.11 -17°41.05
2	208° 50.88	208°41.93 21.27	96°16.14 48.36	135°43.20 11.62	214°21.86 28.79	Acrux 172°59.30 -63°14.36
3	223°53.35	223°45.79 · · 20.56	111°17.93 · · 48.19	150°45.31 · · 11.67	229°24.04 · · 28.67	Gacrux 171°50.95 -57°15.31
4	238° 55.81	238°49.65 19.85	126°19.72 48.03	165°47.43 11.71	244°26.22 28.55	Alioth 166°12.25 55°49.22
5	253° 58.27	253°53.50 19.14	141°21.51 47.86	180°49.54 11.76	259°28.40 28.43	Spica 158°21.85 -11°17.70
6 7	269°0.74 284°3.20	268°57.36 N09°18.43 284°1.21 17.71	156°23.29 N24°47.70 171°25.08 47.53	195°51.65 N22°11.80 210°53.76 11.85	274°30.58 S04°28.31 289°32.76 28.19	Alkaid 152°51.42 49°11.01
8	299°5.67	284°1.21 17.71 299°5.07 16.99	186°26.87 47.37	210°53.76 11.85 225°55.87 11.89	304°34.94 28.08	Hadar 148°35.29 -60°29.61
9	314°8.13	314°8.92 · · 16.27	201°28.65 · · 47.20	240°57.98 ·· 11.94	319°37.12 · · 27.96	Menkent 147°57.12 -36°29.67
10	329° 10.59	329°12.78 15.55	216° 30.44 47.04	256°0.09 11.98	334°39.30 27.84	Arcturus 145°47.49 19°2.85
11	344° 13.06	344°16.63 14.83	231°32.22 46.87	271°2.20 12.03	349°41.48 27.72	Rigil Kent. 139°39.62 -60°56.28 Kochab 137°18.88 74°2.79
12	359° 15.52	359°20.49 N09°14.10	246°34.00 N24°46.71	286°4.31 N22°12.07	4°43.66 <b>S</b> 04°27.60	Kochab 137°18.88 74°2.79 Zuben'ubi 136°55.61 -16°8.89
13	$14^{\circ}17.99$	14°24.34 13.37	261°35.79 46.54	301°6.42 12.12	19°45.84 27.48	Alphecca 126°3.39 26°37.50
14	29°20.45	29°28.20 12.64	276° 37.57 46.37	316° 8.53 12.16	34°48.02 27.36	Antares 112°15.52 -26°29.29
15	44°22.91	44°32.05 · · 11.91	291°39.35 · · 46.21	331°10.64 · · 12.21	49°50.20 · · 27.24	Atria 107°9.48 -69°4.13
16 17	59°25.38 74°27.84	59°35.91 11.18 74°39.76 10.45	306° 41.13 46.04 321° 42.91 45.87	346°12.75 12.25 1°14.85 12.30	64°52.38 27.12 79°54.57 27.00	Sabik 102°2.53 -15°45.44
18	89° 30.31	89°43.61 N09°9.71	336°44.69 N24°45.71	16°16.96 N22°12.34	94°56.75 \$04°26.88	Shaula 96°10.11 -37°7.26
19	104° 32.77	104°47.47 8.97	351°46.46 45.54	31°19.07 12.39	109°58.93 26.76	Rasalhague 95°58.37 12°32.25
20	119°35.24	119°51.32 8.24	6° 48.24 45.37	46°21.18 12.43	125°1.11 26.65	Eltanin 90°42.10 51°28.72
21	134°37.70	134°55.17 · · 7.49	21°50.01 · · 45.20	61°23.28 · · 12.48	140°3.29 · · 26.53	Kaus Aust. 83°32.35 -34°22.31 Vega 80°33.18 38°48.05
22	$149^{\circ}40.16$	149°59.03 6.75	36°51.79 45.04	76°25.39 12.52	155°5.47 26.41	Vega 80°33.18 38°48.05 Nunki 75°47.65 -26°15.93
23	$164^{\circ}42.63$	165°2.88 6.01	51°53.56 44.87	91°27.50 12.57	170°7.65 26.29	Altair 61°59.95 8°55.88
Mer	pass. 12:03	ν3.9' d-0.7' m-4.20	ν1.8' d-0.2' m0.21	$\nu 2.1' \ d0.0' \ \text{m-}2.17$	ν2.2' d-0.1' m1.13	Peacock 53°5.79 -56°39.10
	p					Deneb 49°26.01 45°21.90
٠.	CIIA	CIIA D	CIIA D	CIIA D	CIIA D	Enif 33°38.91 9°59.25
Sat 0	<b>GHA</b> 179° 45.09	<b>GHA Dec</b> 180° 6.73 N09° 5.26	<b>GHA Dec</b> 66°55.34 <b>N</b> 24°44.70	<b>GHA Dec</b> 106°29.60 N22°12.61	<b>GHA Dec</b> 185°9.83 <b>S</b> 04°26.17	Al Na'ir 27°33.09 -46°50.32
1	194° 47.56	195°10.58 4.52	81°57.11 44.53	121°31.71 12.66	200°12.01 26.05	Fomalhaut 15°14.67 -29°29.40
2	209° 50.02	210°14.43 3.77	96°58.88 44.37	136°33.82 12.70	215°14.19 25.93	Scheat 13°45.41 28°13.01
3	224° 52.48	225°18.28 · · 3.02	112°0.65 · · 44.20	151°35.92 · · 12.75	230°16.37 · · 25.81	Markab 13°30.07 15°20.30
4	239°54.95	240°22.13 2.26	127°2.42 44.03	166°38.03 12.79	245°18.55 25.69	Mar 20 Thu SHA Mer.pass
5	254°57.41	255°25.98 1.51	142°4.19 43.86	181°40.13 12.84	260°20.74 25.57	Venus 359°14.91 12:09
6	269° 59.88	270°29.83 N09°0.75	157°5.96 N24°43.69	196°42.24 N22°12.88	275°22.92 <b>S</b> 04°25.46	Mars 247°42.47 19:36
7	285°2.34	285°33.68 09°0.00	172°7.72 43.52	211°44.34 12.93	290°25.10 25.34	Jupiter 287°1.38 16:58
8	300°4.81	300°37.53 08°59.24	187°9.49 43.35	226°46.45 12.98	305°27.28 25.22	Saturn 5°38.36 11:45
9	315°7.27	315°41.37 · · 58.48	202°11.26 · · 43.19	241°48.55 · · 13.02	320°29.46 · · 25.10	Mar 21 Fri SHA Mer.pass
10	330°9.73 345°12.20	330°45.22 57.72 345°49.07 56.95	217°13.02 43.02 232°14.79 42.85	256°50.66 13.07 271°52.76 13.11	335°31.64 24.98 350°33.82 24.86	Venus 359°48.27 12:03
11 12	0° 14.66	0°52.91 N08°56.19	247°16.55 N24°42.68	271°52.76 13.11 286°54.86 N22°13.16	350°33.82 24.86 5°36.00 \$04°24.74	Mars 247°26.60 19:33
13	15° 17.13	15°56.76 55.42	262° 18.31 42.51	301°56.97 13.20	20°38.18 24.62	Jupiter 286°53.02 16:55
14	30° 19.59	31°0.60 54.65	277° 20.07 42.34	316°59.07 13.25	35°40.36 24.50	Saturn 5°31.54 11:41
15	45°22.05	46°4.45 · · 53.88	292°21.83 · · 42.17	332°1.17 · · 13.29	50°42.54 · · 24.38	Mar 22 Sat SHA Mer.pass
16	60° 24.52	61°8.29 53.11	307°23.59 42.00	347° 3.27 13.34	65°44.73 24.27	Venus 0°21.64 11:56
17	75°26.98	76°12.13 52.34	322°25.35 41.83	2°5.38 13.38	80°46.91 24.15	Mars 247°10.24 19:30
18	90° 29.45	91°15.98 N08°51.57	337°27.11 N24°41.66	17°7.48 N22°13.43	95°49.09 \$04°24.03	Jupiter 286°44.51 16:52
19 20	105°31.91 120°34.38	106°19.82 50.79 121°23.66 50.01	352°28.87 41.49 7°30.63 41.32	32°9.58 13.47 47°11.68 13.52	110°51.27 23.91 125°53.45 23.79	Saturn 5°24.74 11:38
20	120 34.38 135°36.84	136° 27.50 · · 49.23	22°32.38 · · 41.14	62°13.78 · · 13.56	140°55.63 · · 23.67	Horizontal parallax
22	150° 39.30	151°31.34 48.45	37°34.14 40.97	77°15.88 13.61	155°57.81 23.55	Venus: 0.5
23	165°41.77	166°35.18 47.67	52°35.89 40.80	92°17.98 13.66	170°59.99 23.43	Mars: 0.1
Mar	pass. 11:59	ν3.9' d-0.7' m-4.20	ν1.8' d-0.2' m0.23	ν2.1' d0.0' m-2.16	ν2.2' d-0.1' m1.14	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°7.38	S00°8.93	299° 5.24	11.5'	\$25°12.50	7.3'	54.3'
1 2	193°7.56 208°7.75	7.94 6.95	313°35.73 328°6.14	11.4' 11.3'	25°19.79 25°26.96	7.2' 7.1'	54.3' 54.4'
3	223°7.93	5.96	342°36.47	11.3'	25°34.01	6.9'	54.4'
4	238°8.12	4.98	$357^{\circ}6.72$	11.2'	$25^{\circ}40.96$	6.8'	54.4'
5	253°8.30	3.99	11°36.90	11.1'	25°47.78	6.7'	54.4'
6 7	268°8.49 283°8.67	S00°3.00 2.01	26°7.01 40°37.03	11.0' 10.9'	\$25°54.50 26°1.09	6.6' 6.5'	54.4' 54.4'
8	298°8.86	1.02	55° 6.98	10.9	26°7.57	6.4	54.4'
9	313°9.04	\$00°0.04	69°36.85	10.8'	$26^{\circ}13.93$	6.2'	54.5'
10	328°9.23	N00° 0.95 1.94	84° 6.65 98° 36.38	10.7'	26°20.17	6.1'	54.5'
11 12	343°9.41 358°9.60	1.94 N00°2.93	98 30.38 113°6.02	10.6' 10.6'	26°26.29 \$26°32.28	6.0' 5.9'	54.5' 54.5'
13	13°9.78	3.92	127°35.60	10.5'	26°38.16	5.8'	54.5'
14	28°9.97	4.90	142°5.10	10.4'	26°43.91	5.6'	54.5'
15 16	43° 10.15 58° 10.34	· · 5.89 6.88	156°34.52 171°3.87	10.4' 10.3'	26°49.54 26°55.04	5.5' 5.4'	54.6' 54.6'
17	73° 10.53	7.87	185°33.15	10.3	20° 33.04 27° 0.42	5.3'	54.6'
18	88° 10.71	N00°8.85	200°2.36	10.1'	\$27°5.67	5.1'	54.6'
19	103°10.90	9.84	214°31.50	10.1'	27°10.79 27°15.79	5.0'	54.6'
20 21	118° 11.08 133° 11.27	10.83 •• 11.82	229° 0.56 243° 29.55	10.0' 9.9'	27°15.79 27°20.65	4.9' 4.7'	54.7' 54.7'
22	148° 11.45	12.81	257°58.48	9.9'	27°25.39	4.6'	54.7'
23	163°11.64	13.79	272°27.33	9.8'	27°29.99	4.5'	54.7'
	SD = 16.1'	d = -1.0'		SD	0 = 14.8'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 11.83	N00°14.78	286°56.12	9.7'	S27°34.46	4.3'	54.7'
1	193°12.01	15.77	301°24.84	9.7'	27°38.80	4.2'	54.7'
2	208° 12.20 223° 12.38	16.76 •• 17.74	315°53.49 330°22.07	9.6' 9.5'	27°43.01 27°47.08	4.1' 3.9'	54.8' 54.8'
4	238° 12.57	18.73	344°50.59	9.5'	27°51.02	3.8'	54.8'
5	253°12.76	19.72	$359^{\circ}19.04$	9.4'	$27^{\circ}54.82$	3.7'	54.8'
6	268° 12.94 283° 13.13	N00°20.71	13°47.43 28°15.76	9.3' 9.3'	\$27°58.48 28°2.01	3.5'	54.9'
7 8	283° 13.13 298° 13.32	21.69 22.68	28° 15.76 42° 44.02	9.3'	28° 5.39	3.4' 3.2'	54.9' 54.9'
9	313° 13.50	• • 23.67	57°12.23	9.1'	28° 8.64	3.1'	54.9'
10	328° 13.69	24.66	71°40.37	9.1'	28°11.75	3.0'	54.9'
11 12	343°13.87 358°14.06	25.64 N00°26.63	86°8.45 100°36.48	9.0' 9.0'	28°14.72 \$28°17.55	2.8' 2.7'	55.0' 55.0'
13	13° 14.25	27.62	115° 4.44	9.0 8.9'	28°20.23	2.7	55.0'
14	28° 14.43	28.60	129°32.35	8.9'	$28^{\circ}22.78$	2.4'	55.0'
15	43°14.62	• • 29.59	144°0.21	8.8'	28°25.18	2.3'	55.1'
16 17	58° 14.81 73° 14.99	30.58 31.57	158°28.01 172°55.75	8.7' 8.7'	28°27.43 28°29.54	2.1' 2.0'	55.1' 55.1'
18	88° 15.18	N00°32.55	187°23.45	8.6'	S28°31.51	1.8'	55.1'
19	103° 15.37	33.54	201°51.09	8.6'	28°33.32	1.7'	55.2'
20 21	118° 15.55 133° 15.74	34.53 •• 35.51	216°18.68 230°46.22	8.5' 8.5'	28°35.00 28°36.52	1.5' 1.4'	55.2' 55.2'
22	148° 15.93	36.50	245°13.72	8.4'	28°37.90	1.4	55.2'
23	163° 16.11	37.49	259°41.17	8.4'	28°39.12	1.1'	55.3'
	SD = 16.1'	d = 1.0'		SD	0 = 14.9'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 16.30	N00°38.47	274°8.57	8.4'	S28°40.20	0.9'	55.3'
1	193°16.49	39.46	288°35.93	8.3'	28°41.13	0.8'	55.3'
2	208° 16.67 223° 16.86	40.45 •• 41.44	303°3.25 317°30.53	8.3' 8.2'	28°41.91 28°42.54	0.6' 0.5'	55.3' 55.4'
4	223 10.80 238°17.05	42.42	317 30.53 331°57.76	8.2'	28°43.01	0.5	55.4'
5	253° 17.23	43.41	346°24.96	8.2'	28°43.34	0.2'	55.4'
6	268° 17.42 283° 17.61	N00°44.40 45.38	0°52.12 15°19.24	8.1' 8.1'	\$28°43.51 28°43.53	0.0' -0.1'	55.4'
7 8	283°17.61 298°17.80	45.38 46.37	15°19.24 29°46.32	8.1'	28°43.53 28°43.40	-0.1' -0.3'	55.5' 55.5'
9	313° 17.98	• • 47.36	44°13.38	8.0'	28°43.11	-0.4'	55.5'
10	328° 18.17	48.34	58°40.40	8.0'	28°42.67	-0.6'	55.6'
11 12	343°18.36 358°18.54	49.33 N00°50.31	73°7.39 87°34.35	8.0' 7.9'	28°42.07 \$28°41.32	-0.8' -0.9'	55.6' 55.6'
13	13° 18.73	51.30	102°1.28	7.9'	28°40.41	-0.9 -1.1'	55.6'
14	28° 18.92	52.29	116°28.18	7.9'	28°39.35	-1.2'	55.7'
15	43°19.11	• • 53.27	130°55.06	7.9'	28°38.13	-1.4'	55.7'
16 17	58° 19.29 73° 19.48	54.26 55.25	145°21.92 159°48.75	7.8' 7.8'	28°36.75 28°35.22	-1.5' -1.7'	55.7' 55.8'
18	88° 19.67	N00°56.23	174°15.56	7.8'	\$28°33.53	-1.8'	55.8'
19	103°19.86	57.22	188°42.35	7.8'	28°31.68	-2.0'	55.8'
20 21	118°20.04 133°20.23	58.20 00°59.19	203°9.13 217°35.88	7.8' 7.7'	28°29.68 28°27.51	-2.2' -2.3'	55.9' 55.9'
22	133 20.23 148°20.42	00 59.19 01°0.18	217 35.88 232°2.62	7.7'	28°25.19	-2.5'	55.9'
23	163°20.61	1.16	246°29.35	7.7'	28°22.72	-2.6'	56.0'
	SD = 16.0'	d = 1.0'		SD	0 = 15.1'		

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

Lat.		Moonris	e		Moonset	į
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°	03:35			04:39		
62°	02:25	20.00	24.40	05:49	06.05	07.00
60°	01:50	03:26	04:43	06:25	06:35	07:09
N 58°	01:25	02:49	03:59	06:51	07:12	07:54
56°	01:05	02:23	03:30	07:11	07:38	08:23
54° 52°	00:49 00:34	02:03 01:46	03:07 02:49	07:28 07:43	07:59 08:16	08:46 09:04
52 50°	00:34	01:46	02:49	07:43	08:10	09:04
45°		01:01	02:01	08:22	09:01	09:51
N 40°		00:38	01:37	08:43	09:01	10:16
35°		00:38	01:37	09:00	09.23	10:16
30°		00:03	01:00	09:15	10:01	10:53
20°	23:36		00:31	09:41	10:29	11:22
N 10°	23:12		00:06	10:03	10:53	11:47
0°	22:50	23:43		10:24	11:16	12:10
<b>S</b> 10°	22:29	23:20		10:45	11:38	12:33
20°	22:05	22:56	23:51	11:07	12:02	12:57
30°	21:38	22:27	23:23	11:33	12:31	13:26
35°	21:22	22:10	23:06	11:48	12:47	13:43
40°	21:04	21:50	22:46	12:06	13:07	14:03
45°	20:42	21:26	22:23	12:28	13:31	14:27
<b>S</b> 50°	20:14	20:56	21:52	12:55	14:01	14:58
52°	20:00	20:40	21:37	13:09	14:17	15:13
54°	19:44	20:22	21:19	13:24	14:34	15:31
56° 58°	19:25	20:01	20:57	13:43	14:56	15:53
<b>S</b> 60°	19:02 18:32	19:33 18:53	20:29 19:49	14:05 14:35	15:23 16:03	16:20 17:01
3 00	10:32	10:03	19:49	14:55	10:03	17:01

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	73-55%
20	07:30	07:22	12:07	04:12	16:37	
21	07:13	07:04	12:07	05:03	17:29	
22	06:55	06:46	12:07	05:56	18:24	

	•		,			
h	Aries	Venus	Mars	Jupiter	Saturn	
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	180°44.23	181°39.01 N08°46.89	67°37.64 N24°40.63	107°20.08 N22°13.70	186°2.17 <b>S</b> 04°23.32	Alphorat
1	195°46.70	196° 42.85 46.11	82°39.40 40.46	122°22.18 13.75	201°4.36 23.20	Alpherat
2	210°49.16	211°46.69 45.32	97°41.15 40.29	137°24.28 13.79	216°6.54 23.08	Anka
3	225°51.62	226°50.52 · · 44.53	112°42.90 · · 40.12	152°26.38 · · 13.84	231°8.72 · · 22.96	Scheda
						Diphd
4	240°54.09	241°54.36 43.74	127° 44.65 39.94	167°28.48 13.88	246°10.90 22.84	Acherna
5	255° 56.55	256°58.19 42.95	142°46.40 39.77	182°30.58 13.93	261°13.08 22.72	Hama
6	270°59.02	272°2.02 N08°42.16	157°48.15 N24°39.60	197°32.68 N22°13.97	276°15.26 \$04°22.60	Polari
7	286°1.48	287°5.86 41.37	172°49.90 39.43	212°34.78 14.02	291°17.44 22.48	
8	301°3.95	302°9.69 40.57	187°51.64 39.26	227°36.88 14.06	306°19.62 22.37	Acama
9	316°6.41	317°13.52 · · 39.78	202°53.39 · · 39.08	242°38.98 · · 14.11	321°21.81 · · 22.25	Menka
10	331°8.87	332°17.35 38.98	217°55.13 38.91	257°41.07 14.16	336°23.99 22.13	Mirfa
						Aldebara
11	346°11.34		232°56.88 38.74	272°43.17 14.20	351°26.17 22.01	Rige
12	1°13.80	2°25.00 N08°37.38	247°58.62 N24°38.56	287°45.27 N22°14.25	6°28.35 <b>S</b> 04°21.89	Capell
13	$16^{\circ}16.27$	17°28.83 36.58	263°0.37 38.39	302°47.37 14.29	21°30.53 21.77	Bellatri
14	31° 18.73	32°32.65 35.78	278°2.11 38.22	317°49.46 14.34	36°32.71 21.65	
15	$46^{\circ}21.19$	47°36.48 · · 34.98	293°3.85 · · 38.04	332°51.56 · · 14.38	51°34.89 · · 21.53	Elnat
16	61°23.66	62°40.30 34.17	308°5.59 37.87	347°53.66 14.43	66°37.08 21.42	Alnilan
17	76°26.12	77°44.12 33.36	323°7.33 37.70	2°55.75 14.48	81°39.26 21.30	Betelgeus
18	91°28.59	92°47.95 N08°32.56	338°9.07 N24°37.52	17°57.85 N22°14.52	96°41.44 S04°21.18	Canopu
	106°31.05					Siriu
19		107°51.77 31.75	353°10.81 37.35	32°59.94 14.57	111°43.62 21.06	Adhar
20	121°33.52	122°55.59 30.94	8° 12.54 37.17	48°2.04 14.61	126°45.80 20.94	Procyo
21	136°35.98	137°59.40 · · 30.13	23°14.28 · · 37.00	63°4.13 · · 14.66	141°47.98 · · 20.82	Pollu
22	151°38.44	153°3.22 29.31	38°16.02 36.83	78° 6.23 14.70	156°50.17 20.70	
23	166° 40.91	168°7.04 28.50	53°17.75 36.65	93°8.32 14.75	171°52.35 20.59	Avio
						Suha
Mer.p	bass. 11:55	$\nu$ 3.8′ <i>d</i> -0.8′ m-4.20	$\nu 1.8' \ d$ -0.2' m0.25	$\nu 2.1' \ d0.0' \ \text{m-}2.16$	$ u 2.2' \; d$ -0.1 $' \; { m m} 1.14$	Miaplacidu
						Alphare
						Regulu
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubh
0	181°43.37	183°10.85 N08°27.68	68°19.49 N24°36.48	108°10.42 N22°14.80	186°54.53 S04°20.47	Denebol
1	196° 45.84	198°14.66 26.87	83°21.22 36.30	123°12.51 14.84	201°56.71 20.35	Giena
2	211°48.30	213°18.48 26.05	98°22.95 36.13	138°14.60 14.89	216°58.89 20.23	
3	226° 50.76	228°22.29 · · 25.23	113°24.69 · · 35.95	153°16.70 · · 14.93	232°1.07 · · 20.11	Acru
4	241°53.23	243°26.10 24.41	128°26.42 35.78	168°18.79 14.98	247°3.26 19.99	Gacru
						Aliot
5	256° 55.69	258°29.91 23.59	143°28.15 35.60	183°20.88 15.02	262°5.44 19.88	Spic
6	271°58.16	273°33.71 N08°22.77	158°29.88 N24°35.42	198°22.98 N22°15.07	277°7.62 \$04°19.76	Alkai
7	287°0.62	288° 37.52 21.94	173°31.60 35.25	213°25.07 15.12	292°9.80 19.64	Hada
8	302°3.09	303°41.33 21.12	188° 33.33 35.07	228°27.16 15.16	307°11.98 19.52	Menken
9	317°5.55	318°45.13 · · 20.29	203°35.06 · · 34.90	243°29.25 · · 15.21	322°14.16 · · 19.40	1
10	332°8.01	333°48.93 19.46	218° 36.79 34.72	258°31.35 15.25	337°16.35 19.28	Arcturu
11	347° 10.48	348°52.73 18.63	233°38.51 34.54	273°33.44 15.30	352°18.53 19.16	Rigil Kent
12	2°12.94	3°56.53 N08°17.80	248°40.24 N24°34.37	288°35.53 N22°15.34	7°20.71 S04°19.05	Kocha
						Zuben'ub
13	17° 15.41	19°0.33 16.97	263°41.96 34.19	303°37.62 15.39	22°22.89 18.93	Alpheco
14	32°17.87	34°4.13 16.14	278°43.68 34.01	318°39.71 15.44	37°25.07 18.81	Antare
15	47°20.33	49°7.92 · · 15.31	293°45.41 · · 33.84	333°41.80 · · 15.48	52°27.26 · · 18.69	Atri
16	62°22.80	64°11.72 14.48	308°47.13 33.66	348°43.89 15.53	67°29.44 18.57	
17	77°25.26	79° 15.51 13.64	323°48.85 33.48	3°45.98 15.57	82°31.62 18.45	Sabi
18	92°27.73	94°19.30 N08°12.80	338°50.57 N24°33.30	18°48.07 N22°15.62	97°33.80 <b>S</b> 04°18.34	Shaul
19	107°30.19	109°23.09 11.97	353°52.29 33.13	33°50.16 15.67	112°35.98 18.22	Rasalhagu
						Eltani
20	122°32.66	124°26.88 11.13	8°54.01 32.95	48°52.25 15.71	127°38.16 18.10	Kaus Aust
21	137°35.12	139°30.67 · · 10.29	23°55.73 · · 32.77	63°54.34 · · 15.76	142°40.35 · · 17.98	Veg
22	152°37.58	154°34.45 9.45	38°57.44 32.59	78°56.43 15.80	157°42.53 17.86	Nunk
23	167°40.05	169°38.24 8.61	53°59.16 32.41	93°58.52 15.85	172°44.71 17.75	Altai
- A	11 [1	2.0/ 1.0.0/ 4.00	1.7/ 1.0.0/ 0.00	2.1/ /0.0/ 2.15	0.0/ / 0.1/ 1.15	Peacoc
Mer.p	oass. 11:51	$\nu 3.8' \ d$ -0.8' m-4.20	$ u 1.7' \ d$ -0.2' m0.28	$ u 2.1' \ d0.0' \ \text{m-}2.15$	$ u 2.2' \ d$ -0.1' m1.15	
						Dene
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Eni
						Al Na'i
0	182° 42.51	184°42.02 N08°7.76	69°0.88 N24°32.24	109° 0.60 N22° 15.90	187°46.89 S04°17.63	Fomalhau
1	197° 44.98	199° 45.80 6.92	84°2.59 32.06	124° 2.69 15.94	202°49.08 17.51	Schea
2	212° 47.44	214°49.58 6.08	99°4.30 31.88	139° 4.78 15.99	217°51.26 17.39	Marka
3	227°49.90	229°53.36 · · 5.23	114°6.02 · · 31.70	154°6.87 · · 16.03	232°53.44 · · 17.27	
4	242°52.37	244°57.14 4.38	129°7.73 31.52	169°8.95 16.08	247°55.62 17.15	Mar 23 Su
5	257° 54.83	260°0.91 3.54	144°9.44 31.34	184°11.04 16.12	262°57.80 17.04	Venu
6	272°57.30	275°4.68 N08°2.69	159°11.15 N24°31.16	199°13.13 N22°16.17	277°59.99 <b>S</b> 04°16.92	Mar
7	287°59.76	290°8.46 1.84	174°12.86 30.98	214°15.22 16.22	293°2.17 16.80	Jupite
						Satur
8	303°2.22	305°12.23 0.99	189°14.57 30.80	229°17.30 16.26	308°4.35 16.68	Satur
9	318°4.69	320°15.99 08°0.14	204° 16.28 · · · 30.62	244°19.39 · · 16.31	323°6.53 · · 16.56	Mar 24 Mo
10	333°7.15	335°19.76 07°59.28	219° 17.99 30.44	259°21.47 16.35	338°8.72 16.45	Venu
11	348°9.62	350°23.53 58.43	234°19.70 30.26	274°23.56 16.40	353°10.90 16.33	
12	3°12.08	5°27.29 N07°57.58	249°21.40 N24°30.08	289°25.64 N22°16.45	8°13.08 <b>S</b> 04°16.21	Mar
13	18° 14.55	20°31.05 56.72	264°23.11 29.90	304°27.73 16.49	23°15.26 16.09	Jupite
14	33° 17.01	35°34.81 55.87	279°24.81 29.72	319°29.81 16.54	38°17.44 15.97	Satur
15	48° 19.47	50°38.57 · · 55.01	294°26.52 · · 29.54	334°31.90 · · 16.59	53°19.63 · · 15.86	NA 25 T
						Mar 25 Tu
16	63°21.94	65°42.32 54.15	309°28.22 29.36	349°33.98 16.63	68°21.81 15.74	Venu
17	78°24.40	80°46.08 53.29	324°29.92 29.18	4°36.07 16.68	83°23.99 15.62	Mar
18	93°26.87	95°49.83 N07°52.43	339°31.62 N24°29.00	19°38.15 N22°16.72	98°26.17 <b>S</b> 04°15.50	Jupite
19	108°29.33	110°53.58 51.57	354°33.33 28.82	34°40.23 16.77	113°28.36 15.38	Satur
20	123°31.79	125°57.33 50.71	9°35.03 28.64	49°42.32 16.82	128°30.54 15.27	
21	138°34.26	141°1.08 · · 49.85	24°36.73 · · 28.45	64°44.40 · · 16.86	143°32.72 · · 15.15	Horiz
22	153° 36.72	156°4.83 48.99	39°38.42 28.27	79°46.48 16.91	158°34.90 15.03	
23	168° 39.19					
23	100 39.19	171°8.57 48.12	54°40.12 28.09	94°48.57 16.95	173°37.09 14.91	
Merr	pass. 11:47	ν3.8′ d-0.8′ m-4.20	ν1.7' d-0.2' m0.30	ν2.1' d0.0' m-2.14	ν2.2' d-0.1' m1.15	

	SHA	Dec
Alpheratz	357°34.98	29° 13.67
Ankaa	353°7.38	-42°10.23
Schedar Diphda	349°31.46 348°47.45	56° 40.51 -17° 51.02
Achernar	335°20.56	-57°6.66
Hamal	327°51.32	23°34.86
Polaris	$314^{\circ}18.98$	89°22.44
Acamar	315°11.94	-40° 12.40
Menkar	314°6.21	4°11.23
Mirfak Aldebaran	308°28.36 290°39.57	49°57.15 16°33.58
Rigel	281°3.79	-8° 10.48
Capella	$280^{\circ}21.76$	$46^{\circ}1.53$
Bellatrix	278°22.77	6°22.29
Elnath Alnilam	278°1.73 275°37.61	28°37.77 -1°11.25
Betelgeuse	270°51.93	7° 24.65
Canopus	263°52.30	-52°42.79
Sirius	$258^{\circ}26.06$	-16°45.21
Adhara	255°5.67	-29°0.59
Procyon Pollux	244°50.55 243°16.96	5°9.54 27°57.95
Avior	243 10.90 234°14.38	-59° 35.65
Suhail	222°45.92	-43°32.27
Miaplacidus	221°37.68	-69°49.43
Alphard	217°47.36	-8°46.22
Regulus	207°33.99 193°40.12	11°50.55
Dubhe Denebola	193°40.12 182°24.45	61°36.91 14°25.74
Gienah	175°43.10	-17°41.06
Acrux	172°59.29	-63°14.38
Gacrux	$171^{\circ}50.94$	-57°15.33
Alioth	166°12.23	55°49.23
Spica Alkaid	158°21.83 152°51.40	-11°17.71 49°11.02
Hadar	148°35.26	-60° 29.63
Menkent	147°57.10	-36°29.68
Arcturus	$145^{\circ}47.47$	19°2.85
Rigil Kent.	139°39.58	-60°56.30
Kochab Zuben'ubi	137°18.84 136°55.59	74°2.80 -16°8.90
Alphecca	126° 3.37	26° 37.50
Antares	112° 15.49	-26°29.29
Atria	$107^{\circ}9.42$	-69°4.14
Sabik	102°2.51	-15°45.44
Shaula Rasalhague	96°10.08 95°58.34	-37°7.26 12°32.25
Eltanin	90°42.07	51°28.72
Kaus Aust.	$83^{\circ}32.31$	-34°22.30
Vega	80°33.15	38°48.05
Nunki	75°47.62	-26° 15.92
Altair Peacock	61°59.93 53°5.75	8°55.88 -56°39.09
Deneb	49°25.98	45°21.90
Enif	33°38.89	9°59.25
Al Na'ir	27°33.07	-46°50.31
Fomalhaut	15°14.66	-29°29.39
Scheat Markab	13°45.40 13°30.05	28° 13.01 15° 20.30
Mar 23 Sun Venus	<b>SHA</b> 0°54.78	Mer.pass
Venus Mars	0°54.78 246°53.41	11:50 19:27
Jupiter	286°35.85	16:48
Saturn	5°17.94	11:34
Mar 24 Mon	SHA	Mer.pass
Venus	1°27.48	11:44
Mars	246°36.11	19:24
Jupiter Saturn	286°27.04 5°11.16	16:45 11:31
Mar 25 Tue	SHA 1° = 0 = 1	Mer.pass
Venus Mars	1°59.51 246°18.36	11:38 19:22
Jupiter	286°18.09	16:42
Jubitci	5°4.38	11:27
Saturn	<u> </u>	
Saturn		
Saturn	ital parallax Venus:	0.5
Saturn	ıtal parallax	0.5 0.1

Stars

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°20.79	N01°2.15	$260^{\circ}56.06$	7.7'	<b>S</b> 28°20.08	-2.8'	56.0'
1	193°20.98	3.13	275° 22.76	7.7'	28°17.28	-3.0'	56.0'
2	208°21.17 223°21.36	4.12 •• 5.11	289° 49.45 304° 16.13	7.7' 7.7'	28°14.33 28°11.22	-3.1' -3.3'	56.1' 56.1'
4	238°21.54	6.09	318° 42.81	7.7'	28°7.94	-3.4'	56.1'
5	253°21.73	7.08	333°9.48	7.7'	$28^{\circ}4.51$	-3.6'	56.2'
6	268°21.92	N01°8.06	347°36.14	7.7'	\$28°0.92	-3.7'	56.2'
7 8	283°22.11 298°22.29	9.05 10.03	2°2.80 16°29.46	7.7' 7.7'	27°57.17 27°53.27	-3.9' -4.1'	56.2' 56.3'
9	313°22.48	· · 11.02	30°56.12	7.7'	27°49.20	-4.2'	56.3'
10	328° 22.67	12.00	45°22.78	7.7'	27°44.97	-4.4'	56.3'
11	343°22.86 358°23.04	12.99 N01°13.98	59° 49.44 74° 16.10	7.7' 7.7'	27°40.59 <b>S</b> 27°36.04	-4.5'	56.4
12 13	13° 23.04	14.96	74° 16.10 88° 42.77	7.7'	27°31.34	-4.7' -4.9'	56.4' 56.4'
14	28°23.42	15.95	103°9.45	7.7'	27°26.48	-5.0'	56.5'
15	43°23.61	• • 16.93	117° 36.13	7.7'	27°21.46	-5.2'	56.5'
16	58° 23.80 73° 23.98	17.92	132°2.82	7.7'	27°16.28 27°10.94	-5.3'	56.5'
17 18	73°23.98 88°24.17	18.90 N01°19.89	146° 29.53 160° 56.24	7.7' 7.7'	\$27° 10.94 \$27° 5.44	-5.5' -5.7'	56.6' 56.6'
19	103°24.36	20.87	175°22.96	7.7'	26°59.79	-5.8'	56.6'
20	118°24.55	21.86	$189^{\circ}49.70$	7.8'	$26^{\circ}53.98$	-6.0'	56.7'
21	133°24.73	• • 22.84	204° 16.45	7.8'	26°48.01	-6.1'	56.7'
22 23	148°24.92 163°25.11	23.83 24.81	218° 43.22 233° 10.01	7.8' 7.8'	26°41.88 26°35.60	-6.3' -6.4'	56.8' 56.8'
23			255 10.01		D = 15.3'	-0.4	33.0
	SD = 16.0'	d = 1.0'		5	D = 15.3'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°25.30	N01°25.79	247°36.81	7.8'	\$26°29.16	-6.6'	56.8'
1 2	193°25.49 208°25.67	26.78 27.76	262°3.63 276°30.48	7.8' 7.9'	26°22.56 26°15.81	-6.8' -6.9'	56.9' 56.9'
3	208°25.86	28.75	276° 30.48 290° 57.34	7.9° 7.9°	26°15.81 26°8.90	-6.9 -7.1'	56.9'
4	238° 26.05	29.73	305°24.23	7.9'	26°1.83	-7.2	57.0'
5	253°26.24	30.72	319°51.13	7.9'	25°54.61	-7.4'	57.0'
6	268°26.43 283°26.61	N01°31.70	334° 18.07 348° 45.03	8.0'	\$25°47.24 25°39.71	-7.5'	57.1'
7 8	283°26.81 298°26.80	32.69 33.67	348 45.03 3° 12.01	8.0' 8.0'	25°39.71 25°32.03	-7.7' -7.8'	57.1' 57.1'
9	313°26.99	• • 34.65	17°39.02	8.0'	25°24.20	-8.0'	57.2'
10	328°27.18	35.64	32°6.06	8.1'	$25^{\circ}16.21$	-8.1'	57.2'
11	343°27.37	36.62	46°33.13	8.1'	25°8.07	-8.3'	57.2'
12 13	358°27.55 13°27.74	N01°37.61 38.59	61°0.23 75°27.35	8.1' 8.2'	\$24°59.78 24°51.34	-8.4' -8.6'	57.3' 57.3'
14	28° 27.93	39.57	89°54.51	8.2'	24°42.75	-8.7'	57.4'
15	43°28.12	• • 40.56	$104^{\circ}21.70$	8.2'	24°34.01	-8.9'	57.4'
16	58° 28.31	41.54	118° 48.93	8.3'	24°25.12	-9.0'	57.4'
17 18	73°28.49 88°28.68	42.52 N01°43.51	133° 16.18 147° 43.47	8.3' 8.3'	24°16.08 524°6.89	-9.2' -9.3'	57.5' 57.5'
19	103°28.87	44.49	162° 10.79	8.4'	23°57.55	-9.5'	57.6'
20	118°29.06	45.48	176°38.15	8.4'	23°48.07	-9.6'	
21	133°29.25	• • 46.46	191°5.55	8.4'	23°38.44	-9.8'	57.6'
22 23	148°29.44 163°29.62	47.44 48.43	205°32.98 220°0.44	8.5' 8.5'	23°28.67 23°18.75	-9.9' -10.1'	57.7' 57.7'
23			220 0.44			-10.1	31.1
	SD = 16.0'	d = 1.0'			D = 15.5'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°29.81	N01°49.41	234°27.95	8.5'	\$23°8.69	-10.2'	57.8'
1 2	193°30.00 208°30.19	50.39 51.37	248°55.49 263°23.07	8.6' 8.6'	22°58.49 22°48.14	-10.3' -10.5'	57.8' 57.8'
3	208 30.19 223°30.38	52.36	203 23.07 277°50.69	8.7'	22 48.14 22°37.65	-10.5 -10.6'	57.8 57.9'
4	238°30.56	53.34	292°18.34	8.7'	22°27.02	-10.8'	57.9'
5	253°30.75	54.32	306°46.04	8.7'	22°16.26	-10.9'	58.0'
6 7	268°30.94 283°31.13	N01°55.31 56.29	321°13.77 335°41.55	8.8' 8.8'	\$22°5.35 21°54.30	-11.0' -11.2'	58.0' 58.0'
8	298° 31.32	57.27	350°9.36	8.9'	21°43.12	-11.2	58.1
9	313°31.51	• • 58.25	4°37.22	8.9'	21°31.80	-11.5'	58.1'
10	328° 31.69	01°59.24	19°5.11	8.9'	21°20.35	-11.6'	58.2'
11 12	343°31.88 358°32.07	02°0.22 N02°1.20	33°33.05 48°1.02	9.0' 9.0'	21°8.76 \$20°57.04	-11.7' -11.9'	58.2' 58.2'
13	13° 32.26	2.18	62°29.04	9.0	20°45.19	-11.9	58.3'
14	28°32.45	3.17	76° 57.09	9.1'	20°33.20	-12.1'	58.3'
15	43°32.64	• • 4.15	91°25.19	9.1'	20°21.09	-12.2'	58.4'
16 17	58° 32.82 73° 33.01	5.13 6.11	105°53.33 120°21.50	9.2' 9.2'	20°8.84 19°56.47	-12.4' -12.5'	58.4' 58.4'
18	73 33.01 88°33.20	0.11 N02°7.09	120 21.50 134°49.72	9.2	19 50.47 \$19°43.97	-12.5	58.5
19	103°33.39	8.07	149° 17.98	9.3'	19°31.34	-12.8'	58.5'
20	118°33.58	9.06	163°46.28	9.3'	19°18.59	-12.9'	58.6'
21 22	133°33.76 148°33.95	· · 10.04 11.02	178° 14.62 192° 43.00	9.4' 9.4'	19°5.71 18°52.71	-13.0' -13.1'	58.6' 58.6'
23	146 33.95 163°34.14	12.00	207° 11.42	9.4 9.5'	18°39.59	-13.1 -13.2'	58.7'
	SD = 16.0'	d = 1.0'			D = 15.8'		
	JD — 10.0	<u> </u>			13.0		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	45-25%
23	06:37	06:28	12:06	06:51	19:19	
24	06:19	06:10	12:06	07:47	20:14	
25	06:01	05.52	12.06	00.41	21.07	

h	Aries	Venus	Mars	Jupiter	Saturn	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	183°41.65	186°12.31 N07°47.26	69°41.82 N24°27.91	109°50.65 N22°17.00	188°39.27 <b>S</b> 04°14.79	١.
1	198°44.11	201°16.05 46.40	84°43.52 27.73	124°52.73 17.05	203°41.45 14.68	A
2	213°46.58	216°19.79 45.53	99° 45.21 27.54	139°54.81 17.09	218°43.63 14.56	
3	228°49.04	231°23.53 · · 44.66	114°46.91 · · 27.36	154°56.89 · · 17.14	233°45.82 · · 14.44	
4	243°51.51	246°27.26 43.80	129° 48.60 27.18	169°58.98 17.18	248°48.00 14.32	1,
5	258° 53.97	261°30.99 42.93	144°50.30 27.00	185°1.06 17.23	263°50.18 14.21	'
6	273°56.44	276°34.72 N07°42.06	159°51.99 N24°26.81	200° 3.14 N22° 17.28	278°52.37 <b>S</b> 04°14.09	
7	288° 58.90	291°38.45 41.19	174°53.68 26.63	215° 5.22 17.32	293°54.55 13.97	
8	304°1.36	306° 42.18 40.32	189°55.37 26.45	230°7.30 17.37	308°56.73 13.85	
9	319°3.83	321°45.90 · · 39.45	204°57.06 · · 26.26	245°9.38 · · 17.42	323°58.91 · · 13.73	
10	334°6.29 349°8.76	336°49.62 38.58 351°53.35 37.70	219°58.75 26.08 235°0.44 25.90	260°11.46 17.46 275°13.54 17.51	339°1.10 13.62 354°3.28 13.50	A
11 12	4° 11.22	6°57.06 N07°36.83	250°2.13 N24°25.71	275°13.54 17.51 290°15.62 N22°17.55	354°3.28 13.50 9°5.46 \$04°13.38	
13	19° 13.68	22°0.78 35.96	265°3.82 25.53	305°17.70 17.60	24°7.65 13.26	
14	34° 16.15	37°4.49 35.08	280°5.50 25.35	320°19.78 17.65	39°9.83 13.15	
15	49° 18.61	52°8.21 · · 34.21	295°7.19 · · 25.16	335°21.85 · · 17.69	54°12.01 · · 13.03	
16	$64^{\circ}21.08$	67°11.92 33.33	310°8.88 24.98	350°23.93 17.74	69°14.19 12.91	
17	79°23.54	82°15.63 32.45	325° 10.56 24.79	5°26.01 17.79	84°16.38 12.79	Be
18	94°26.00	97°19.33 N07°31.58	340°12.24 N24°24.61	20°28.09 N22°17.83	99°18.56 <b>S</b> 04°12.68	'
19	109°28.47	112°23.04 30.70	355°13.93 24.42	35°30.17 17.88	114°20.74 12.56	
20	124° 30.93	127°26.74 29.82	10°15.61 24.24	50°32.24 17.92	129°22.93 12.44	
21	139°33.40	142°30.44 · · 28.94	25°17.29 · · 24.05	65°34.32 · · 17.97	144°25.11 · · 12.32	
22	154° 35.86	157°34.13 28.06	40° 18.97 23.87	80°36.40 18.02	159°27.29 12.20	
23	169°38.32	172°37.83 27.18	55°20.65 23.68	95°38.47 18.06	174°29.48 12.09	
Mer.p	pass. 11:43	ν3.7′ d-0.9′ m-4.18	ν1.7' d-0.2' m0.32	ν2.1' d0.0' m-2.14	ν2.2' d-0.1' m1.15	Mia
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 nu 0	<b>GПА</b> 184°40.79	187°41.52 N07°26.30	70°22.33 N24°23.50	110°40.55 N22°18.11	189°31.66 <b>S</b> 04°11.97	
1	199°43.25	202°45.21 25.42	85°24.01 23.31	125°42.63 18.16	204°33.84 11.85	
2	214°45.72	217°48.90 24.54	100°25.69 23.12	140°44.70 18.20	219°36.03 11.73	
3	229°48.18	232°52.59 · · 23.65	115°27.37 · · 22.94	155°46.78 · · 18.25	234°38.21 · · 11.62	
4	244°50.64	247°56.27 22.77	130°29.04 22.75	170°48.85 18.30	249°40.39 11.50	
5	$259^{\circ}53.11$	262°59.96 21.89	145°30.72 22.57	185°50.93 18.34	264°42.58 11.38	
6	274° 55.57	278°3.63 N07°21.00	160°32.39 N24°22.38	200°53.00 N22°18.39	279°44.76 S04°11.26	
7	289°58.04	293°7.31 20.12	175°34.07 22.19	215°55.08 18.43	294°46.94 11.15	
8	305°0.50	308°10.99 19.23	190°35.74 22.00	230°57.15 18.48	309°49.13 11.03	1
9 10	320°2.96 335°5.43	323°14.66 · · 18.35 338°18.33 17.46	205°37.41 · · 21.82 220°39.09 21.63	245°59.23 · · 18.53 261°1.30 18.57	324°51.31 · · 10.91 339°53.49 10.80	4
10	350°7.89	353° 22.00 16.58	235°40.76 21.44	276° 3.38 18.62	354°55.68 10.68	Ri
12	5° 10.36	8°25.66 N07°15.69	250°42.43 N24°21.26	291°5.45 N22°18.67	9°57.86 S04°10.56	_
13	20° 12.82	23°29.33 14.80	265°44.10 21.07	306° 7.52 18.71	25°0.04 10.44	Z
14	$35^{\circ}15.29$	38°32.99 13.91	280° 45.77 20.88	321°9.60 18.76	40°2.23 10.33	'
15	$50^{\circ}17.75$	53°36.65 · · 13.03	295°47.44 •• 20.69	336°11.67 · · 18.81	55°4.41 · · 10.21	
16	65°20.21	68°40.30 12.14	310°49.10 20.50	351°13.74 18.85	70°6.59 10.09	
17	80°22.68	83°43.96 11.25	325°50.77 20.32	6°15.81 18.90	85°8.78 9.97	
18	95°25.14	98°47.61 N07°10.36	340°52.44 N24°20.13	21°17.89 N22°18.94	100°10.96 S04°9.86	Ras
19	110°27.61	113°51.26 9.47	355°54.10 19.94	36°19.96 18.99	115°13.14 9.74	
20 21	125°30.07 140°32.53	128° 54.91 8.58 143° 58.55 •• 7.69	10°55.77 19.75 25°57.43 · · 19.56	51°22.03 19.04 66°24.10 • 19.08	130°15.33 9.62 145°17.51 • 9.51	Ka
22	140 32.53 155° 35.00	159°2.19 6.80	40°59.09 19.37	81°26.17 19.13	160°19.70 9.39	
23	170° 37.46	174°5.83 5.90	56°0.76 19.18	96°28.24 19.18	175°21.88 9.27	
Mer.p	pass. 11:39	ν3.7' d-0.9' m-4.13	ν1.7' d-0.2' m0.34	ν2.1' d0.0' m-2.13	ν2.2' d-0.1' m1.15	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	185° 39.93	189°9.47 N07°5.01	71°2.42 N24°18.99	111°30.31 N22°19.22	190°24.06 S04°9.15	-
1	200°42.39	204° 13.10 4.12	86°4.08 18.80	126°32.38 19.27	205°26.25 9.04	Fo
2	215° 44.85	219° 16.73 3.23	101°5.74 18.61	141°34.45 19.32	220°28.43 8.92	
3	230°47.32	234°20.36 · · 2.34	116°7.40 · · 18.42	156°36.52 · · 19.36	235°30.61 · · 8.80	
4	$245^{\circ}49.78$	249°23.99 1.44	131°9.06 18.23	171°38.59 19.41	250°32.80 8.69	Mar
5	260° 52.25	264°27.62 07°0.55	146° 10.72 18.04	186°40.66 19.46	265°34.98 8.57	
6	275°54.71	279°31.24 N06°59.66	161°12.38 N24°17.85	201°42.73 N22°19.50	280°37.17 S04°8.45	
7	290°57.17	294°34.86 58.76	176° 14.03 17.66	216°44.80 19.55	295°39.35 8.33	
8	305°59.64	309°38.47 57.87	191°15.69 17.47	231°46.87 19.59	310°41.53 8.22	
9	321°2.10 336°4.57	324°42.09 · · 56.97	206°17.35 · · 17.28	246°48.94 · · 19.64	325°43.72 · · 8.10	Mar
10 11	336°4.57 351°7.03	339°45.70 56.08 354°49.31 55.18	221°19.00 17.09 236°20.65 16.90	261°51.01 19.69 276°53.08 19.73	340°45.90 7.98 355°48.09 7.87	
12	6°9.49	9°52.91 N06°54.29	251°22.31 N24°16.71	276 53.08 19.73 291°55.14 N22°19.78	10°50.27 S04°7.75	
13	21°11.96	24°56.52 53.39	266°23.96 16.52	306°57.21 19.83	25°52.45 7.63	
14	36° 14.42	40°0.12 52.50	281°25.61 16.33	321°59.28 19.87	40°54.64 7.51	
15	$51^{\circ}16.89$	55°3.72 · · 51.60	296°27.26 · · 16.13	337°1.35 · · 19.92	55°56.82 · · 7.40	Ма
16	66° 19.35	70°7.31 50.70	311°28.91 15.94	352° 3.41 19.97	70°59.01 7.28	
17	81°21.81	85°10.90 49.81	326°30.56 15.75	7°5.48 20.01	86°1.19 7.16	
18	96°24.28	100°14.49 N06°48.91	341°32.21 N24°15.56	22°7.54 N22°20.06	101°3.38 S04°7.05	
19	111°26.74	115°18.08 48.01	356° 33.86 15.37	37°9.61 20.11	116° 5.56 6.93	
20 21	126° 29.21 141° 31.67	130°21.67 47.12 145°25.25 •• 46.22	11°35.51 15.17 26°37.16 · · 14.98	52°11.68 20.15 67°13.74 · · 20.20	131°7.74 6.81 146°9.93 •• 6.70	
22	141 31.07 156° 34.13	145 25.25 · · 40.22 160°28.83 45.32	41°38.80 14.79	82°15.81 20.25	161°12.11 6.58	
23	171°36.60	175°32.40 44.43	56° 40.45 14.59	97°17.87 20.29	176°14.30 6.46	L
	pass. 11:35	ν3.6' d-0.9' m-4.05	ν1.7' d-0.2' m0.36	ν2.1' d0.0' m-2.13	ν2.2' d-0.1' m1.16	
- iviei.	Juss. 11.33	ν σ.υ α-υ. σ III-4.03	ν 1.1 u-υ.∠ III∪.30	ν Δ.1 UU.U III-2.13	ν Δ.Δ. U-U.1 III1.1U	

	SHA	Dec
Alpheratz	357°34.97	29°13.66
Ankaa	353°7.37	-42°10.22
Schedar Diphda	349°31.46 348°47.44	56°40.50 -17°51.01
Achernar	335°20.56	-17 51.01 -57°6.64
Hamal	327°51.32	23°34.86
Polaris	$314^{\circ}20.04$	89°22.43
Acamar	315°11.94	-40°12.39
Menkar Mirfak	314°6.21 308°28.37	4°11.23 49°57.14
Aldebaran	290°39.58	49 57.14 16°33.58
Rigel	281°3.80	-8°10.48
Capella	$280^{\circ}21.78$	$46^{\circ}1.53$
Bellatrix	278°22.78	6°22.29
Elnath Alnilam	278°1.74 275°37.62	28°37.77 -1°11.25
Betelgeuse	270°51.94	7°24.65
Canopus	263°52.33	-52°42.79
Sirius	$258^{\circ}26.07$	$-16^{\circ}45.21$
Adhara	255°5.69	-29°0.59
Procyon Pollux	244°50.56 243°16.97	5°9.54 27°57.95
Avior	234° 14.41	-59°35.65
Suhail	222°45.93	-43°32.28
Miaplacidus	221°37.72	-69°49.44
Alphard	217°47.37	-8°46.22
Regulus Dubhe	207°33.99 193°40.12	11°50.55 61°36.93
Dubhe	193°40.12 182°24.45	61°36.93 14°25.74
Gienah	175°43.10	-17°41.06
Acrux	$172^{\circ}59.29$	-63°14.40
Gacrux	171°50.93	-57°15.34
Alioth	166°12.22 158°21.82	55°49.24 -11°17.72
Spica Alkaid	150 21.02 152°51.39	49°11.03
Hadar	148°35.24	-60°29.64
Menkent	$147^{\circ}57.09$	-36°29.69
Arcturus	145°47.45	19°2.85
Rigil Kent. Kochab	139°39.56 137°18.79	-60°56.31 74°2.81
Zuben'ubi	137 16.79 136°55.57	-16°8.90
Alphecca	126° 3.35	26°37.51
Antares	112°15.46	-26°29.30
Atria	107°9.36 102°2.48	-69°4.15 -15°45.45
Sabik Shaula	96°10.05	-15 45.45 -37°7.26
Rasalhague	95°58.32	12°32.25
Eltanin	90°42.04	$51^{\circ}28.72$
Kaus Aust.	83°32.28	-34°22.31
Vega Nunki	80°33.13 75°47.59	38°48.05 -26°15.92
Altair	61°59.91	8°55.88
Peacock	53°5.71	-56°39.08
Deneb	49°25.96	45°21.89
Enif	33°38.88	9°59.25
Al Na'ir Fomalhaut	27°33.05 15°14.64	-46°50.30 -29°29.38
Scheat	13°45.39	28°13.00
Markab	13°30.04	15°20.30
Mar 26 Wed	SHA	Mer.pass
Venus	$2^{\circ}30.66$	11:32
Mars	246°0.17	19:19
Jupiter Saturn	286° 9.00 4° 57.62	16:38 11:24
Mar 27 Thu Venus	<b>SHA</b> 3°0.73	Mer.pass 11:26
Mars	245°41.54	19:16
Jupiter	$285^{\circ}59.76$	16:35
Saturn	4°50.87	11:20
Mar 28 Fri	SHA	Mer.pass
Venus	3°29.54	11:21
Mars	245°22.49	19:14
Jupiter Saturn	285°50.39 4°44.14	16:32 11:17
		11.11
Horizor	ntal parallax Venus:	0.5
	Mars:	0.1

Stars

h	Su	n		-011 -	_ +09.1421 Moon		
Wed 0	<b>GHA</b> 178° 34.33	<b>Dec</b> N02°12.98	<b>GHA</b> 221°39.88	u 9.5'	<b>Dec</b> \$18° 26.34	d -13.4'	<b>HP</b> 58.7'
1	170 34.53 193°34.52	13.96	236°8.38	9.5'	18°12.98	-13.5'	58.8'
2	208°34.71	14.95	250°36.91	9.6'	17°59.50	-13.6'	58.8'
3	223°34.89	•• 15.93	265° 5.49	9.6'	$17^{\circ}45.90$	-13.7'	58.8'
4	238°35.08	16.91	279°34.10	9.7'	17°32.19	-13.8'	58.9'
5 6	253°35.27 268°35.46	17.89 N02°18.87	294°2.76 308°31.45	9.7' 9.7'	17°18.36 \$17°4.42	-13.9' -14.1'	58.9' 58.9'
7	283°35.65	19.85	323° 0.18	9. <i>1</i> 9.8'	16°50.36	-14.1 -14.2'	59.0'
8	298°35.83	20.83	337°28.94	9.8'	16°36.19	-14.3'	59.0'
9	313°36.02	• • 21.81	351°57.74	9.8'	$16^{\circ}21.92$	-14.4'	59.1'
10	328°36.21	22.79	6°26.58	9.9'	16°7.53	-14.5'	59.1'
11	343°36.40 358°36.59	23.77 N02°24.75	20°55.45 35°24.36	9.9' 9.9'	15°53.04 \$15°38.44	-14.6' -14.7'	59.1' 59.2'
12 13	13° 36.78	25.73	35 24.30 49°53.31	9.9 10.0'	15°23.74	-14.7 -14.8'	59.2'
14	28°36.96	26.71	64°22.28	10.0'	15°8.93	-14.9'	59.3'
15	43°37.15	• • 27.69	$78^{\circ}51.29$	10.0'	$14^{\circ}54.02$	-15.0'	59.3'
16	58° 37.34	28.67	93°20.34	10.1'	14°39.01	-15.1'	59.3'
17	73°37.53 88°37.72	29.65 N02°30.63	107°49.41 122°18.52	10.1' 10.1'	14°23.90 \$14°8.69	-15.2' -15.3'	59.4' 59.4'
18 19	103°37.90	31.61	122 18.52 136°47.65	10.1	13°53.39	-15.3 -15.4'	59.4 59.4'
20	118°38.09	32.59	151°16.82	10.2'	13°37.99	-15.5'	59.5'
21	133°38.28	• • 33.57	165°46.02	10.2'	$13^{\circ}22.50$	-15.6'	59.5'
22	148°38.47	34.55	180°15.24	10.3'	13°6.91	-15.7'	59.5'
23	163°38.66	35.53	194°44.50	10.3'	12°51.24	-15.8'	59.6'
	SD = 16.0'	d = 1.0'		SI	O = 16.0'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 38.84	N02°36.51	209°13.78	10.3'	\$12°35.47	-15.9'	59.6'
1	193°39.03	37.49	223°43.09	10.3'	12°19.62	-15.9'	59.7'
2	208° 39.22	38.47	238°12.42	10.4'	12°3.68	-16.0'	59.7'
3	223°39.41	• • 39.45	252°41.78 267°11.16	10.4	11°47.66 11°31.55	-16.1'	59.7'
4 5	238°39.60 253°39.79	40.43 41.41	281°40.56	10.4' 10.4'	11° 31.55 11° 15.36	-16.2' -16.3'	59.8' 59.8'
6	268° 39.97	N02°42.39	296° 9.99	10.4	\$10°59.09	-16.3	59.8'
7	283°40.16	43.36	310°39.44	10.5'	10°42.74	-16.4'	59.9'
8	298° 40.35	44.34	325°8.91	10.5'	10°26.31	-16.5'	59.9'
9	313° 40.54	• • 45.32	339°38.39	10.5'	10°9.81	-16.6'	59.9'
10 11	328°40.72 343°40.91	46.30 47.28	354°7.90 8°37.43	10.5' 10.5'	09°53.24 09°36.59	-16.6' -16.7'	60.0' 60.0'
12	358°41.10	N02°48.26	23° 6.97	10.6	S09°19.87	-16.8	60.0'
13	13°41.29	49.24	$37^{\circ}36.52$	10.6'	09°3.08	-16.9'	60.1'
14	28°41.48	50.21	52°6.09	10.6'	08°46.22	-16.9'	60.1'
15 16	43°41.66 58°41.85	· · 51.19 52.17	66°35.68 81°5.28	10.6' 10.6'	08°29.30 08°12.32	-17.0'	60.1' 60.1'
16 17	73° 42.04	53.15	95°34.89	10.6'	06 12.32 07°55.27	-17.0' -17.1'	60.2
18	88° 42.23	N02°54.12	110° 4.51	10.6'	S07°38.16	-17.2	60.2
19	103°42.42	55.10	124°34.14		$07^{\circ}20.99$		60.2'
20	118° 42.60	56.08	139°3.77	10.6'	07°3.76	-17.3'	60.3'
21 22	133° 42.79 148° 42.98	· · 57.06 58.03	153°33.42 168°3.07	10.7' 10.7'	06°46.48 06°29.15	-17.3' -17.4'	60.3' 60.3'
23	163° 43.17	59.01	182°32.73	10.7'	06°29.13	-17.4'	60.4
	SD = 16.0'	d = 1.0'			D = 16.3'		
	3D = 10.0	<u>u = 1.0</u>		JI	J = 10.5		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178° 43.36	N02°59.99	197°2.39	10.7'	S05°54.32	-17.5'	60.4
1 2	193° 43.54 208° 43.73	0.97 1.94	211°32.05 226°1.72	10.7' 10.7'	05°36.83 05°19.30	-17.5' -17.6'	60.4' 60.4'
3	206 43.73 223°43.92	. 2.92	240°31.38	10.7'	05 19.30 05°1.72	-17.6'	60.5
4	238° 44.11	3.90	255° 1.05	10.7'	04°44.10	-17.7'	60.5
5	253° 44.29	4.87	269°30.71	10.7'	04°26.43	-17.7'	60.5
6	268° 44.48	N03° 5.85	284° 0.38 298° 30.03	10.7'	\$04°8.73 03°50.99	-17.7'	60.5'
7 8	283°44.67 298°44.86	6.83 7.80	298°30.03 312°59.69	10.7' 10.6'	03°50.99 03°33.21	-17.8' -17.8'	60.6' 60.6'
9	313° 45.04	• • 8.78	327°29.33	10.6'	03°15.40	-17.8'	60.6
10	328° 45.23	9.75	$341^{\circ}58.97$	10.6'	$02^{\circ}57.56$	-17.9'	60.6'
11	343° 45.42	10.73	356°28.60	10.6'	02°39.68	-17.9'	60.7'
12 13	358° 45.61 13° 45.79	N03°11.71 12.68	10°58.22 25°27.83	10.6' 10.6'	\$02°21.78 02°3.85	-17.9'	60.7' 60.7'
13 14	13°45.79 28°45.98	12.68	25° 27.83 39° 57.43	10.6'	02°3.85 01°45.90	-18.0' -18.0'	60.7'
15	43°46.17	14.63	54°27.01	10.6'	01°27.92	-18.0'	60.7
16	58°46.36	15.61	68°56.58	10.6'	01°9.92	-18.0'	60.8'
17	73° 46.54	16.58	83°26.13	10.5'	00°51.91	-18.0'	60.8'
18	88°46.73 103°46.92	N03°17.56	97°55.67 112°25.19	10.5' 10.5'	\$00°33.87 \$00°15.83	-18.0'	60.8'
19 20	103°46.92 118°47.11	18.53 19.51	112°25.19 126°54.69	10.5'	N00°2.23	-18.1' 18.1'	60.8' 60.8'
21	133° 47.29	. 20.48	141°24.16	10.5'	00°20.31	18.1	60.9
22	148° 47.48	21.46	155°53.62	10.4'	00°38.39	18.1'	60.9'
23	163° 47.67	22.43	170°23.05	10.4'	00°56.47	18.1'	60.9'
	SD = 16.0'	d = 1.0'		SI	O = 16.5'		
	_		_				

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	26-28	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	16-3%	
26	05:43	05:34	12:06	09:33	21:59		
27	05:25	05:16	12:05	10:24	22:49		
28	05:07	04:58	12:05	11:15	23:40		

h	Aries	Venus	Mars	Jupiter	Saturn
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	186° 39.06	190°35.98 N06°43.53	71°42.09 N24°14.40	112°19.94 N22°20.34	191°16.48
1	201°41.53	205°39.55 42.63	86°43.74 14.21	127°22.00 20.39	206°18.67 6.23
2	216°43.99	220° 43.12 41.73	101°45.38 14.01	142°24.07 20.43	221°20.85 6.11
3	231°46.45	235°46.68 · · 40.83	116° 47.02 · · 13.82	157°26.13 · · 20.48	236°23.04 · · 6.00
4	246°48.92	250°50.24 39.94	131°48.67 13.63	172°28.20 20.53	251°25.22 5.88
5	261°51.38	265°53.80 39.04	146°50.31 13.43	187°30.26 20.57	266°27.40 5.76
6	276° 53.85	280°57.36 N06°38.14	161°51.95 N24°13.24	202°32.32 N22°20.62	281°29.59
7	291°56.31	296°0.92 37.24	176°53.59 13.05	217°34.39 20.67	296°31.77 5.53
8	306°58.77	311°4.47 36.34	191°55.23 12.85	232°36.45 20.71	311°33.96 5.41
9	322°1.24	326°8.02 · · 35.45	206° 56.87 · · 12.66	247°38.51 · · 20.76	326°36.14 · · 5.30
10	337°3.70	341°11.56 34.55	221°58.51 12.46	262°40.57 20.80	341°38.33 5.18
11	$352^{\circ}6.17$	356° 15.10 33.65	237°0.14 12.27	277°42.64 20.85	356°40.51 5.06
12	7°8.63	11°18.64 N06°32.75	252°1.78 N24°12.07	292°44.70 N22°20.90	11°42.70 S04°4.95
13	$22^{\circ}11.09$	26°22.18 31.85	267°3.42 11.88	307°46.76 20.94	26°44.88 4.83
14	$37^{\circ}13.56$	41°25.71 30.95	282°5.05 11.68	322°48.82 20.99	41°47.07 4.71
15	$52^{\circ}16.02$	56°29.25 · · 30.06	$297^{\circ}6.69 \cdot \cdot 11.49$	337°50.88 · · 21.04	56°49.25 · · 4.60
16	67° 18.49	71°32.77 29.16	312°8.32 11.29	352°52.95 21.08	71°51.44 4.48
17	82°20.95	86°36.30 28.26	327°9.95 11.09	7°55.01 21.13	86°53.62 4.36
18	97°23.41	101°39.82 N06°27.36	342°11.58 N24°10.90	22°57.07 N22°21.18	101°55.81
19	112° 25.88	116°43.34 26.46	357° 13.22 10.70	37°59.13 21.22	116°57.99 4.13
20	127°28.34	131°46.86 25.56	12°14.85 10.51	53° 1.19 21.27	132°0.18 4.01
21	142°30.81	146°50.37 · · 24.67	27°16.48 · · 10.31	68° 3.25 · · 21.32	147°2.36 · · 3.90
22	157° 33.27	161°53.88 23.77	42°18.11 10.11	83°5.31 21.36	162°4.55 3.78
23	172°35.73	176°57.39 22.87	57°19.74 9.92	98°7.37 21.41	177°6.73 3.66
Mer.	pass. 11:32	ν3.6′ d-0.9′ m-4.06	$\nu$ 1.6′ <i>d</i> -0.2′ m0.38	$\nu 2.1' \ d0.0' \ \text{m-}2.12$	ν2.2' d-0.1' m1.16
					CIIA
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	187° 38.20	192°0.89 N06°21.97	72°21.37 N24°9.72	113°9.43 N22°21.46	192°8.92 S04°3.55
1	202°40.66	207°4.40 21.07	87°22.99 9.52	128°11.49 21.50	207°11.10 3.43
2	217°43.13	222°7.89 20.17	102°24.62 9.32	143°13.54 21.55	222°13.29 3.32
3	232°45.59	237°11.39 · · 19.28	117°26.25 · · 9.13	158°15.60 · · 21.60	237°15.47 · · · 3.20
4	247°48.05	252°14.88 18.38	132°27.87 8.93	173°17.66 21.64	252°17.66 3.08
5	262°50.52	267°18.37 17.48	147°29.50 8.73 162°31.12 N24°8.53	188°19.72 21.69 203°21.78 N22°21.74	267°19.84 2.97 282°22.03 \$04°2.85
6	277° 52.98	282°21.86 N06°16.58			
7	292°55.45	297°25.34 15.69	177°32.75 8.34	218°23.84 21.78	297°24.21 2.73
8 9	307°57.91 323°0.38	312°28.82 14.79 327°32.30 · · 13.89	192°34.37 8.14 207°35.99 · · 7.94	233°25.89 21.83 248°27.95 · · 21.88	312°26.40 2.62 327°28.58 · · 2.50
	323 0.38 338°2.84	327°32.30 ·· 13.89 342°35.77 13.00	207 35.99 · · 7.94 222°37.61 7.74	248°27.95 · · 21.88 263°30.01 21.92	327°28.58 · · 2.50 342°30.77 2.39
10 11	358 2.84 353°5.30	357°39.24 12.10	222 37.01 7.74 237°39.23 7.54	278°32.06 21.97	342 30.77 2.39 357°32.96 2.27
12	8°7.77	12°42.71 N06°11.20	252°40.85 N24°7.34	293°34.12 N22°22.02	12°35.14 S04°2.15
13	23° 10.23	27°46.18 10.31	267° 42.47 7.14	308°36.18 22.06	27°37.33 2.04
14	38° 12.70	42°49.64 9.41	282°44.09 6.94	323°38.23 22.11	42°39.51 1.92
15	53° 15.16	57°53.10 · · 8.52	297°45.71 · · 6.75	338°40.29 · · 22.16	57°41.70 · · 1.80
16	68° 17.62	72°56.55 7.62	312°47.33 6.55	353°42.34 22.20	72°43.88 1.69
17	83°20.09	88°0.00 6.72	327°48.94 6.35	8°44.40 22.25	87°46.07 1.57
18	98° 22.55	103°3.45 N06°5.83	342°50.56 N24°6.15	23°46.46 N22°22.30	102°48.25 S04°1.46
19	113° 25.02	118°6.90 4.93	357° 52.18 5.95	38°48.51 22.34	117°50.44 1.34
20	128° 27.48	133°10.34 4.04	12°53.79 5.75	53°50.57 22.39	132°52.63 1.22
21	143°29.94	148°13.78 · · 3.14	27°55.41 · · 5.55	68°52.62 · · 22.44	147°54.81 · · 1.11
22	158° 32.41	163°17.22 2.25	42°57.02 5.35	83°54.67 22.48	162°57.00 0.99
23	173°34.87	178°20.65 1.36	57°58.63 5.14	98°56.73 22.53	177°59.18 0.88
Meri	pass. 11:28	ν3.5' d-0.9' m-4.12	ν1.6' d-0.2' m0.40	ν2.1' d0.0' m-2.12	ν2.2' d-0.1' m1.16
			71.0 d 0.2 mo.10		
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	188° 37.34	193°24.08 N06°0.46	73°0.24 N24°4.94	113°58.78 N22°22.58	193°1.37
1	203° 39.80	208°27.50 05°59.57	88°1.86 4.74	129° 0.84 22.62	208°3.56 0.64
2	218° 42.26	223°30.93 58.68	103°3.47 4.54	144°2.89 22.67	223°5.74 0.53
3	233° 44.73	238°34.35 · · 57.78	118°5.08 · · 4.34	159° 4.94 · · 22.72	238°7.93 · · 0.41
4	248° 47.19	253°37.77 56.89	133°6.69 4.14	174° 6.99 22.76	253°10.11 0.30
5	263°49.66	268°41.18 56.00	148°8.30 3.94	189° 9.05 22.81	268°12.30 0.18
6	278°52.12	283°44.59 N05°55.11	163°9.90 N24°3.74	204°11.10 N22°22.86	283°14.49
7	293°54.58	298°48.00 54.22	178°11.51 3.53	219°13.15 22.90	298°16.67 03°59.95
8	308°57.05	313°51.40 53.33	193°13.12 3.33	234°15.20 22.95	313°18.86 59.83
9	323°59.51	328°54.80 · · 52.43	208°14.72 · · 3.13	249°17.26 · · 23.00	328°21 04 · · 59 72
10	339°1.98	343°58.20 51.54	223°16.33 2.93	264°19.31 23.04	343°23.23 59.60
11	354°4.44	359°1.59 50.65	238°17.93 2.72	279°21.36 23.09	358°25.42 59.49
12	9°6.91	14°4.98 N05°49.76	253°19.54 N24°2.52	294°23.41 N22°23.14	13°27.60
13	24°9.37	29°8.37 48.88	268°21.14 2.32	309°25.46 23.18	28°29.79 59.25
14	$39^{\circ}11.83$	44°11.75 47.99	283°22.75 2.12	324°27.51 23.23	43°31.98 59.14
15	54° 14.30	59° 15.13 · · 47.10	298°24.35 · · 1.91	339°29.56 · · 23.28	58°34.16 · · 59.02 N
16	69° 16.76	74° 18.51 46.21	313°25.95 1.71	354°31.61 23.32	73°36.35 58.91
17	84° 19.23	89°21.89 45.32	328°27.55 1.51	9°33.66 23.37	88°38.53 58.79
18	99°21.69	104°25.26 N05°44.44	343°29.15 N24°1.30	24°35.71 N22°23.42	103°40.72 S03°58.67
19	114°24.15	119°28.62 43.55	358°30.75 1.10	39°37.76 23.46	118°42.91 58.56
20	129° 26.62	134°31.99 42.66	13°32.35 0.89	54°39.81 23.51	133°45.09 58.44
21	144°29.08	149°35.35 · · 41.78	28°33.95 · · 0.69	69°41.86 · · 23.56	148°47.28 · · 58.33
22	159°31.55	164°38.70 40.89	43°35.55 0.49	84°43.91 23.60	163°49.47 58.21
23	174° 34.01	179°42.06 40.01	58°37.14 0.28	99°45.96 23.65	178°51.65 58.10
Mer.	pass. 11:24	$ u 3.4' \ d$ -0.9' m-4.18	$\nu 1.6' \ d$ -0.2' m0.42	$\nu 2.1' \ d0.0' \ \text{m-}2.11$	$ u 2.2' \ d$ -0.1' m1.16

Stars SHA

357°34.97 353°7.37

349°31 47

348°47.44

 $335^{\circ}20.57$ 

 $327^{\circ}51.33$ 

 $314^{\circ}21.06$ 

315°11.96

 $314^{\circ}6.22$ 

308°28.39 290°39.59

281°3.82

280°21.80

278°22.80

 $278^{\circ}1.76$ 

Alpheratz

Ankaa Schedar

Diphda Achernar

Hamal

**Polaris** 

Acamar

Menkar

Mirfak

Capella

Bellatrix

Elnath

Aldebaran Rigel **Dec** 29° 13.66

-42°10.20

56° 40.48 -17° 51.00

-57°6.63

 $23^{\circ}34.85$ 

89°22.42

-40°12.38

49°57.13

16°33.58

-8°10.47

 $46^{\circ}1.53$ 

 $6^{\circ}22.29$ 

28°37.77

4°11.23

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.86	N03°23.41	184°52.46	10.4	N01°14.57	18.1'	60.9'
1	193°48.04	24.38	$199^{\circ}21.84$	10.4'	01°32.66	18.1'	60.9'
2	208°48.23	25.36	213°51.19	10.3'	01°50.76	18.1'	60.9'
3	223°48.42	• • 26.33	228°20.52	10.3'	02°8.86	18.1'	61.0'
4	238°48.60	27.31	242°49.81	10.3'	02°26.95	18.1'	61.0'
5 6	253°48.79 268°48.98	28.28 N03°29.25	257°19.08 271°48.31	10.2' 10.2'	02°45.04 N03°3.12	18.1' 18.1'	61.0' 61.0'
7	283°49.17	30.23	286°17.52	10.2'	03°21.19	18.1	61.0'
8	298°49.35	31.20	300°46.68	10.1'	03°39.25	18.0'	61.0'
9	313°49.54	• • 32.17	315°15.81	10.1'	03°57.29	18.0'	61.0'
10	328°49.73	33.15	329°44.91	10.1'	04°15.32	18.0'	61.0'
11	343°49.91	34.12	344°13.96	10.0'	04°33.34	18.0'	61.1'
12	358°50.10 13°50.29	N03°35.09	358°42.98 13°11.95	10.0'	N04°51.33 05°9.30	18.0'	61.1'
13 14	28°50.48	36.07 37.04	27°40.89	9.9' 9.9'	05°27.25	17.9' 17.9'	61.1' 61.1'
15	43°50.66	38.01	42°9.78	9.8'	05°45.17	17.9	61.1'
16	58°50.85	38.99	56°38.63	9.8'	06°3.06	17.9'	61.1'
17	73°51.04	39.96	71°7.43	9.8'	06°20.92	17.8'	61.1'
18	88°51.22	N03°40.93	85°36.19	9.7'	N06°38.75	17.8'	61.1'
19	103°51.41	41.90	100°4.90	9.7'	06°56.55	17.8'	61.1'
20	118°51.60	42.87	114°33.55	9.6'	07°14.31	17.7'	61.1'
21 22	133°51.78 148°51.97	· · 43.85 44.82	129°2.16 143°30.72	9.6' 9.5'	07°32.03 07°49.71	17.7' 17.6'	61.1' 61.1'
22	148°51.97 163°52.16	44.82 45.79	143°30.72 157°59.23	9.5' 9.5'	07°49.71 08°7.35	17.6' 17.6'	61.1'
20						11.0	01.1
	SD = 16.0'	d = 1.0'		SE	D = 16.6'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°52.34	N03°46.76	172°27.68	9.4'	N08°24.94	17.5'	61.1'
1	193°52.53 208°52.72	47.73 48.71	186°56.08 201°24.43	9.3' 9.3'	08°42.48 08°59.97	17.5' 17.4'	61.1' 61.1'
2	208 52.72 223°52.90	48.71 •• 49.68	201 24.43 215°52.72	9.3 9.2'	08 59.97 09°17.41	17.4 17.4'	61.1
4	238°53.09	50.65	230°20.95	9.2	09°17.41	17.3	61.1'
5	253°53.28	51.62	244°49.12	9.1'	09°52.13	17.3'	61.1'
6	268°53.46	N03°52.59	259°17.23	9.1'	N10°9.41	17.2'	61.1'
7	283°53.65	53.56	273°45.28	9.0'	10°26.62	17.2'	61.1'
8	298°53.84	54.53	288°13.27	8.9'	10°43.77	17.1'	61.1'
9	313°54.02	• • 55.50	302°41.20	8.9'	11°0.86	17.0'	61.1'
10 11	328°54.21 343°54.39	56.47 57.44	317°9.06 331°36.86	8.8' 8.7'	11°17.88 11°34.83	16.9' 16.9'	61.1' 61.1'
12	358° 54.58	N03°58.41	346°4.60	8.7'	N11°51.71	16.8	61.1
13	13°54.77	03°59.38	0°32.27	8.6'	12°8.51	16.7	61.1'
14	28°54.95	04°0.35	14°59.87	8.5'	12°25.24	16.7'	61.1'
15	43°55.14	• • 1.32	29°27.40	8.5'	12°41.89	16.6'	61.1'
16	58°55.33	2.29	43°54.86	8.4'	12°58.46	16.5'	61.1'
17	73°55.51	3.26	58°22.26	8.3'	13°14.95	16.4'	61.1'
18	88°55.70 103°55.88	N04°4.23	72°49.58 87°16.84	8.3'	N13°31.36 13°47.68	16.3' 16.2'	61.1'
19 20	103 55.88 118°56.07	5.20 6.17	101°44.02	8.2' 8.1'	13 47.08 14°3.91	16.2	61.1' 61.1'
21	133°56.26	• • 7.14	101 44.02 116°11.13	8.0'	14 3.91 14°20.05	16.1	61.1
22	148°56.44	8.11	130°38.17	8.0'	14°36.10	16.0'	61.1'
23	163°56.63	9.08	145°5.13	7.9'	14°52.05	15.9'	61.1'
	SD = 16.0'	d = 1.0'		SE	O = 16.7'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 56.81	N04°10.05	159°32.02	7.8'	N15°7.91	15.8'	61.1'
1	193°57.00	11.01	173°58.83	7.7'	$15^{\circ}23.66$	15.7'	61.0'
2	208°57.18	11.98	188°25.57	7.7'	15°39.32	15.6'	61.0'
3	223°57.37	• • 12.95	202°52.23	7.6'	15°54.87	15.4'	61.0'
4 5	238°57.56 253°57.74	13.92 14.89	217°18.81 231°45.32	7.5' 7.4'	16°10.32 16°25.66	15.3' 15.2'	61.0' 61.0'
6	253°57.74 268°57.93	14.89 N04°15.86	231°45.32 246°11.75	7.4	N16°40.88	15.2	61.0'
7	283°58.11	16.82	260°38.10	7.4	16°56.00	15.1	61.0'
8	298°58.30	17.79	275°4.38	7.2'	17°11.01	14.9'	61.0'
9	313°58.48	• • 18.76	289°30.57	7.1'	$17^{\circ}25.90$	14.8'	60.9'
10	328°58.67	19.73	303°56.69	7.0'	17°40.67	14.7'	60.9'
11	343°58.86	20.69 N04°21.66	318°22.73	7.0'	17°55.32	14.5'	60.9'
12 13	358°59.04 13°59.23	N04°21.66 22.63	332°48.69 347°14.57	6.9' 6.8'	N18°9.85 18°24.25	14.4' 14.3'	60.9' 60.9'
13 14	28°59.41	22.03	1°40.37	6.8 6.7'	18° 38.53	14.3 14.2'	60.9
15	43°59.60	24.56	16°6.09	6.6'	18°52.69	14.0'	60.8'
16	58°59.78	25.53	30°31.73	6.6'	19°6.71	13.9'	60.8'
17	73°59.97	26.49	44°57.29	6.5'	19°20.60	13.8'	60.8'
18	89° 0.15	N04°27.46	59°22.78	6.4'	N19°34.36	13.6'	60.8'
19	104° 0.34	28.42	73°48.18	6.3'	19°47.98	13.5'	60.8'
20 21	119° 0.52 134° 0.71	29.39 •• 30.36	88°13.50 102°38.75	6.2' 6.2'	20°1.46 20°14.81	13.3' 13.2'	60.7' 60.7'
22	134°0.71 149°0.89	31.32	102°38.75 117°3.91	6.2	20°14.81 20°28.02	13.1	60.7'
23	164° 1.08	32.29	131°29.00	6.0'	20°41.08	12.9'	60.7
	SD = 16.0'	d = 1.0'			0 = 16.7'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	01:58	03:52	05:05	19:06	20:20	22:19
N 70°	02:35	04:07	05:12	19:00	20:05	21:40
68°	03:00	04:18	05:17	18:54	19:53	21:13
66°	03:18	04:28	05:21	18:50	19:43	20:54
64°	03:33	04:36	05:25	18:46	19:35	20:38
62°	03:45	04:43	05:28	18:42	19:28	20:26
60°	03:56	04:48	05:31	18:39	19:22	20:15
N 58°	04:04	04:53	05:33	18:37	19:17	20:06
56°	04:12	04:58	05:35	18:35	19:13	19:59
54°	04:18	05:02	05:37	18:33	19:09	19:52
52°	04:24	05:05	05:39	18:31	19:05	19:46
50°	04:29	05:08	05:41	18:29	19:02	19:41
45°	04:40	05:15	05:44	18:25	18:55	19:30
<b>N</b> 40°	04:48	05:20	05:47	18:22	18:50	19:22
35°	04:54	05:24	05:49	18:20	18:45	19:15
30°	05:00	05:28	05:52	18:18	18:42	19:10
20°	05:07	05:33	05:55	18:14	18:36	19:02
N 10°	05:13	05:37	05:58	18:11	18:32	18:56
0°	05:16	05:40	06:01	18:08	18:28	18:52
<b>S</b> 10°	05:18	05:43	06:04	18:05	18:26	18:50
20°	05:19	05:45	06:07	18:02	18:24	18:49
30°	05:18	05:46	06:10	17:59	18:23	18:50
35°	05:17	05:46	06:11	17:57	18:22	18:51
40°	05:15	05:46	06:13	17:55	18:22	18:53
45°	05:12	05:46	06:15	17:53	18:22	18:56
<b>S</b> 50°	05:08	05:46	06:18	17:50	18:22	19:00
52°	05:06	05:45	06:19	17:49	18:22	19:01
54°	05:04	05:45	06:20	17:48	18:23	19:04
56°	05:01	05:44	06:22	17:46	18:23	19:06
58° <b>S</b> 60°	04:58	05:44	06:23	17:44	18:23	19:09
<b>5</b> 60°	04:55	05:43	06:25	17:43	18:24	19:12

Lat.		Moonris	e		Moonset			
Lat.	Sat	Sun	Mon	Sat	Sun	Mon		
N 72°	05:18	04:35	03:26	19:50	22:54			
N 70°	05:22	04:49	04:03	19:39	22:19			
68°	05:25	05:01	04:29	19:31	21:55			
66°	05:27	05:10	04:50	19:23	21:36			
64°	05:29	05:19	05:06	19:17	21:22	23:38		
62°	05:31	05:26	05:20	19:12	21:09	23:14		
60°	05:33	05:32	05:32	19:07	20:59	22:55		
N 58°	05:34	05:38	05:42	19:04	20:50	22:40		
56°	05:36	05:42	05:51	19:00	20:42	22:26		
54°	05:37	05:47	05:59	18:57	20:35	22:15		
52°	05:38	05:51	06:06	18:54	20:28	22:05		
50°	05:39	05:55	06:13	18:51	20:23	21:56		
45°	05:41	06:03	06:27	18:46	20:11	21:37		
N 40°	05:43	06:09	06:39	18:41	20:01	21:22		
35°	05:45	06:15	06:49	18:37	19:52	21:09		
30°	05:46	06:20	06:58	18:34	19:45	20:58		
20°	05:49	06:29	07:13	18:28	19:32	20:39		
N 10°	05:51	06:38	07:27	18:22	19:21	20:22		
0°	05:53	06:45	07:40	18:17	19:11	20:07		
<b>S</b> 10°	05:55	06:53	07:53	18:13	19:00	19:51		
20°	05:58	07:01	08:07	18:07	18:49	19:35		
30°	06:01	07:11	08:23	18:01	18:37	19:16		
35°	06:02	07:16	08:32	17:58	18:30	19:06		
40°	06:04	07:23	08:43	17:54	18:22	18:53		
45°	06:06	07:30	08:56	17:50	18:12	18:39		
<b>S</b> 50°	06:09	07:39	09:12	17:44	18:01	18:21		
52°	06:10	07:43	09:19	17:42	17:56	18:13		
54°	06:11	07:48	09:28	17:39	17:50	18:04		
56°	06:13	07:53	09:37	17:36	17:44	17:54		
58° <b>S</b> 60°	06:15 06:16	07:59 08:06	09:48 10:00	17:33	17:37 17:29	17:42 17:29		
<b>5</b> 60°	00:10	00:00	10:00	17:30	17:29	17:29		

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-4%	
29	04:49	04:40	12:05	12:05	-:-		
30	04:31	04:22	12:04	12:58	00:31		
31	04:13	04:04	12:04	13:53	01:25		

h	Aries	, Vei	nus	M	ars	Jup	oiter	Sat	urn		Stars
Tue 0	<b>GHA</b> 189° 36.47	<b>GHA</b> 194° 45.41	<b>Dec</b> N05°39.12	<b>GHA</b> 73°38.74	<b>Dec</b> N24° 0.08	<b>GHA</b> 114°48.00	<b>Dec</b> N22°23.70	<b>GHA</b> 193°53.84	<b>Dec</b> \$03° 57.98		SHA
1	204° 38.94	209° 48.75	38.24	88° 40.34	23°59.87	129°50.05	23.74	208°56.03	57.87	Alpheratz	357°34.96
2	219°41.40	224°52.10	37.36	103°41.93	59.67	144°52.10	23.79	223°58.21	57.75	Ankaa	353°7.36
3	234° 43.87	239°55.44	• • 36.47	118°43.53	• • 59.46	159°54.15	23.84	239°0.40	• • 57.63	Schedar	349°31.45
4	249°46.33	254°58.78	35.59	133°45.12	59.26	174°56.20	23.88	254°2.59	57.52	Diphda	348°47.44
5	264°48.80	270°2.11	34.71	148°46.71	59.05	189°58.24	23.93	269°4.77	57.40	Achernar Hamal	335°20.58 327°51.33
6	279°51.26	285°5.44	N05°33.83	163°48.31	N23°58.84	205° 0.29	N22°23.98	284°6.96	<b>S</b> 03°57.29	Polaris	314°21.63
7	294°53.72	300°8.76	32.95	178°49.90	58.64	220°2.34	24.03	299°9.15	57.17	Acamar	315°11.97
8	309°56.19	315°12.09	32.07	193°51.49	58.43	235°4.38	24.07	314°11.34	57.06	Menkar	314°6.23
9	324° 58.65	330° 15.41	· · 31.19	208°53.08	• • 58.23	250°6.43	• • 24.12	329°13.52	• • 56.94	Mirfak	308°28.40
10 11	340°1.12 355°3.58	345°18.72 0°22.03	30.31 29.43	223°54.67 238°56.26	58.02 57.81	265°8.48 280°10.52	24.17 24.21	344°15.71 359°17.90	56.83 56.71	Aldebaran	290°39.60
12	10°6.04	15° 25.34	N05°28.55	253° 57.85	N23°57.61	295°12.57	N22°24.26	14°20.08	\$03°56.60	Rigel	$281^{\circ}3.83$
13	25°8.51	30°28.65	27.67	268° 59.44	57.40	310°14.61	24.31	29°22.27	56.48	Capella	280°21.82
14	40° 10.97	45°31.95	26.80	284°1.02	57.19	325°16.66	24.35	44°24.46	56.37	Bellatrix	278°22.81
15	55° 13.44	60°35.25	• • 25.92	299°2.61	• • 56.99	340°18.70	• • 24.40	59°26.65	• • 56.25	Elnath	278°1.78
16	$70^{\circ}15.90$	75°38.54	25.04	314°4.20	56.78	355°20.75	24.45	74°28.83	56.13	Alnilam Betelgeuse	275°37.65 270°51.97
17	85° 18.36	90°41.84	24.17	329°5.78	56.57	10°22.79	24.49	89°31.02	56.02	Canopus	263°52.39
18	100°20.83	105°45.12	N05°23.29	344°7.37	N23°56.36	25°24.84	N22°24.54	104°33.21	\$03°55.90	Sirius	258°26.10
19	115°23.29	120°48.41	22.42	359°8.95	56.16	40°26.88	24.59	119°35.39	55.79	Adhara	255°5.72
20 21	130° 25.76 145° 28.22	135°51.69 150°54.97	21.55 •• 20.67	14° 10.54 29° 12.12	55.95 •• 55.74	55°28.92 70°30.97	24.63 •• 24.68	134°37.58 149°39.77	55.67 •• 55.56	Procyon	$244^{\circ}50.59$
22	160°30.69	165° 58.24	19.80	44°13.70	55.53	85°33.01	24.73	164°41.96	55.44	Pollux	243°17.01
23	175°33.15	181°1.51	18.93	59° 15.28	55.32	100°35.05	24.77	179°44.14	55.33	Avior	234°14.46
	11.00									Suhail	222°45.97
ivier.p	pass. 11:20	$\nu$ 3.3 d-0.	.9′ m-4.24	$\nu$ 1.6 $a$ -0	.2′ m0.44	$\nu$ 2.0° $a$ 0.	.0′ m-2.11	$\nu$ 2.2 a-0	.1′ m1.16	Miaplacidus Alphard	221°37.79 217°47.39
										Regulus	217 47.39 207°34.01
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°40.15
0	190°35.61	196°4.78	N05°18.06	74°16.86	N23°55.12	115°37.10	N22°24.82	194°46.33	S03°55.21	Denebola	182°24.45
1	205°38.08	211°8.04	17.19	89° 18.45	54.91	130°39.14	24.87	209°48.52	55.10	Gienah	175°43.09
2	220° 40.54 235° 43.01	226°11.30 241°14.56	16.32 •• 15.45	104°20.03 119°21.60	54.70 •• 54.49	145°41.18 160°43.23	24.91 •• 24.96	224°50.71 239°52.89	54.98 •• 54.87		$172^{\circ}59.28$
4	250° 45.47	256° 17.81	14.58	134°23.18	54.28	175° 45.27	25.01	254°55.08	54.75		171°50.92
5	265°47.93	271°21.06	13.72	149°24.76	54.07	190°47.31	25.05	269°57.27	54.64		166°12.21
6	280° 50.40	286° 24.30	N05°12.85	164°26.34	N23°53.86	205°49.35	N22°25.10	284°59.46	S03°54.52	Spica Alkaid	158°21.81 152°51.37
7	295°52.86	301°27.54	11.98	$179^{\circ}27.92$	53.65	220°51.39	25.15	300°1.65	54.41	Hadar	152 51.37 148°35.20
8	310°55.33	316°30.78	11.12	194°29.49	53.44	235°53.43	25.19	315°3.83	54.29		147°57.06
9	325°57.79	331°34.02	• • 10.25	209°31.07	• • 53.23	250°55.47	• • 25.24	330°6.02	• • 54.18	Arcturus	145°47.43
10	341°0.26	346° 37.25	9.39	224°32.64	53.02	265°57.52	25.29	345°8.21	54.06	Rigil Kent.	139°39.51
11 12	356°2.72 11°5.18	1°40.47 16°43.70	8.53 N05°7.66	239°34.22 254°35.79	52.81 N23°52.60	280°59.56 296°1.60	25.33 N22°25.38	0°10.40 15°12.59	53.95 \$03°53.83	Kochab	137°18.73
13	26°7.65	31°46.92	6.80	269°37.36	52.39	311° 3.64	25.43	30°14.77	53.72	Zuben'ubi	136°55.54
14	41° 10.11	46°50.13	5.94	284°38.94	52.18	326° 5.68	25.47	45°16.96	53.60	Alphecca	126°3.32
15	56° 12.58	61°53.35	• • 5.08	299°40.51	• • 51.97	341°7.72	25.52	60°19.15	• • 53.49	Antares Atria	112°15.42 107°9.26
16	71° 15.04	$76^{\circ}56.55$	4.22	314°42.08	51.76	$356^{\circ}9.76$	25.57	75°21.34	53.37	Sabik	107 9.20 102°2.44
17	86° 17.50	91°59.76	3.36	329° 43.65	51.55	11°11.79	25.61	90°23.53	53.26	Shaula	96°10.00
18	101°19.97	107°2.96	N05° 2.51	344° 45.22	N23°51.33	26°13.83	N22°25.66	105°25.71		Rasalhague	95°58.28
19	116°22.43	122°6.16	1.65	359°46.79	51.12	41°15.87	25.71	120°27.90	53.03	Eltanin	$90^{\circ}41.98$
20 21	131°24.90 146°27.36	137°9.35 152°12.54	05°0.79 04°59.94	14°48.36 29°49.93	50.91 •• 50.70	56°17.91 71°19.95	25.76 •• 25.80	135°30.09 150°32.28	52.91 •• 52.80	Kaus Aust.	83°32.23
22	161°29.83	167° 15.73	59.08	44°51.49	50.49	86°21.99	25.85	165°34.47	52.68	Vega	80°33.08
23	176° 32.29	182°18.91	58.23	59°53.06	50.27	101°24.03	25.90	180°36.66	52.57	Nunki	75°47.54
							.0′ m-2.10			Altair Peacock	61°59.87 53°5.65
ivier.p	pass. 11:16	$\nu$ 3.3° $a$ -0.	.9′ m-4.30	$\nu$ 1.6° $a$ -0	.2′ m0.46	$\nu$ 2.0° $a$ 0.	.0° m-2.10	$\nu$ 2.2 a-0	.1′ m1.16	Deneb	49°25.91
										Enif	33°38.85
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°33.01
0	191°34.75	197°22.09	N04°57.38	74°54.63	N23°50.06	116°26.06	N22°25.94	195°38.84	S03°52.46	Fomalhaut	$15^{\circ}14.62$
1	206° 37.22 221° 39.68	212°25.27 227°28.44	56.53 55.67	89°56.19 104°57.76	49.85 49.64	131°28.10 146°30.14	25.99 26.04	210°41.03 225°43.22	52.34 52.23	Scheat	13°45.37
2 3	221 39.08 236°42.15	242° 31.61	55.07	104 57.76 119°59.32	· · 49.42	146 30.14 161°32.17	. 26.04	225 43.22 240°45.41	52.23	Markab	13°30.02
4	251°44.61	257° 34.78	53.98	135°0.89	49.42	176°34.21	26.13	255°47.60	52.00	Apr 01 Tue	SHA
5	266° 47.08	272°37.94	53.13	150°2.45	49.00	191°36.25	26.18	270°49.79	51.88	Venus	5°8.93
6	281°49.54	287°41.09	N04°52.28	165°4.01	N23°48.78	206°38.28	N22°26.22	285°51.97	S03°51.77	Mars	$244^{\circ}2.27$
7	296°52.00	302°44.25	51.43	180°5.58	48.57	221°40.32	26.27	300°54.16	51.65	Jupiter	
8	311°54.47	317°47.40	50.59	195°7.14	48.36	236°42.36	26.32	315°56.35	51.54	Saturn	4°17.37
9	326° 56.93	332°50.54	• • 49.74	210°8.70	• • 48.14	251°44.39	• • 26.36	330°58.54	• • 51.42	Apr 02 Wed	SHA
10 11	341°59.40 357°1.86	347°53.69 2°56.82	48.90 48.05	225°10.26 240°11.82	47.93 47.71	266°46.43 281°48.46	26.41 26.46	346°0.73 1°2.92	51.31 51.20	Venus	$5^{\circ}29.16$
12	12°4.32		N04°47.21	255°13.38	N23°47.50	296°50.50	N22°26.50		\$03°51.08		243°41.25
13	27°6.79	33°3.09	46.37	270° 14.94	47.29	311°52.53	26.55	31°7.30	50.97	Jupiter	285°1.48
14	$42^{\circ}9.25$	48°6.22	45.53	$285^{\circ}16.50$	47.07	326°54.57	26.60	46°9.49	50.85	Saturn	4°10.72
15	57° 11.72	63°9.34	• • 44.69	300° 18.05	• • 46.86	341°56.60	• • 26.64	61°11.67	•• 50.74	Apr 03 Thu	SHA
16	72°14.18	78°12.46	43.85	315°19.61	46.64	356°58.64	26.69	76°13.86	50.62	Venus	5°47.34
17	87° 16.65	93° 15.58	43.01	330°21.17	46.43	12° 0.67	26.74	91°16.05	50.51		243°19.87
18 19	102° 19.11 117° 21.57	108° 18.69 123° 21.80	N04°42.18 41.34	345°22.72 0°24.28	N23°46.21 45.99	27°2.71 42°4.74	N22°26.78 26.83	106°18.24 121°20.43	\$03°50.40 50.28		284°51.31
20	117 21.57 132°24.04	138° 24.90	40.50	15° 25.83	45.99 45.78	57° 6.77	26.88	121 20.43 136°22.62	50.28	Saturn	4°4.09
21	147°26.50	153° 28.00	39.67	30°27.38	• 45.56	72°8.81	. 26.92	151°24.81	50.05	Horizor	ıtal parallax
22	$162^{\circ}28.97$	168°31.10	38.84	45°28.94	45.35	87°10.84	26.97	166°27.00	49.94		Venus:
23	$177^{\circ}31.43$	183°34.20	38.01	60°30.49	45.13	102°12.87	27.02	181°29.19	49.82		Mars:
Mer.r	pass. 11:12	$\nu$ 3.2′ d-0.	.9′ m-4.35	$\nu 1.6' d-0$	.2′ m0.48	$\nu$ 2.0′ d0.	.0′ m-2.10	$\nu 2.2' \ d-0$	.1′ m1.16		

Dec 29°13.65 -42°10.19 56° 40.47 -17° 51.00  $\text{-}57^{\circ}6.61$  $23^{\circ}34.84$ 89°22.40 -40°12.37 4°11.23 49°57.12 16°33.58 -8°10.48  $46^{\circ}1.52$  $6^{\circ}22.29$ 28°37.76 -1°11.25  $7^{\circ}24.65$ -52°42.79 -16°45.21 -29°0.59 5°9.54 27°57.95 -59°35.67 -43°32.30 -69°49.47 -8°46.23 11°50.55  $61^{\circ}36.95$  $14^{\circ}25.75$ -17°41.07 -63°14.43 -57°15.37 55°49.27 -11°17.72 49°11.05 -60°29.67 -36°29.71  $19^{\circ}2.86$ -60°56.34  $74^{\circ}2.84$ -16°8.91  $26^{\circ}37.52$ -26°29.30 -69°4.16  $\textbf{-15}^{\circ} \textbf{45.45}$  $-37^{\circ}7.26$  $12^{\circ}32.26$ 51°28.73 -34°22.30 38°48.05 -26° 15.92 8° 55.88 -56°39.07  $45^{\circ}21.88$  $9^{\circ}59.25$  $-46^{\circ}50.27$ -29°29.35 28°12.99 15°20.29 Mer.pass 10:59 19:03 16:19 11:03 Mer.pass 10:53 19:01 16:15 10:59 Mer.pass 10:48 18:58 16:12 10:56

> 0.5 0.1

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°1.26	$N04^{\circ}33.25$	$145^{\circ}54.01$	5.9'	N20°54.00	12.8'	60.7'
1	194°1.45	34.22	160°18.94	5.9'	21°6.77	12.6'	60.6'
2	209°1.63 224°1.82	35.18 •• 36.15	174°43.80 189°8.57	5.8' 5.7'	21°19.39 21°31.86	12.5' 12.3'	60.6' 60.6'
4	239°2.00	37.11	203°33.27	5.6'	21°44.18	12.2'	60.6'
5	254°2.19	38.08	217°57.90	5.5'	$21^{\circ}56.35$	12.0'	60.6'
6	269°2.37	N04°39.04	232°22.45	5.5'	N22°8.37	11.9'	60.5
7 8	284°2.56 299°2.74	40.01 40.97	246°46.92 261°11.32	5.4' 5.3'	22°20.22 22°31.92	11.7' 11.5'	60.5' 60.5'
9	314°2.92	• • 41.93	275°35.65	5.3'	22°43.46	11.4	60.5
10	329°3.11	42.90	289°59.91	5.2'	22°54.84	11.2'	60.4'
11	344°3.29	43.86	304°24.09	5.1'	23°6.05	11.0'	60.4'
12 13	359°3.48 14°3.66	N04°44.83 45.79	318°48.21 333°12.25	5.0' 5.0'	N23°17.10 23°27.99	10.9' 10.7'	60.4' 60.4'
14	29°3.85	46.75	347°36.23	4.9'	23°38.70	10.7	60.3
15	44°4.03	• • 47.72	2°0.14	4.8'	23°49.25	10.4	60.3
16	59°4.22	48.68	16°23.98	4.8'	23°59.63	10.2'	60.3'
17	74°4.40	49.64	30°47.76	4.7'	24°9.83	10.0'	60.2'
18 19	89°4.58 104°4.77	N04°50.60 51.57	45°11.47 59°35.12	4.7' 4.6'	N24°19.87 24°29.72	9.9' 9.7'	60.2' 60.2'
20	119°4.95	52.53	73°58.71	4.5'	24° 39.41	9.5'	60.2
21	134°5.14	• • 53.49	88°22.24	4.5'	24°48.91	9.3'	60.1'
22	149°5.32	54.45	102°45.71	4.4'	24°58.24	9.1'	60.1
23	164°5.50	55.41	117°9.13	4.4'	25°7.39	9.0'	60.1'
	SD = 16.0'	d = 1.0'		S	D = 16.5'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°5.69	N04°56.38	131°32.49	4.3'	N25°16.36	8.8'	60.0'
1	194°5.87	57.34	145°55.79	4.3'	25°25.14	8.6'	60.0'
2	209°6.05 224°6.24	58.30 04°59.26	160°19.05 174°42.25	4.2' 4.2'	25°33.75 25°42.17	8.4' 8.2'	60.0' 60.0'
4	239°6.42	05°0.22	189° 5.40	4.1'	25°50.40	8.1	59.9'
5	254°6.61	1.18	203°28.51	4.1'	25°58.45	7.9'	59.9'
6	269°6.79	N05°2.14	217°51.57	4.0'	N26°6.32	7.7'	59.9'
7	284°6.97	3.10	232°14.59	4.0'	26°13.99	7.5'	59.8'
8 9	299°7.16 314°7.34	4.06 • • 5.02	246°37.57 261°0.50	3.9' 3.9'	26°21.48 26°28.78	7.3' 7.1'	59.8' 59.8'
10	329°7.52	5.98	275°23.40	3.9'	26°35.89	6.9'	59.7'
11	344°7.71	6.94	289°46.27	3.8'	$26^{\circ}42.81$	6.7'	59.7'
12	359°7.89	N05°7.90	304°9.10	3.8'	N26°49.54	6.5'	59.7'
13 14	14°8.07 29°8.26	8.86 9.82	318°31.90 332°54.67	3.8' 3.7'	26°56.07 27°2.42	6.3' 6.1'	59.6' 59.6'
15	44°8.44	. 10.78	347°17.41	3.7'	27°8.56	6.0'	59.6'
16	59°8.62	11.74	1°40.13	3.7'	$27^{\circ}14.52$	5.8'	59.5'
17	74°8.80	12.70	16°2.82	3.7'	27°20.28	5.6'	59.5'
18 19	89°8.99 104°9.17	N05°13.66 14.62	30°25.50 44°48.16	3.7' 3.6'	N27°25.85 27°31.22	5.4' 5.2'	59.5' 59.4'
20	119° 9.35	15.58	59°10.80	3.6'	27°36.40	5.2 5.0'	59.4'
21	134°9.54	• • 16.54	73°33.42	3.6'	27°41.38	4.8'	59.4'
22	149°9.72	17.49	87°56.04	3.6'	27°46.17	4.6'	59.3'
23	164°9.90	18.45	102°18.65	3.6'	27°50.76	4.4'	59.3'
	SD = 16.0'	d = 1.0'		5	D = 16.4'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179° 10.08 194° 10.27	N05°19.41	116°41.25 131°3.84	3.6' 3.6'	N27°55.15 27°59.35	4.2' 4.0'	59.3' 59.2'
2	194° 10.27 209° 10.45	20.37 21.32	131 3.84 145°26.44	3.6'	27°59.35 28°3.35	4.0 3.8'	59.2' 59.2'
3	224° 10.63	22.28	159°49.03	3.6'	28°7.15	3.6'	59.2'
4	239° 10.81	23.24	174°11.63	3.6'	28°10.76	3.4'	59.1'
5	254°11.00 269°11.18	24.20 N05°25.15	188°34.23 202°56.85	3.6'	28°14.16 N28°17.38	3.2'	59.1'
6 7	269°11.18 284°11.36	N05°25.15 26.11	202°56.85 217°19.47	3.6' 3.6'	N28°17.38 28°20.39	3.0' 2.8'	59.1' 59.0'
8	299°11.54	27.07	231°42.11	3.7'	28°23.21	2.6'	59.0'
9	314°11.72	• • 28.02	246°4.76	3.7'	28°25.84	2.4'	58.9'
10	329°11.91	28.98	260°27.43	3.7'	28°28.26	2.2'	58.9'
11 12	344° 12.09 359° 12.27	29.93 N05°30.89	274°50.12 289°12.83	3.7' 3.7'	28°30.49 N28°32.53	2.0' 1.8'	58.9' 58.8'
13	14°12.45	31.85	303°35.57	3.8'	28°34.37	1.6'	58.8'
14	29° 12.63	32.80	317°58.34	3.8'	$28^{\circ}36.01$	1.5'	58.8'
15	44°12.81	• • 33.76	332°21.13	3.8'	28°37.46	1.3'	58.7'
16 17	59° 13.00 74° 13.18	34.71 35.67	346°43.96 1°6.83	3.9' 3.9'	28°38.72 28°39.78	1.1' 0.9'	58.7' 58.7'
18	74 13.18 89°13.36	35.67 N05°36.62	1 0.83 15°29.73	3.9'	28 39.78 N28°40.65	0.9	58.6'
19	104°13.54	37.58	29°52.67	4.0'	28°41.33	0.5'	58.6'
20	119° 13.72	38.53	44°15.66	4.0'	28°41.82	0.3'	58.6'
21	134° 13.90 149° 14.08	39.49	58°38.69 73°1.76	4.1'	28°42.11 28°42.22	0.1'	58.5'
22 23	149° 14.08 164° 14.27	40.44 41.39	73°1.76 87°24.89	4.1' 4.2'	28°42.22 28°42.13	-0.1' -0.3'	58.5' 58.5'
	SD = 16.0'	d = 1.0'			D = 16.2'		

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

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

		Sun			Moon	
Day	Eqn.o	f Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	10-28%
01	03:55	03:46	12:04	14:52	02:22	
02	03:37	03:28	12:03	15:53	03:22	
03	03:20	03:11	12:03	16:55	04:24	

h	Aries	Ve	nus	M	ars	Juj	piter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	192°33.89	198°37.29	N04°37.17	75°32.04	N23°44.91	117°14.90	N22°27.06	196°31.38	S03°49.71	Alpheratz	357°34.95	29°13.65
1	207°36.36	213°40.37	36.34	90°33.59	44.70	132°16.94	27.11	211°33.57	49.60	Ankaa	353°7.35	-42°10.17
2	222°38.82	228°43.45	35.52	105°35.14	44.48	147°18.97	27.16	226°35.76	49.48	Schedar	349°31.44	56°40.46
3	237°41.29	243°46.53	• • 34.69	120°36.70	• • 44.26	162°21.00	• • 27.21	241°37.95	• • 49.37	Diphda	348° 47.43	-17°50.98
4	252° 43.75	258°49.61	33.86	135° 38.24	44.05	177°23.03	27.25	256°40.13	49.25	Achernar	335°20.58	-57° 6.59
5	267°46.22	273°52.68	33.03	150°39.79	43.83	192°25.06	27.30	271°42.32	49.14	Hamal	327°51.33	23°34.84
6	282°48.68	288°55.74	N04°32.21	165°41.34	N23°43.61	207°27.09	N22°27.35	286°44.51	S03°49.03	Polaris	314°22.09	89°22.39
7	297°51.14	303°58.81	31.39	180°42.89	43.40	222°29.13	27.39	301°46.70	48.91	Acamar	315°11.97	-40°12.36
8	312°53.61	319°1.87	30.56	195°44.44	43.18	237°31.16	27.44	316°48.89	48.80	Menkar	314°6.23	4°11.24
9	327°56.07	334°4.92	• • 29.74	210°45.98	• • 42.96	252°33.19	• • 27.49	331°51.08	• • 48.68	Mirfak	308°28.40	49°57.12
10	342°58.54	349°7.97	28.92	225°47.53	42.74	267°35.22	27.53	346°53.27	48.57	Aldebaran	290°39.61	16°33.57
11	358°1.00	4°11.02	28.10	240°49.08	42.52	282°37.25	27.58	1°55.46	48.46	Rigel	281°3.83	-8°10.47
12	13°3.47	19°14.06	N04°27.28	255° 50.62	N23°42.31	297°39.28	N22°27.63	16°57.65	S03°48.34	Capella	280°21.82	46°1.52
13	28°5.93	34° 17.10	26.46	270°52.17	42.09	312°41.31	27.67	31°59.84	48.23	Bellatrix	278°22.81	6°22.29
14	43°8.39	49°20.14	25.65	285°53.71	41.87	327°43.34	27.72	47°2.03	48.11	Elnath	278°1.78	28°37.76
15	58° 10.86	64°23.17	• • 24.83	300°55.25	• • 41.65	342°45.37	• • 27.77	62°4.22	• • 48.00	Alnilam	275°37.66	$-1^{\circ}11.25$
16	73° 13.32	79°26.20	24.02	315° 56.80	41.43	357°47.40	27.81	77°6.41	47.89	Betelgeuse	270°51.98	$7^{\circ}24.65$
17	88° 15.79	94°29.23	23.20	330°58.34	41.21	12°49.42	27.86	92°8.60	47.77	Canopus	263°52.41	-52°42.79
18	103° 18.25	109°32.25	N04°22.39	345°59.88	N23°40.99	27°51.45	N22°27.91	107°10.79	\$03°47.66	Sirius	258°26.11	-16°45.21
19	118° 20.71	124°35.26	21.58	1°1.42	40.77	42°53.48	27.95	122°12.98	47.54	Adhara	255°5.73	-29°0.59
20	133° 23.18	139°38.28	20.77	16°2.96	40.55	57°55.51	28.00	137°15.17	47.43	Procyon	244°50.60	5°9.54
21	148° 25.64	154°41.29	• • 19.96	31°4.50	• • 40.33	72°57.54	• • 28.05	152°17.36	• • 47.32	Pollux	243°17.01	27°57.95
22	163°28.11	169°44.29	19.15	46°6.04	40.11	87°59.57	28.09	167°19.55	47.20	Avior	234°14.49	-59°35.68
23	178°30.57	184°47.29	18.34	61°7.58	39.89	103°1.59	28.14	182°21.74	47.09	Suhail	222°45.98	-43°32.31
Mer.	pass. 11:08	$\nu$ 3.1′ d-0	.8′ m-4.40	$\nu$ 1.6′ d-0	).2′ m0.50	$\nu 2.0' \ d0$	.0' m-2.09	$\nu$ 2.2′ d-0	$0.1'  \mathrm{m} 1.16$	Miaplacidus	221°37.83	-69°49.48
										Alphard	217°47.39	-8°46.23
٠.	CIIA	CIIA	Б.	CIIA	Б	CIIA	ъ.	CIIA		Regulus	207°34.01	11°50.55
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°40.16	61°36.96
0	193°33.04	199°50.29	N04°17.54		N23°39.67	118° 3.62	N22°28.19	197°23.93	503°46.98	Denebola	182°24.45	14°25.75
1	208° 35.50	214°53.28	16.73	91°10.66	39.45	133° 5.65	28.23	212°26.12	46.86	Gienah	175°43.08	-17°41.08
2	223° 37.96	229°56.27	15.93	106° 12.19	39.23	148°7.68	28.28	227°28.31	46.75	Acrux	172°59.27	-63°14.45
3	238° 40.43	244°59.26	• • 15.13	121°13.73	• • 39.01	163°9.70	• • 28.33	242°30.50	• • 46.64	Gacrux	171°50.91	-57°15.39
4	253° 42.89	260°2.24	14.33	136° 15.26	38.79	178°11.73	28.37	257°32.69	46.52	Alioth	166°12.20	55°49.28
5	268° 45.36	275°5.22	13.53	151°16.80	38.57	193°13.76	28.42	272°34.89	46.41	Spica	158°21.79	-11°17.73
6	283° 47.82	290°8.20	N04°12.73	166° 18.33	N23°38.35	208°15.78	N22°28.47	287°37.08	\$03°46.29	Alkaid	152°51.35	49°11.06
7	298° 50.28	305°11.17	11.93	181°19.87	38.13	223°17.81	28.51	302°39.27	46.18	Hadar	148°35.17	-60°29.69
8 9	313°52.75 328°55.21	320°14.13 335°17.09	11.13 •• 10.34	196°21.40 211°22.94	37.90 •• 37.68	238°19.83 253°21.86	28.56 •• 28.61	317°41.46 332°43.65	46.07 •• 45.95	Menkent	147°57.04	-36°29.72
10		350°20.05						347°45.84		Arcturus	145°47.42	19°2.86
	343°57.68 359°0.14	5°23.01	9.54	226°24.47 241°26.00	37.46	268°23.88 283°25.91	28.65	2°48.03	45.84	Rigil Kent.	139°39.48	-60°56.35
11	14°2.61	20°25.96	8.75 N04° 7.96		37.24		28.70 N22°28.75	2 48.03 17°50.22	45.73	Kochab	137° 18.70	74°2.85
12 13	29°5.07	20°25.90 35°28.91	7.17	256° 27.53 271° 29.06	N23°37.02 36.79	298°27.93 313°29.96	28.79	32°52.41	\$03°45.61 45.50	Zuben'ubi	136°55.52	-16°8.91
14	44°7.53	50°31.85	6.38	271 29.00 286° 30.59	36.57	313 29.90 328°31.98	28.84	47°54.60	45.39	Alphecca	126°3.30	26°37.53
15	59° 10.00	65°34.79	• 5.59	301°32.12	• • 36.35	343°34.01	. 28.89	62°56.79	. 45.27	Antares	112°15.39	$-26^{\circ}29.31$
16	74° 12.46	80°37.72	4.80	316° 33.65	36.13	358°36.03	28.93	77°58.98	45.16	Atria	$107^{\circ}9.19$	-69°4.17
17	89° 14.93	95°40.66	4.00	331°35.18	35.90	13°38.06	28.98	93°1.17	45.05	Sabik	102°2.41	-15°45.45
18	104° 17.39	110°43.58	N04° 3.23		N23°35.68	28°40.08	N22°29.03	108°3.37	\$03°44.93	Shaula	96°9.96	-37°7.27
19	119° 19.85	125°46.51	2.45	1°38.24	35.46	43°42.10	29.07	123°5.56	44.82	Rasalhague	95°58.25	12°32.26
20	134° 22.32	140°49.43	1.67	16°39.76	35.23	58°44.13	29.12	138°7.75	44.71	Eltanin	90°41.94	51°28.73
21	149° 24.78	155°52.34	0.89	31°41.29	35.01	73°46.15	29.17	153° 9.94	• • 44.60	Kaus Aust.	83°32.20	-34°22.30
22	164° 27.25	170°55.25	04°0.11	46°42.81	34.78	88°48.17	29.21	168°12.13	44.48	Vega	80°33.05	38°48.06
23	179° 29.71	185°58.16	03°59.33	61°44.34	34.56	103°50.20	29.26	183°14.32	44.37	Nunki		-26°15.91
										Altair	61°59.84	8°55.89
Mer. <sub>I</sub>	pass. 11:04	$\nu$ 3.0′ d-0	.8′ m-4.45	u 1.5' d-0	).2′ m0.52	$\nu$ 2.0′ d0	.0′ m-2.09	$\nu$ 2.2′ d-0	$0.1' \; { m m} 1.16$	Peacock	53°5.61	
										Deneb	49°25.88	45°21.88
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.82	9°59.26
0	194° 32.18		N03°58.55	76°45.86	N23°34.34	118°52.22		198°16.51		Al Na'ir	27°32.98	-46°50.25
1	209° 34.64	216°3.97	57.78	91°47.39	34.11	133°54.24	29.35	213° 18.70	44.14	Fomalhaut	15° 14.60	-29°29.34
2	224° 37.10	231°6.86	57.00	106°48.91	33.89	148°56.26	29.40	228°20.90	44.03	Scheat	13°45.35	28°12.99
3	239° 39.57	246°9.75	56.23	121°50.44	33.66	163°58.28	• • 29.45	243°23.09	• • 43.92	Markab	13°30.00	15°20.30
4	254° 42.03	261°12.64	55.45	136°51.96	33.44	179° 0.31	29.49	258°25.28	43.80	Apr 04 Fri	SHA	Mer.pass
5	269° 44.50	276° 15.53	54.68	151°53.48	33.21	194°2.33	29.54	273°27.47	43.69	Venus	6°3.39	10:43
6	284° 46.96	291° 18.41		166° 55.00	N23°32.99	209° 4.35	N22°29.59	288°29.66	S03°43.58	Mars	242°58.15	18:56
7	299° 49.42	306°21.28	53.15	181°56.52	32.76	224°6.37	29.63	303°31.85	43.46	Jupiter	284°41.01	16:09
8	314°51.89	321°24.16	52.38	196° 58.04	32.54	239°8.39	29.68	318°34.04	43.35	Saturn	3°57.48	10:52
9	329° 54.35	336°27.02	51.61	211°59.56	• • 32.31	254° 10.41	29.73	333°36.24	• • 43.24			10.02
10	344° 56.82	351°29.89	50.85	227°1.08	32.08	269°12.43	29.77	348°38.43	43.13	Apr 05 Sat	SHA	Mer.pass
11	359° 59.28	6°32.75	50.09	242°2.60	31.86	284°14.45	29.82	3°40.62	43.13	Venus	6°17.26	10:39
12	15°1.74	21°35.61	N03°49.32		N23°31.63	299°16.47	N22°29.87	18°42.81	503°42.90	Mars	242°36.08	18:53
13	30°4.21	36°38.46	48.56	272°5.64	31.41	314°18.49	29.91	33°45.00	42.79	Jupiter	284°30.59	16:06
14	45°6.67	50° 30.40 51° 41.31	47.80	287°7.15	31.41	329°20.51	29.91	48°47.20	42.79	Saturn	3°50.90	10:49
15	60°9.14	66°44.15	• • 47.05	302°8.67	30.95	344°22.53	30.01	63°49.39	• 42.56	A OC C	CIIA	M
16	75° 11.60	81°46.99	46.29	302 8.67 317°10.18	30.72	359°24.55	30.01	78°51.58	42.45	Apr 06 Sun	SHA 6° 20 90	Mer.pass
16 17	75°11.60 90°14.07	96°49.83	46.29 45.53	317°10.18 332°11.70	30.72	359°24.55 14°26.57	30.05	78°51.58 93°53.77	42.45 42.34	Venus	6°28.89	10:34
18	90 14.07 105° 16.53	96 49.83 111°52.66	45.53 N03°44.78	347° 13.22	N23°30.27	29°28.59	N22°30.15	93 53.77 108°55.96	503°42.22	Mars	242°13.69	18:51
19	105 16.53 120° 18.99	111 52.00 126°55.49	44.78	2°14.73	30.04	29 28.59 44°30.61	30.19	108 55.96 123°58.16	42.22	Jupiter	284°20.04	16:02
20	120 18.99 135°21.46	120 55.49 141°58.32	44.03	2 14.73 17°16.24	29.82	59°32.63	30.19	123 58.16 139°0.35	42.11	Saturn	3°44.34	10:45
21	150° 23.92	141 58.32 157°1.14	43.28 •• 42.53	32° 17.76	· · 29.59	59 32.63 74°34.64	30.24	154°2.54	42.00 •• 41.89	Horizo	ntal parallax	
22	165° 26.39	157 1.14 172°3.96	41.78	47° 19.27	29.36	89°36.66	30.29	154 2.54 169°4.73	41.89		Venus:	0.5
23	180° 28.85	172 3.90 187°6.77	41.78	62°20.78	29.30	104°38.68	30.38	184°6.92	41.77		Mars:	0.1
	100 20.00											
Mer. <sub>I</sub>	pass. 11:00	$\nu 2.9' \ d-0$	.8′ m-4.49	$\nu$ 1.5 $^{\prime}$ d-0	).2′ m0.54	$\nu$ 2.0′ d0	.0′ m-2.08	$\nu$ 2.2′ d-0	$0.1^\prime$ m $1.17$			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 14.45	N05°42.35	101°48.07	4.2'	N28°41.85	-0.5'	58.4'
1	194° 14.63	43.30	116°11.30	4.3'	28°41.39	-0.7'	58.4'
2	209° 14.81	44.25	130°34.59	4.3'	28°40.74	-0.8'	58.3'
3 4	224° 14.99 239° 15.17	· · 45.21 46.16	144°57.94 159°21.34	4.4' 4.5'	28°39.90 28°38.88	-1.0' -1.2'	58.3' 58.3'
5	259 15.17 254° 15.35	40.10	173°44.81	4.5'	20 30.00 28°37.67	-1.∠ -1.4'	58.2'
6	269° 15.53	N05°48.07	188°8.35	4.6'	N28°36.27	-1.6'	58.2'
7	284° 15.71	49.02	202°31.95	4.7'	28°34.70	-1.8'	58.2'
8	299° 15.89	49.97	216°55.62	4.7'	28°32.94	-1.9'	58.1'
9	314° 16.07	• • 50.92	231°19.37	4.8'	28°31.00	-2.1'	58.1'
10 11	329°16.25 344°16.43	51.87 52.83	245°43.18 260°7.07	4.9' 5.0'	28°28.88 28°26.58	-2.3' -2.5'	58.1' 58.0'
12	359° 16.62	N05°53.78	274°31.04	5.0'	N28°24.10	-2.7	58.0'
13	14° 16.80	54.73	288°55.09	5.1'	28°21.45	-2.8'	58.0'
14	29° 16.98	55.68	303°19.21	5.2'	$28^{\circ}18.62$	-3.0'	57.9'
15	44° 17.16	• • 56.63	317°43.42	5.3'	28°15.62	-3.2'	57.9'
16	59° 17.34 74° 17.52	57.58	332°7.71 346°32.09	5.4'	28°12.44 28°9.09	-3.3' -3.5'	57.8'
17 18	89° 17.70	58.53 N05°59.48	0°56.56	5.5' 5.6'	28° 9.09 N28° 5.57	-3.5'	57.8' 57.8'
19	104° 17.88	06° 0.43	15°21.11	5.6'	28° 1.88	-3.9	57.7'
20	119° 18.06	1.38	29°45.76	5.7'	27°58.02	-4.0'	57.7'
21	134° 18.23	• • 2.33	44°10.50	5.8'	27°54.00	-4.2'	57.7'
22	149° 18.41	3.28	58°35.33	5.9'	27°49.80	-4.4'	57.6'
23	164°18.59	4.23	73°0.25	6.0'	27°45.45	-4.5'	57.6'
	SD = 16.0'	d = 1.0'		SI	D = 15.9'		
Sat	GHA	Dec	GHA		Dec	d	НР
5aτ 0	БПА 179° 18.77	N06° 5.18	впа 87°25.27	u  6.1'	N27°40.93	a -4.7'	пР 57.6'
1	194° 18.95	6.13	101°50.39	6.2'	27°36.25	-4.8'	57.5'
2	209° 19.13	7.08	116°15.61	6.3'	27°31.41	-5.0'	57.5'
3	224° 19.31	• • 8.03	130°40.92	6.4'	27°26.41	-5.2'	57.5'
4	239° 19.49	8.98	145°6.34	6.5'	27°21.25	-5.3'	57.4
5 6	254° 19.67 269° 19.85	9.93 N06°10.88	159°31.86 173°57.48	6.6' 6.7'	27°15.93 N27°10.46	-5.5' -5.6'	57.4' 57.4'
7	284° 20.03	11.82	188°23.21	6.8'	27°4.84	-5.8'	57.4°
8	299°20.21	12.77	202°49.04	6.9'	26°59.07	-5.9'	57.3'
9	314°20.39	• • 13.72	217°14.98	7.0'	$26^{\circ}53.14$	-6.1'	57.3'
10	329°20.56	14.67	231°41.02	7.2'	26°47.07	-6.2'	57.2'
11	344°20.74 359°20.92	15.61 N06°16.56	246°7.18 260°33.44	7.3' 7.4'	26°40.85 N26°34.48	-6.4'	57.2'
12 13	14°21.10	17.51	200 33.44 274°59.81	7.4 7.5'	26°27.96	-6.5' -6.7'	57.2' 57.1'
14	29°21.28	18.45	289°26.29	7.6'	26°21.31	-6.8'	57.1
15	44°21.46	• • 19.40	303°52.88	7.7'	$26^{\circ}14.51$	-6.9'	57.1'
16	59°21.63	20.35	318°19.58	7.8'	26°7.57	-7.1'	57.0'
17	74°21.81	21.29 N06°22.24	332°46.39 347°13.31	7.9'	26°0.49 N25°53.28	-7.2'	57.0'
18 19	89°21.99 104°22.17	N06°22.24 23.18	347°13.31 1°40.35	8.0' 8.1'	N25°53.28 25°45.93	-7.3' -7.5'	57.0' 56.9'
20	119°22.35	24.13	16°7.50	8.3'	25°38.45	-7.6'	56.9'
21	134°22.53	• • 25.08	30°34.76	8.4'	25°30.83	-7.7'	56.9'
22	149°22.70	26.02	45°2.14	8.5'	25°23.08	-7.9'	56.8'
23	164°22.88	26.97	59°29.63	8.6'	25°15.20	-8.0'	56.8'
	SD = 16.0'	d = 0.9'		SI	D = 15.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
Sun 0	179°23.06	N06°27.91	73°57.23	ν 8.7'	N25°7.20	a -8.1'	пР 56.8'
1	194°23.24	28.86	88°24.95	8.8	24°59.06	-8.3	56.7'
2	209°23.41	29.80	102°52.78	8.9'	24°50.81	-8.4'	56.7'
3	224°23.59	• • 30.74	117°20.72	9.1'	24°42.42	-8.5'	56.7'
4 5	239°23.77 254°23.95	31.69 32.63	131°48.78 146°16.96	9.2' 9.3'	24°33.92 24°25.30	-8.6' -8.7'	56.7' 56.6'
6	254 23.95 269°24.12	32.03 N06°33.58	140 10.90 160°45.25	9.3	N24°16.55	-8.7 -8.9'	56.6'
7	284°24.30	34.52	175°13.65	9.5'	24°7.69	-9.0'	56.6'
8	299°24.48	35.46	189°42.17	9.6'	23°58.71	-9.1'	56.5'
9	314°24.65	• • 36.40	204°10.80	9.7'	23°49.62	-9.2'	56.5'
10 11	329°24.83 344°25.01	37.35 38.29	218°39.54 233°8.40	9.9' 10.0'	23°40.41 23°31.09	-9.3' -9.4'	56.5' 56.4'
11	344°25.01 359°25.18	38.29 N06°39.23	233°8.40 247°37.37	10.0	23°31.09 N23°21.67	-9.4° -9.5'	56.4'
13	14°25.36	40.17	262°6.45	10.2	23°12.13	-9.6'	56.4
14	29°25.54	41.12	276°35.65	10.3'	23°2.49	-9.8'	56.4'
15	44°25.71	• • 42.06	291°4.96	10.4	22°52.73	-9.9'	56.3'
16	59°25.89	43.00	305°34.38	10.5'	22°42.88	-10.0'	56.3'
17 18	74°26.07 89°26.24	43.94 N06°44.88	320°3.91 334°33.56	10.6' 10.8'	22°32.92 N22°22.86	-10.1' -10.2'	56.3' 56.2'
18 19	89° 26.24 104° 26.42	45.82	334°33.56 349°3.31	10.8	N22° 22.86 22° 12.70	-10.2 -10.3'	56.2'
20	119° 26.59	46.76	3°33.18	11.0'	22°2.44	-10.3	56.2'
21	134°26.77	• • 47.70	18°3.15	11.1'	21°52.09	-10.5'	56.2'
22	149° 26.95	48.65	32°33.24	11.2'	21°41.64	-10.5'	56.1'
23	164°27.12	49.59	47°3.43	11.3'	21°31.09	-10.6'	56.1'
	SD = 16.0'	d = 0.9'		SI	D = 15.5'		

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

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	195°31.31	202°9.58 N03°40.28	77°22.29 N23°28.90	119°40.70 N22°30.42	199°9.12 S03°41.55	
1	210°33.78	217°12.39 39.54	92°23.80 28.67	134°42.71 30.47	214°11.31 41.44	Alpheratz 357°34.93
2	225°36.24	232°15.19 38.80	107°25.31 28.45	149°44.73 30.52	229°13.50 41.32	Ankaa 353°7.34
3	240°38.71	247°17.98 · · 38.05	122°26.82 · · 28.22	164°46.75 · · 30.56	244°15.69 · · 41.21	Schedar 349°31.43
4	$255^{\circ}41.17$	262°20.78 37.31	137°28.33 27.99	179°48.77 30.61	259°17.89 41.10	Diphda 348°47.42 Achernar 335°20.58
5	270°43.63	277°23.57 36.57	152°29.84 27.76	194°50.78 30.66	274°20.08 40.99	Hamal 327°51.32
6	285° 46.10	292°26.35 N03°35.84	167°31.35 N23°27.53	209°52.80 N22°30.70	289°22.27 \$03°40.87	Polaris 314°22.78
7 8	300° 48.56 315° 51.03	307°29.13 35.10 322°31.91 34.37	182° 32.86 27.30 197° 34.37 27.07	224°54.81 30.75 239°56.83 30.80	304°24.46 40.76 319°26.66 40.65	Acamar 315° 11.98
9	330°53.49	337°34.69 · · 33.63	212°35.87 · · 26.84	254°58.85 · · 30.84	319°26.66 40.65 334°28.85 • 40.54	Menkar 314°6.23
10	345°55.96	352°37.46 32.90	227° 37.38 26.61	270° 0.86 30.89	349°31.04 40.42	Mirfak 308°28.41
11	0°58.42	7°40.22 32.17	242°38.89 26.38	285°2.88 30.94	4°33.24 40.31	Aldebaran 290°39.61
12	16°0.88	22°42.98 N03°31.44	257°40.39 N23°26.15	300°4.89 N22°30.98	19°35.43	Rigel 281°3.84 Capella 280°21.84
13	31°3.35	37°45.74 30.71	272°41.90 25.92	315°6.91 31.03	34°37.62 40.09	Bellatrix 278° 22.82
14	46°5.81	52°48.50 29.99	287°43.40 25.69	330°8.92 31.08	49°39.81 39.98	Elnath 278°1.79
15	61°8.28 76°10.74	67°51.24 · · 29.26 82°53.99 28.54	302°44.90 · · 25.46	345°10.94 · · 31.12	64°42.01 · · 39.86 79°44.20 39.75	Alnilam 275° 37.67
16 17	91° 13.20	82°53.99 28.54 97°56.73 27.82	317° 46.41 25.23 332° 47.91 25.00	0°12.95 31.17 15°14.97 31.22	79°44.20 39.75 94°46.39 39.64	Betelgeuse 270°51.99
18	106° 15.67	112°59.47 N03°27.09	347°49.41 N23°24.77	30°16.98 N22°31.26	109°48.59 S03°39.53	Canopus 263° 52.44
19	121° 18.13	128°2.21 26.38	2°50.91 24.53	45°18.99 31.31	124°50.78 39.41	Sirius 258° 26.12
20	$136^{\circ}20.60$	143°4.94 25.66	17°52.41 24.30	60°21.01 31.35	139°52.97 39.30	Adhara 255°5.75 Procyon 244°50.61
21	151°23.06	158°7.66 · · 24.94	32°53.91 · · 24.07	75°23.02 · · 31.40	154°55.17 · · 39.19	Procyon 244°50.61 Pollux 243°17.02
22	166°25.52	173°10.38 24.23	47°55.42 23.84	90°25.03 31.45	169°57.36 39.08	Avior 234° 14.52
23	181°27.99	188°13.10 23.51	62°56.91 23.61	105°27.05 31.49	184°59.55 38.97	Suhail 222° 45.99
Mer.p	pass. 10:56	$\nu 2.8' \ d$ -0.7' m-4.53	$\nu 1.5' \ d$ -0.2' m0.55	$\nu 2.0' \ d0.0' \ \text{m-}2.08$	$ u 2.2' \ d$ -0.1' m1.17	Miaplacidus 221°37.87
						Alphard 217° 47.40
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.01
0	196° 30.45	203°15.82 N03°22.80	77°58.41 N23°23.38	120°29.06 N22°31.54	200°1.75 S03°38.85	Dubhe 193°40.16
1	211°32.92	218° 18.53 22.09	92°59.91 23.14	135°31.07 31.59	215°3.94 38.74	Denebola 182°24.44 Gienah 175°43.08
2	226°35.38	233°21.23 21.38	108°1.41 22.91	150°33.08 31.63	230°6.13 38.63	Acrux 172°59.27
3	241°37.84	248°23.93 · · 20.67	123°2.91 · · 22.68	165°35.10 · · 31.68	245°8.33 · · 38.52	Gacrux 171°50.91
4	256° 40.31	263°26.63 19.97	138°4.40 22.44	180°37.11 31.73	260°10.52 38.41	Alioth 166° 12.20
5	271°42.77	278°29.33 19.26	153°5.90 22.21	195°39.12 31.77	275°12.71 38.30 290°14.91 \$03°38.18	Spica 158°21.78
6 7	286° 45.24 301° 47.70	293°32.02 N03°18.56 308°34.70 17.86	168°7.40 N23°21.98 183°8.89 21.74	210°41.13 N22°31.82 225°43.14 31.86	290°14.91 S03°38.18 305°17.10 38.07	Alkaid 152°51.34
8	316°50.17	323°37.39 17.16	198° 10.39 21.51	240°45.15 31.91	320°19.29 37.96	Hadar 148°35.15
9	331°52.63	338°40.07 · · 16.46	213°11.88 · · 21.28	255°47.17 · · 31.96	335°21.49 · · 37.85	Menkent 147° 57.03
10	346°55.09	353°42.74 15.76	228° 13.37 21.04	270°49.18 32.00	350°23.68 37.74	Arcturus 145°47.40 Rigil Kent. 139°39.46
11	1°57.56	8°45.41 15.06	243°14.87 20.81	285°51.19 32.05	5°25.88 37.63	Kochab 137°18.67
12	17°0.02	23°48.08 N03°14.37	258°16.36 N23°20.57	300°53.20 N22°32.10	20°28.07 S03°37.51	Zuben'ubi 136° 55.51
13	32°2.49	38°50.74 13.68	273°17.85 20.34	315°55.21 32.14	35°30.26 37.40	Alphecca 126°3.28
14	47°4.95 62°7.41	53°53.40 12.99 68°56.05 •• 12.30	288°19.35 20.11 303°20.84 · · 19.87	330°57.22 32.19 345°59.23 · · 32.24	50°32.46 37.29 65°34.65 · 37.18	Antares 112° 15.37
15 16	77°9.88	83°58.70 11.61	318°22.33 19.64	1°1.24 32.28	80°36.85 37.07	Atria 107°9.14
17	92° 12.34	99°1.35 10.92	333°23.82 19.40	16° 3.25 32.33	95°39.04 36.96	Sabik 102°2.39
18	107° 14.81	114°3.99 N03°10.24	348°25.31 N23°19.17	31°5.26 N22°32.37	110°41.24 <b>S</b> 03°36.84	Shaula 96°9.93 Rasalhague 95°58.23
19	$122^{\circ}17.27$	129°6.63 9.55	3°26.80 18.93	46°7.26 32.42	125°43.43 36.73	Eltanin 90°41.91
20	137° 19.73	144°9.27 8.87	18°28.29 18.69	61°9.27 32.47	140°45.62 36.62	Kaus Aust. 83°32.17
21	152°22.20	159°11.90 · · 8.19	33°29.77 · · 18.46	76°11.28 · · 32.51	155°47.82 · · 36.51	Vega 80°33.02
22 23	167°24.66 182°27.13	174°14.53 7.51 189°17.15 6.83	48°31.26 18.22 63°32.75 17.99	91°13.29 32.56 106°15.30 32.61	170°50.01 36.40 185°52.21 36.29	Nunki 75°47.48
						Altair 61°59.81
Mer.p	bass. 10:52	$\nu 2.7' \ d$ -0.7' m-4.56	$ u 1.5' \ d$ -0.2' m0.57	$\nu 2.0' \ d0.0' \ \text{m-}2.07$	$ u 2.2' \ d$ -0.1' m1.17	Peacock 53°5.57
						Deneb 49°25.85 Enif 33°38.80
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.80 Al Na'ir 27°32.96
0	197°29.59	204°19.77 N03°6.16	78°34.24 N23°17.75	121°17.31 N22°32.65	200°54.40 <b>S</b> 03°36.18	Fomalhaut 15°14.58
1	212°32.05	219°22.38 5.48	93°35.72 17.51	136°19.31 32.70	215°56.60 36.06	Scheat 13°45.33
2	227°34.52 242°36.98	234°25.00 4.81	108°37.21 17.28	151°21.32 32.74	230°58.79 35.95 246°0.99 · · 35.84	Markab 13°29.99
3 4	242°36.98 257°39.45	249°27.60 · · 4.14 264°30.21 3.47	123°38.69 · · 17.04 138°40.18 16.80	166°23.33 ·· 32.79 181°25.34 32.84	246°0.99 · · 35.84 261°3.18 35.73	Apr 07 Mon SHA
5	272°41.91	279°32.81 2.80	153° 41.66 16.57	196°27.34 32.88	276°5.38 35.62	Venus 6°38.27
6	287° 44.37	294°35.40 N03°2.13	168°43.15 N23°16.33	211°29.35 N22°32.93	291°7.57 S03°35.51	Mars 241°50.98
7	302°46.84	309°37.99 1.47	183° 44.63 16.09	226°31.36 32.97	306°9.76 35.40	Jupiter 284°9.38
8	317°49.30	324°40.58 0.80	198° 46.11 15.85	241°33.36 33.02	321°11.96 35.29	Saturn 3° 37.80
9	332°51.77	339°43.16 03°0.14	213°47.59 · · 15.62	256°35.37 · · 33.07	336°14.15 · · 35.17	Apr 08 Tue SHA
10	347°54.23	354°45.74 02°59.48	228°49.07 15.38	271°37.38 33.11	351°16.35 35.06	Venus 6°45.36
11 12	2°56.69 17°59.16	9°48.32 58.82 24°50.89 N02°58.16	243°50.56 15.14 258°52.04 N23°14.90	286°39.38 33.16 301°41.39 N22°33.21	6°18.54 34.95 21°20.74 \$03°34.84	Mars 241°27.96
13	33°1.62	39°53.46 57.51	273°53.52 14.66	316°43.39	36°22.93 34.73	Jupiter 283°58.61
14	48°4.09	54°56.02 56.85	288°55.00 14.42	331°45.40 33.30	51°25.13 34.62	Saturn 3°31.29
15	63°6.55	69°58.58 · · 56.20	303°56.48 · · 14.18	346°47.40 · · 33.34	66°27.33 · · 34.51	Apr 09 Wed SHA
16	78°9.02	85°1.14 55.55	318° 57.95 13.95	1°49.41 33.39	81°29.52 34.40	Venus 6°50.18
17	93°11.48	100°3.69 54.90	333°59.43 13.71	16°51.41 33.44	96°31.72 34.29	Mars 241°4.64
18	108° 13.94	115°6.24 N02°54.25	349°0.91 N23°13.47	31°53.42 N22°33.48	111°33.91 \$03°34.18	Jupiter 283°47.72
19 20	123° 16.41 138° 18.87	130°8.78 53.61 145°11.32 52.96	4°2.39 13.23 19°3.87 12.99	46°55.42 33.53 61°57.43 33.57	126°36.11 34.06 141°38.30 33.95	Saturn 3°24.81
20	158 18.87 153°21.34	145 11.32 52.90 160°13.86 · · 52.32	34°5.34 · · 12.75	76°59.43 · · 33.62	156°40.50 · · 33.84	Horizontal parallax
22	168° 23.80	175°16.39 51.68	49°6.82 12.51	92°1.43 33.67	171°42.69 33.73	Venus:
23	183°26.26	190°18.92 51.04	64°8.29 12.27	107°3.44 33.71	186°44.89 33.62	Mars:
Merr	pass. 10:48	ν2.6' d-0.7' m-4.59	ν1.5' d-0.2' m0.59	ν2.0' d0.0' m-2.07	ν2.2' d-0.1' m1.17	
14101.		ν Δ.υ α-υ.ι III-4.39	ν 1.5 u-0.2 III0.39	ν Δ.Ο   α Ο.Ο   ΠΕΔ.ΟΙ	ν Δ.Δ. U=U.1 III1.11	

Dec 29°13.64 -42°10.15 56° 40.45 -17° 50.97  $\textbf{-57}^{\circ}\,6.57$  $23^{\circ}34.84$ 89°22.38 -40°12.34 4°11.24 49°57.11 16°33.58 -8°10.47  $46^{\circ}1.52$  $6^{\circ}22.29$ 28°37.76 -1°11.24 7°24.65 -52°42.79 -16°45.21 -29°0.59 5°9.54 27°57.96 -59°35.68 -43°32.31 -69°49.49 -8°46.23 11°50.56  $61^{\circ}36.98$  $14^{\circ}25.75$ -17°41.09  $-63^{\circ}14.47$  $-57^{\circ}15.41$ 55°49.29 -11°17.73 49°11.08 -60°29.70 -36°29.73  $19^{\circ}2.87$ -60°56.37  $74^{\circ}2.86$ -16°8.92  $26^{\circ}37.53$ -26°29.31  $-69^{\circ}4.18$  $\text{-}15^{\circ}45.45$  $\text{-}37^{\circ}7.27$  $12^{\circ}32.26$ 51°28.74 -34°22.30 38°48.06 -26°15.91 8°55.89 -56°39.05  $45^{\circ}21.88$ 9°59.26 -46°50.24 -29°29.33 28°12.99 15°20.30 Mer.pass 10:29 18:49 15:59 10:42 Mer.pass 10:25 18:46 15:56 10:38 Mer.pass 10:21 18:44 15:53 10:35

> 0.5 0.1

	011-016 =	+0.0373 sec		-011 -	- +09.1407	555	
h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.30	N06° 50.53	61°33.73	11.4'	N21°20.45	-10.7'	56.1'
1	194°27.47	51.46	76°4.14	11.5'	$21^{\circ}9.72$	-10.8'	56.0'
2	209°27.65	52.40	90°34.65	11.6'	20°58.90	-10.9'	56.0'
3	224°27.82	• • 53.34	105°5.27	11.7'	20°47.98	-11.0'	56.0'
4	239°28.00	54.28	119°36.00	11.8'	20°36.99	-11.1'	56.0'
5	254°28.17 269°28.35	55.22 N06° 56.16	134°6.83 148°37.77	11.9'	20°25.90 N20°14.73	-11.2'	55.9'
6 7	269 28.35 284°28.52	57.10	148 37.77 163°8.81	12.0' 12.1'	N20 14.73 20°3.48	-11.3' -11.3'	55.9' 55.9'
8	299°28.70	58.04	177° 39.95	12.1	19°52.14	-11.4	55.9'
9	314°28.87	• • 58.98	192°11.19	12.3'	19°40.72	-11.5'	55.8'
10	329°29.05	$06^{\circ}59.91$	206°42.53	12.4'	19°29.23	-11.6'	55.8'
11	344°29.22	07°0.85	221°13.98	12.5'	19° 17.65	-11.7'	55.8'
12	359°29.40	N07°1.79	235° 45.52	12.6'	N19°6.00	-11.7'	55.8'
13	14°29.57 29°29.75	2.73 3.66	250° 17.16 264° 48.90	12.7' 12.8'	18° 54.27 18° 42.47	-11.8' -11.9'	55.7'
14 15	29 29.75 44°29.92	• • 4.60	204 48.90 279°20.73	12.8	18 42.47 18°30.59	-11.9 -11.9'	55.7' 55.7'
16	59°30.09	5.54	293°52.66	13.0'	18° 18.64	-12.0'	55.7'
17	74°30.27	6.47	308°24.69	13.1'	18°6.62	-12.1'	55.6'
18	89°30.44	N07°7.41	322°56.81	13.2'	N17°54.53	-12.2'	55.6'
19	104°30.62	8.34	337°29.02	13.3'	17°42.37	-12.2'	55.6'
20	119°30.79	9.28	352°1.33	13.4'	17°30.15	-12.3'	55.6'
21	134°30.96 149°31.14	• • 10.22	6°33.72	13.5'	17° 17.86 17° 5.50	-12.4'	55.5'
22 23	149°31.14 164°31.31	11.15 12.09	21°6.21 35°38.78	13.6' 13.7'	17°5.50 16°53.08	-12.4' -12.5'	55.5' 55.5'
23						-12.3	55.5
	SD = 16.0'	d = 0.9'		SI	D = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.48	N07° 13.02	50°11.44	13.8'	N16° 40.60	-12.5'	55.5'
1	194°31.66	13.96	64° 44.20	13.8'	16°28.06	-12.6'	55.4'
2	209°31.83	14.89	79° 17.03	13.9'	16° 15.45	-12.7'	55.4'
3	224°32.00	•• 15.82	93°49.95	14.0'	16°2.79	-12.7'	55.4'
4	239°32.18	16.76	108°22.96	14.1'	15°50.07	-12.8'	55.4'
5 6	254°32.35 269°32.52	17.69 N07° 18.63	122°56.05 137°29.22	14.2' 14.3'	15°37.29 N15°24.46	-12.8' -12.9'	55.4' 55.3'
7	284°32.70	19.56	157 29.22 152°2.47	14.3	15° 11.57	-12.9'	55.3'
8	299°32.87	20.49	166° 35.80	14.4'	14°58.63	-13.0'	55.3'
9	314°33.04	• • 21.42	181°9.21	14.5'	14° 45.63	-13.0'	55.3'
10	329°33.21	22.36	195°42.70	14.6'	14°32.59	-13.1'	55.2'
11	344°33.39	23.29	210° 16.26	14.6'	14° 19.49	-13.1'	55.2'
12	359°33.56	N07°24.22	224°49.91	14.7'	N14°6.35	-13.2'	55.2'
13	14°33.73 29°33.90	25.15	239°23.62 253°57.41	14.8' 14.9'	13°53.16 13°39.92	-13.2' -13.3'	55.2'
14 15	29 33.90 44°34.07	26.09 •• 27.02	268°31.27	14.9'	13° 26.63	-13.3'	55.2' 55.1'
16	59°34.24	27.95	283°5.20	15.0'	13° 13.30	-13.4'	55.1'
17	74°34.42	28.88	297°39.21	15.1'	12° 59.93	-13.4'	55.1'
18	89°34.59	N07°29.81	312° 13.28	15.1'	N12°46.51	-13.5'	55.1'
19	104°34.76	30.74	326° 47.42		12° 33.05	20.0	55.1'
20	119°34.93	31.67	341°21.62	15.3'	12° 19.55	-13.5'	55.0'
21 22	134°35.10 149°35.27	· · 32.60 33.53	355°55.90 10°30.23	15.3' 15.4'	12°6.01 11°52.43	-13.6' -13.6'	55.0' 55.0'
23	164°35.44	34.46	25°4.64	15.5'	11°38.82	-13.7	55.0'
20		d = 0.9'			D = 15.1'	20.7	
	SD = 16.0'	$a = 0.9^{\circ}$		- 51	$D = 15.1^{\circ}$		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.62	N07°35.39	39°39.10	15.5'	N11°25.17	-13.7'	55.0'
1	194°35.79	36.32	$54^{\circ}13.62$	15.6'	$11^{\circ}11.48$	-13.7'	55.0'
2	209°35.96	37.25	68° 48.21	15.6'	10°57.75	-13.8'	54.9'
3	224°36.13	• • 38.18	83°22.85 97°57.56	15.7'	10°43.99	-13.8'	54.9'
4 5	239°36.30 254°36.47	39.11 40.04	97°57.56 112°32.32	15.8' 15.8'	10°30.20 10°16.38	-13.8' -13.9'	54.9' 54.9'
6	254°36.47 269°36.64	40.04 N07°40.96	112° 32.32 127° 7.13	15.8	N10° 2.52	-13.9'	54.9'
7	284°36.81	41.89	141° 42.00	15.9'	09°48.64	-13.9'	54.8'
8	299°36.98	42.82	156° 16.92	16.0'	09°34.72	-13.9'	54.8'
9	314°37.15	• • 43.75	170°51.90	16.0'	09°20.78	-14.0'	54.8'
10	329°37.32	44.68	185°26.93	16.1'	09°6.81	-14.0'	54.8'
11	344°37.49	45.60	200°2.00	16.1'	08°52.81	-14.0'	54.8'
12 13	359°37.66 14°37.83	N07°46.53 47.46	214° 37.13 229° 12.31	16.2' 16.2'	N08° 38.79 08° 24.74	-14.0' -14.1'	54.8' 54.7'
13 14	14°37.83 29°38.00	47.46 48.38	243° 47.53	16.2	08° 24.74 08° 10.67	-14.1' -14.1'	54.7'
15	44°38.17	49.31	258° 22.79	16.3	00° 10.07° 56.57	-14.1	54.7'
16	59°38.34	50.23	272°58.11	16.4	07°42.46	-14.1'	54.7'
17	74°38.51	51.16	287°33.46	16.4'	07°28.32	-14.2'	54.7'
18	89°38.67	N07° 52.09	302°8.86	16.4'	N07°14.16	-14.2'	54.7'
19	104°38.84	53.01	316°44.30	16.5	06°59.98	-14.2'	54.6'
20	119°39.01	53.94	331°19.78	16.5'	06°45.78	-14.2'	54.6'
21 22	134°39.18 149°39.35	• • 54.86 55.78	345°55.30 0°30.85	16.6' 16.6'	06°31.57 06°17.33	-14.2' -14.2'	54.6' 54.6'
23	164°39.52	56.71	15°6.45	16.6'	06°3.09	-14.2 -14.3'	54.6'
						25	
	SD = 16.0'	d = 0.9'		SI	D = 15.0'		

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

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

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	70-86%
07	02:11	02:02	12:02	20:33	08:10	
08	01:54	01:46	12:02	21:17	08:55	
09	01:38	01:29	12:01	21:58	09:38	

The   Char   C	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1 2 12 12 10 22 12 10 10 10 10 10 11 12 11 13 10 12 10 10 10 10 12 12 12 10 10 10 10 11 12 12 10 10 10 11 12 12 10 10 10 11 12 12 12 10 10 10 12 12 12 10 10 10 12 12 12 12 10 10 10 12 12 12 12 12 12 12 12 12 12 12 12 12	Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
3 247 38.12 267 39.27 30.2 30.2 30.2 30.2 30.2 30.2 30.2 30.2	0	198°28.73	205°21.45 N02°50.40	79°9.77 N23°12.03	122°5.44 N22°33.76	201°47.08	Alpharatz 257°24.02 20°12.64
Section   Control   Con							
1							
5 29°4.05   20°34.01   47.20   15°11.1   10.02   10°11.56   13.39   20°35.06   12.09   14.00   12°11.1   10°11.05   12°1							Diphda 348°47.42 -17°50.97
9. 287-851 309°8-951 100°4-060 100°1-101 327°1-080 227°1-140 102°1-101 300°1-101 327°1-140 102°							
7 9 93° 4.98 30° 93° 10 45 88 18° 20° 20° 10 49 100° 10 50° 100° 100° 100° 100° 100° 10							
9 383°90 39 390°90 39 390°450 49 475 24 20 20 20 30 30 30 30 30 30 43 50 4 20 20 30 30 30 30 30 30 43 50 4 20 20 30 30 30 30 30 30 40 30 40 40 30 40 30 30 30 30 30 30 30 30 30 30 30 30 30							
93 939 939 937 937 938 938 938 938 938 938 938 938 938 938	8		325°41.50 45.35	199°21.55 10.10	242°21.46 34.13	322°4.65 32.63	
10 19 19 19 19 19 19 19 19 19 19 19 19 19	9	333°50.90	340°43.99 · · 44.73		257°23.46 · · 34.17	337°6.85 · · 32.51	l .
1.   1.   1.   1.   1.   1.   1.   1.							
18							I
14							_
15 64 56 0 70 5825 4102 304 3133 8.40 247 35.47 34.45 67 20.3 11.85 64.15 10 79 81.5 10 79 81.00 10 79 81.00 10 79 81.00 10 79 77 90 70 93 84 94 77 77 97 91 79 91 70 91							Bellatrix 278°22.83 6°22.29
15 99"06 10"37.7" 97"08 13"1 40.41 319"33 97"08 34"47.7" 791 173"347 34.94 9"2"42.2" 31.64 680"08 79"42.72 13.65 110"157"08 79"08 34"352.3 N33"14.77 791 173"347 34.94 8"2"2.2" 21.65 120"34"157"08 29"2.21 19"157.0 131"08 110"08							
17 04 10.62 101 107 27 30 70 30 34 34 34 7 70 11 17 30 47 34 54 07 34 54 107 34 54 107 34 54 107 34 54 107 34 54 107 34 54 107 34 107							
19 19 19 19 19 19 19 19 19 19 19 19 19 1							, ,
Adhama   1978	18	109° 13.08	116°6.22 N02°39.19	349°36.23 N23°7.67	32°41.47 N22°34.59	112°26.62 <b>S</b> 03°31.52	
19							
1							
18   18   18   18   18   18   18   18							
Mary							Avior 234°14.55 -59°35.69
Part   CHA		184 25.40			<del></del>		
Fig.   CHA   CH	Mer.	pass. 10:44	$\nu 2.5' \ d$ -0.6' m-4.62	$ u 1.5' \; d$ -0.2 $' \; {\sf m0.61}$	$\nu 2.0' \ d0.0' \ \text{m-}2.06$	$ u 2.2' \ d$ -0.1' m1.17	
Fin GHA GHA   Dec   Dependent   193*0.18   61°36.90   193*0.18   193*0							
1	Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
1 214 30.33							
2 297 327 9 296 297 1 34.77 109 479 4 5.72 152 7746 34.95 232 44.19 30.64 4 299 37.72 6374.49 4 5.72 107 596 6 35.00 30.00 4 2476.39 30.33 14 178 50.02 25.74 4 299 37.72 6 30.05 30.15 131 139 30.67 5.23 181 1.46 35.00 202 46.88 30.42 24.00 180 3.00 181 1.46 35.00 202 181 1.46 35.00 11.4	1	$214^{\circ}30.33$	221°23.29 34.97	94°46.48 5.96	137°55.46 34.91	217°41.99 30.75	
3 44°35.0° 3 30° 30° 30° 30° 30° 30° 30° 30° 30°							
6 289°426 5 296°437 NO°32.01   166°53.79 N.32°44   21°54.85   N22°52.16   29°52.08   30°33.02   Alleid   150°21.71   170°1.00   150°21.71   170°1.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.00   150°21.71   170°21.71   170°21.00   170°21.71							
8 280°42.65 260°35.37 N02°32.01 160°33.70 N23°4.74 213°5.48 N22°35.14 22°5.14 20°5.05 S93°9.02 N368 190°5.07 14.94 243°9.49 35.23 32°5.37 29.87 N368 190°45.07 14.24 243°9.49 35.23 32°5.37 29.87 N368 190°5.07 10 340°5.05 36°44.99 29.67 220°5.68 3.75 273°13.44 35.32 35°1.77 29.67 N368 11 4°5.40 245°1.00 340°5.00 35°1.00 11 4°5.00							Alioth 166°12.20 55°49.31
8 319°47.8 326°40.17 30.83 19°50.71 4.24 249°45 35.18 300°55.18 30.09 41°42.57 30.05 214°88.17 4.00 258°11.48 35.27 337°50.57 2.98 4618.61 14°47.00 19°50.71 4.00 258°11.48 35.27 337°50.57 2.98 4618.61 14°47.00 19°50.71 4.00 258°11.48 35.27 337°50.57 2.98 4618.61 14°47.00 19°2.07 19°2.							Spica 158°21.78 -11°17.74
8 319°8758 04 341°4257 7 30.83 199°5671 4.24 243°9.45 35.23 32°5737 298 Merikent 14°570.23 36°29.74 14°39.45 14							
9 348*90.04 341*42.97 · 30.25 214*88.17 · 4.00 228*91.14\$ · 35.27 337*99.97 · 20.87							
10   349°52.50   366°44.66   226°76   226°99.63   3.75   273°13.44   35.32   353°1.77   29.76   Rigif Kent. 1 39°39.45   60°6.33   21   19°57.43   26°49.73   N02°28.51   260°2.54   N23°3.36   303°17.44   N22°55.41   23°6.16   503°29.54   Kochab   137°18.66   74°2.28   14   50°2.36   50°54.49   27.75   260°5.46   2.77   33°3°21.43   35.50   53°10.56   29.32   Alphecta   120°3.26   26°3.32   26°54.62   27°5.66   2.67°3.33   21.43   35.50   53°10.56   29.32   Alphecta   120°3.26   22°3.73   26°59.32   26°16   30°7.29   36°59.33   26.21   30°8.37   2.77   3°25.42   35.59   38°14.95   29.10   Altrais   112°15.35   26°29.32   Alphecta   120°3.26   26°3.32   Alphecta   27°3.26   26°3.32   Alphecta   27°3.26   27°3.32   Alphecta   27°3.26   Alphecta   27°3.26   27°3.32   Alphecta   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26   27°3.26							
11 4°5497 3 26°4973 No2°28.15 26°92.94 245°1.08 3.51 288°15.44 35.37 8°3.66 29.65   12 10°574 3 26°4973 No2°28.15 260°2.54 No2°3.36 30°3.744 No2°3.54 23°6.03°29.54   13 34°5990 41°52.11 27.93 275°4.00 3.01 318°19.43 35.46 38°3.86 29.45   14 50°2.36 56°4.49 27.35 290°5.46 2.77 333°2.143 35.50 53°10.56 29.32   15 66°4.82 71°56.66 26.78 305°6.01 2.52 2348°23.42 35.55 68°12.75 29.11   16 80°7.92 86°59.33 26.21 320°8.37 2.27 35°2.542 35.55 68°12.75 29.11   17 95°97.5 100°1.60 25.64 335°9.82 20.2 18°27.42 35.64 98°17.15 28.99   18 110°1.22 117°3.96 No2°25.07 350°11.28 N23°1.78 33°2.41 35.73 185°21.55 89.91 110°2.20 110°2.00 110°1.0							
19 19'57'43	11	4°54.97	11°47.35 29.09				
13 3 4°59.90 4°52.11 27.93 27°4.00 3.01 318°19.43 35.46 38°8.35 2943 1.45 12°7.35 50°5.44 27.75 33°2.14 3 55.05 50°1.05 29.25 15 66°4.82 71°6.68 6°2.275 290°5.46 2.77 33°2.14 3 55.05 50°1.05 29.25 15 66°4.82 71°6.68 6°2.275 28°6.99.32 26.21 320°8.37 2.27 38°2.54.2 35.56 66°12.75 29.21 1.05 12°1.00 25.64 33°6.92 2.02 18°27.42 35.64 96°1.275 28.99 1.02°1.00 25.64 33°6.92 2.02 18°27.42 35.64 96°1.275 28.99 1.02°1.00 25.64 33°6.92 2.02 18°27.42 35.64 96°1.275 28.99 1.02°1.00 25.04 33°6.92 2.04 1.02°1.01 1.02 1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.01 1.02°1.02°1.02°1.01 1.02°1							l .
15 66°4.82 71°56.86 · 26.78 306°6.91 · 2.52 348°23.42 · 35.55 66°12.75 · 29.21 ARrians File 1.0°2.86°9.23 26.1 320°8.37 2.27 3°25.42 · 35.59 83°1.495 29.01 68°4.39 10 6°4.19 10							
16 80°7.29 86°59.23 26.21 320°8.37 2.27 3°25.42 33.56 83°14.95 29.10 36°1.19 10°1.10 21°1.60 25.64 335°9.82 2.02 18°27.42 35.64 96°1.71.15 2.99 58.11 10°1.22 117°3.96 N02°25.07 350°1.128 N23°1.78 33°29.41 N22°35.69 113°19.35 S03°28.88 110°1.22 117°3.96 N02°25.07 350°1.128 N23°1.78 33°29.41 N22°35.69 113°19.35 S03°28.88 123°2.22 10°2.21 10°2.22 110°2.24 40°1.71.4 147°8.67 23.94 20°14.19 1.28 66°33.40 35.78 148°23.74 28.66 148°2							Antares 112°15.35 -26°29.32
18							
18 110°12 22 117°3 96 N02°25 07 350°11.28 N23°1 78 33°29.41 N22°35 69 113°19.35 \$03°28.88 Rasalhague \$7.57 1.27 2.26 12°32.65 12°32.76 12°32.65 12°32.76 12°32.65 12°32.76 12°32.76 12°32.76 12°11.02 1.23 1.53 1.53 1.53 1.53 1.53 1.53 1.53 1.5							
19 126°14.68 132°6.32 24.50 5°12.73 1.53 48°31.41 35.73 128°21.55 28.77 28.66 20171/14 147°867 23.94 20°14.19 1.26 63°3.34 0.35.64 1.32°3.74 28.66 22 170°22.07 17°13.37 22.81 50°17.09 0.78 93°37.39 35.87 173°28.14 28.44 28.34 28.33 21.53 18°24.54 192°15.71 22.25 65°18.55 0.54 108°39.39 3.591 188°30.34 28.33 48′28.30 40.56 45 108°39.39 3.591 188°30.34 28.33 48′46.06 Nunki 75°47.46 26°15.91 188°30.34 188							
140°17.14   147°8.67   23.94   20°14.19   1.28   63°33.40   35.78   143°23.74   28.66   Kaus Aust   34°22.30   22 170°22.07   177°13.37   22.81   50°17.09   0.78   93°37.39   35.87   173°28.14   28.44   Nunki   75°47.46   -26°15.91   Altair   61°59.80   87°55.80   35.91   188°30.34   28.33   Altair   61°59.80   87°55.80   Altair   61°59.80   87°58.80   Altair   61°59.80   87°58.90   Altair   61°59.80   Altair							1
155°19.61   162°11.02	20	$140^{\circ}17.14$	147°8.67 23.94	20°14.19 1.28	63°33.40 35.78	143°23.74 28.66	
170°22.07   170°13.37   22.81   50°17.09   0.78   93°37.39   35.91   188°30.34   23.34     170°22.07   170°13.37   22.81   50°18.55   0.54   108°39.39   35.91   188°30.34   23.34     170°22.07   20°27'00   20°18.05   N02°21.69   80°20.00   N23°0.29   123°41.38   N22°35.96   20°32.55   50°32.22     1 215°29.46   222°20.38   21.13   95°21.45   23°0.04   138°43.37   36.00   218°34.73   28.11     2 20°31.93   23°22.71   20.58   110°22.90   22°59.79   153°45.37   36.05   233°36.3   28.01     3 26°39.32   252°25.04   20.02   125°24.35   59.29   183°49.36   36.14   25°41.33   27.79     4 260°36.86   26°7°27.36   19.47   140°25.80   59.29   183°49.36   36.14   26°341.33   27.79     5 275°39.32   282°29.68   18.92   155°27.25   59.04   198°51.35   36.19   278°43.53   27.68     8 320°46.71   327°66.62   17.28   200°31.60   58.29   243°57.33   36.32   233°50.12   27.35     8 320°46.71   327°66.62   17.28   200°31.60   58.29   243°57.33   36.41   35°54.51   27.58   20°30.34     1 35°54.11   12°43.52   15.66   245°35.94   57.79   274°1.31   36°41   35°54.51   27.02   27.58     1 2 20°55.77   27.58   110°2.18   20°31.77   55.29   40°31.20   20°30.34   49   57.79   274°1.31   36°41   35°54.51   27.02   27.02     1 36°64.38   87°54.94   12.98   300°43.17   55.29   49°3.30   36.46   60°5.51   23°58.92   20°3.05   20°3.01   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.05   20°3.04   20°3.0							
185°24.54   192°15.71   22.25   65°18.55   0.54   108°39.39   35.91   188°30.34   28.33   28							_
Sat         GHA         GHA         Dec         AI Nair         33° 38.79         9°50.23         46°50.23         20°20.20         20°21.65         20°20.20         20°30°31.93         23°07°22.71         20.58         110°22.90         22°90.99         153°45.37         36.05         233°36.93         28.01         Scheat         13°45.32         28°29.26         40°20.20         125°24.35         50.95.44         168°47.36         36.05         233°36.93         28.01         Markab         13°29.98         15°20.30           4 260°36.86         267°27.36         19.47         140°25.80         59.29         183°49.36         36.14         263°41.33         27.79         Wenus         6°52.72         10.17           7 305°44.25         312°34.31         17.83         188°30.15         88.54         228°55.33         36.28         30°47.92         27.46         Jupiter         233°36.71         Jupiter         233°36.71         Jupiter	23	185°24.54	192°15.71 22.25	65° 18.55 0.54	108°39.39 35.91	188°30.34 28.33	
Sat         GHA         GHA         Dec         Al Nair         27° 32.93         46° 50.23           0         200° 27.00         207° 18.05         NO2° 21.69         80° 20.00         N23° 0.29         123° 41.38         N22° 35.96         203° 32.54         S03° 28.22         1Al Nair         27° 32.93         46° 50.23           2         230° 31.93         32° 22.71         20.58         110° 22.90         22° 59.79         153° 45.37         36.05         233° 36.93         28.01         Markab         13° 45.32         28° 12.99         13° 45.32         28° 12.99         Markab         27° 73°         14° 40° 24.35         ∘ 59.54         168° 47.36         ∘ 36.10         248° 39.13         ∘ 2.79         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28° 12.99         13° 45.32         28°	Mer.	pass. 10:40	ν2.4' d-0.6' m-4.65	$\nu 1.5' \ d\text{-}0.2' \ \text{m}0.63$	$\nu 2.0' \ d0.0' \ \text{m-}2.06$	$\nu 2.2' \; d\text{-}0.1' \; \text{m}1.17$	
Sat         GHA         Dec         CHA         Dec         GHA         Dec         GHA         Dec         GHA         Dec         All Nair         20°27:00         20°20:07:08:05         N02°21:69         80°20:00         N23°0:02         123°41:38         80°22:35:96         20°3:35:45         50°3:28:25         50°3:28:25         16°4:57         20°29:33:93         23°1:39         23°1:45         23°0:04         138°43:37         36.00         218°34:73         28.11         50°2:16:90         20°29:32:29         22°9:97.91         153°45:37         36.05         233°3:69:33         28.01         15°1:45:72         50°20:30         426°3:43:39         22°22:20:81         10°2:58:00         59.29         153°44:53         36.05         233°3:69:33         28.01         248°3:91:33         27.79         426°3:43:33         227.79         426°3:43:33         22.79         22.79         20.03         248°3:33         27.68         20°2:18:37         170°2:87.0         228°5:59.29         183°49:36         36.19         278°43:53         27.68         27.79         27.72         59.04         198°51:35         36.19         278°43:53         27.68         27.78         27.78         27.72         10:17           7         305°4.62         312°3:43:1         17.83							
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10 350°51.64 357°41.22 16.20 230°34.49 57.79 274°1.31 36.41 353°54.52 27.13							
11 5°54.11 12°43.52 15.66 245°35.94 57.54 289°3.30 36.46 8°56.72 27.02 12 20°56.57 27°45.81 N02°15.12 260°37.39 N22°57.29 304°5.30 N22°36.51 23°58.92 S03°26.91 13 35°59.03 42°48.10 14.58 275°38.83 57.04 319°7.29 36.55 39°1.12 26.80 14 51°1.50 57°50.38 14.05 290°40.28 56.79 334°9.28 36.60 54°3.31 26.69 15 66°3.96 72°52.67 · · 13.52 305°41.72 · · 56.54 349°11.27 · · 36.64 69°55.1 · · 26.58 16 81°6.43 87°54.94 12.98 320°43.17 56.29 4°13.26 36.69 84°7.71 26.48 17 96°8.89 102°57.22 12.46 335°44.61 56.03 19°15.25 36.73 99°9.91 26.37 18 111°11.35 117°59.49 N02°11.93 350°46.06 N22°55.78 34°17.25 N22°36.78 114°12.11 S03°26.26 19 126°13.82 133°1.75 11.40 5°47.50 55.53 49°19.24 36.82 129°14.31 26.15 20 141°16.28 148°4.02 10.88 20°48.94 55.28 64°21.23 36.87 144°16.51 26.04 21 156°18.75 163°6.27 · · 10.35 35°50.39 · · 55.03 79°23.22 · · 36.91 159°18.71 · · 25.93 22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82 23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71							
12 20°56.57 27°45.81 N02°15.12 260°37.39 N22°57.29 304°5.30 N22°36.51 23°58.92 S03°26.91 13 35°59.03 42°48.10 14.58 275°38.83 57.04 319°7.29 36.55 39°1.12 26.80 14 51°1.50 57°50.38 14.05 290°40.28 56.79 334°9.28 36.60 54°3.31 26.69 15 66°3.96 72°52.67 · 13.52 305°41.72 · 56.54 349°11.27 · 36.64 69°5.51 · 26.58 16 81°6.43 87°54.94 12.98 320°43.17 56.29 4°13.26 36.69 84°7.71 26.48 17 96°8.89 102°57.22 12.46 335°44.61 56.03 19°15.25 36.73 99°9.91 26.37 18 111°11.35 117°59.49 N02°11.93 350°46.06 N22°55.78 34°17.25 N22°36.78 114°12.11 S03°26.26 19 126°13.82 133°1.75 11.40 5°47.50 55.53 49°19.24 36.82 129°14.31 26.15 20 141°16.28 148°4.02 10.88 20°48.94 55.28 64°21.23 36.87 144°16.51 26.04 21 156°18.75 163°6.27 · 10.35 35°50.39 · 55.03 79°23.22 · 36.91 159°18.71 · 25.93 22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82 23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71  Mars: 240°17.15 18:39 Jupiter 283°25.60 15:46 Saturn 3°11.93 10:28  Apr 12 Sat SHA Mer.pass Venus 6°51.05 10:09 Mars 230°51.05 10:09 Saturn 3°1.93 10:28  Apr 12 Sat SHA Mer.pass Venus 6°51.05 10:09 15.43 Saturn 3°5.54 10:24  Horizontal parallax Venus: 0.4  Horizontal parallax Venus: 0.4  Nars: 0.1							I
13 35°59.03 42°48.10 14.58 275°38.83 57.04 319°7.29 36.55 39°1.12 26.80   14 51°1.50 57°50.38 14.05 290°40.28 56.79 334°9.28 36.60 54°3.31 26.69   15 66°3.96 72°52.67 ·· 13.52 305°41.72 ·· 56.54 349°11.27 ·· 36.64 69°5.51 ·· 26.58   16 81°6.43 87°54.94 12.98 320°43.17 56.29 4°13.26 36.69 84°7.71 26.48   17 96°8.89 102°57.22 12.46 335°44.61 56.03 19°15.25 36.73 99°9.91 26.37   18 111°11.35 117°59.49 N02°11.93 350°46.06 N22°55.78 34°17.25 N22°36.78 114°12.11 503°26.26   19 126°13.82 133°1.75 11.40 5°47.50 55.53 49°19.24 36.82 129°14.31 26.15   20 141°16.28 148°4.02 10.88 20°48.94 55.28 64°21.23 36.87 144°16.51 26.04   21 156°18.75 163°6.27 ·· 10.35 35°50.39 ·· 55.03 79°23.22 ·· 36.91 159°18.71 ·· 25.93   22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82   23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71    Saturn 3°11.93 10:28   Saturn 3°1.93 10:28   Satur	12	20° 56.57	27°45.81 N02°15.12	260°37.39 N22°57.29	304°5.30 N22°36.51	23°58.92 <b>S</b> 03°26.91	
14 51 1.50 57 50.38 14.05 290 40.28 50.79 334 9.28 30.60 54 3.31 20.69 15 10.09 15 66°3.96 72°52.67 · 13.52 305°41.72 · · 56.54 349°11.27 · · 36.64 69°5.51 · · 26.58							· ·
16       81°6.43       87°54.94       12.98       320°43.17       56.29       4°13.26       36.69       84°7.71       26.48       Venus       6°51.05       10:09         17       96°8.89       102°57.22       12.46       335°44.61       56.03       19°15.25       36.73       99°9.91       26.37       Mars       239°53.00       18:37         18       111°11.35       117°59.49       N02°11.93       350°46.06       N22°55.78       34°17.25       N22°36.78       114°12.11       503°26.26       Jupiter       283°14.38       15:43         19       126°13.82       133°1.75       11.40       5°47.50       55.53       49°19.24       36.82       129°14.31       26.15       Saturn       3°5.54       10:24         20       141°16.28       148°4.02       10.88       20°48.94       55.28       64°21.23       36.87       144°16.51       26.04         21       156°18.75       163°6.27       10.35       35°50.39       55.03       79°23.22       36.91       159°18.71       25.93         22       171°21.21       178°8.53       9.83       50°51.83       54.77       94°25.21       36.96       174°20.91       25.82       Venus       0.4 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
17       96°8.89       102°57.22       12.46       335°44.61       56.03       19°15.25       36.73       99°9.91       26.37       Mars       239°53.00       18:37         18       111°11.35       117°59.49       N02°11.93       350°46.06       N22°55.78       34°17.25       N22°36.78       114°12.11       S03°26.26       Jupiter       283°14.38       15:43         19       126°13.82       133°1.75       11.40       5°47.50       55.53       49°19.24       36.82       129°14.31       26.15       Saturn       3°5.54       10:24         20       141°16.28       148°4.02       10.88       20°48.94       55.28       64°21.23       36.87       144°16.51       26.04         21       156°18.75       163°6.27       · 10.35       35°50.39       · 55.03       79°23.22       · 36.91       159°18.71       · 25.93       Horizontal parallax         22       171°21.21       178°8.53       9.83       50°51.83       54.77       94°25.21       36.96       174°20.91       25.82       Venus:       0.4         23       186°23.67       193°10.78       9.31       65°53.27       54.52       109°27.20       37.01       189°23.11       25.71       Mars:       0							
18 111°11.35 117°59.49 N02°11.93 350°46.06 N22°55.78 34°17.25 N22°36.78 114°12.11 S03°26.26 19 126°13.82 133°1.75 11.40 5°47.50 55.53 49°19.24 36.82 129°14.31 26.15 20 141°16.28 148°4.02 10.88 20°48.94 55.28 64°21.23 36.87 144°16.51 26.04 21 156°18.75 163°6.27 · 10.35 35°50.39 · 55.03 79°23.22 · 36.91 159°18.71 · 25.93 22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82 23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71  Jupiter 283°14.38 15:43 Saturn 3°5.54 10:24  Horizontal parallax Venus: 0.4 Mars: 0.1							_
19 126°13.82 133°1.75 11.40 5°47.50 55.53 49°19.24 36.82 129°14.31 26.15 20 141°16.28 148°4.02 10.88 20°48.94 55.28 64°21.23 36.87 144°16.51 26.04 21 156°18.75 163°6.27 · 10.35 35°50.39 · 55.03 79°23.22 · 36.91 159°18.71 · 25.93 22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82 23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71    Saturn 3°5.54 10:24   Horizontal parallax   Horizontal parallax   Venus: 0.4   Mars: 0.1							_
20 141°16.28 148°4.02 10.88 20°48.94 55.28 64°21.23 36.87 144°16.51 26.04 21 156°18.75 163°6.27 · · 10.35 35°50.39 · · 55.03 79°23.22 · · 36.91 159°18.71 · · 25.93 22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82 23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71  Horizontal parallax Venus: 0.4 Mars: 0.1							
21 156°18.75 163°6.27 · · 10.35 35°50.39 · · 55.03 79°23.22 · · 36.91 159°18.71 · · 25.93  22 171°21.21 178°8.53 9.83 50°51.83 54.77 94°25.21 36.96 174°20.91 25.82  23 186°23.67 193°10.78 9.31 65°53.27 54.52 109°27.20 37.01 189°23.11 25.71  Horizontal parallax  Venus: 0.4  Mars: 0.1							Saturn 3 3.34 10:24
22       171°21.21       178°8.53       9.83       50°51.83       54.77       94°25.21       36.96       174°20.91       25.82       Venus: 0.4         23       186°23.67       193°10.78       9.31       65°53.27       54.52       109°27.20       37.01       189°23.11       25.71       Mars: 0.1							•
25 160 25.61 155 16.10 5.51 05 55.21 51.52 155 27.20 51.61 155 25.11							
Mer.pass. 10:36 $\nu 2.3' \ d$ -0.6' m-4.67 $\nu 1.5' \ d$ -0.2' m0.64 $\nu 2.0' \ d$ 0.0' m-2.05 $\nu 2.2' \ d$ -0.1' m1.17	23	186°23.67	193°10.78 9.31	65°53.27 54.52	109°27.20 37.01	189°23.11 25.71	Mars: 0.1
	Mer.	pass. 10:36	ν2.3' d-0.6' m-4.67	ν1.5' d-0.2' m0.64	ν2.0' d0.0' m-2.05	ν2.2' d-0.1' m1.17	

h	Su	n			Moon		
hu	GHA	Dec	GHA	ν	Dec	d	НР
0	179°39.69	N07°57.63	29°42.08	16.7'	N05°48.82	-14.3'	54.6
1	194°39.85	58.56	44°17.74	16.7'	05°34.54	-14.3'	54.6
2	209°40.02	07°59.48	58°53.44	16.7'	05°20.25	-14.3'	54.5
3	224°40.19	08°0.40	73°29.17	16.8'	05°5.95	-14.3'	54.5
1	239°40.36	1.33	88°4.93	16.8'	04°51.63	-14.3'	54.5
5	254°40.53	2.25	102°40.72	16.8'	04°37.30	-14.3'	54.5
5	269°40.69	N08°3.17	$117^{\circ}16.54$	16.8'	N04°22.96	-14.3'	54.5
7	284°40.86	4.09	131°52.39	16.9'	04°8.61	-14.4'	54.5
3	299°41.03	5.02	146°28.26	16.9'	03°54.26	-14.4'	54.5
)	314°41.20	• • 5.94	161°4.17	16.9'	03°39.89	-14.4'	54.5
0	329°41.36	6.86	175°40.09	17.0'	03°25.52	-14.4'	54.4
1	344°41.53	7.78	190°16.04	17.0'	03°11.14	-14.4'	54.4
2	359°41.70	N08°8.70	204°52.02	17.0'	N02°56.76	-14.4'	54.4
3	14°41.86	9.62	$219^{\circ}28.01$	17.0'	02°42.37	-14.4'	54.4
4	29°42.03	10.55	234°4.03	17.0'	$02^{\circ}27.98$	-14.4'	54.4
5	44°42.20	•• 11.47	248°40.06	17.1'	02°13.58	-14.4'	54.4
6	59°42.36	12.39	263°16.11	17.1'	$01^{\circ}59.18$	-14.4'	54.4
7	74°42.53	13.31	277°52.18	17.1'	01°44.78	-14.4'	54.4
8	89°42.70	N08° 14.23	292°28.27	17.1'	N01°30.38	-14.4'	54.3
9	104°42.86	15.15	307°4.37	17.1'	$01^{\circ}15.98$	-14.4'	54.3
0	119°43.03	16.06	321°40.49	17.1'	$01^{\circ}1.58$	-14.4'	54.3
1	134°43.19	• • 16.98	336°16.62	17.1'	$00^{\circ}47.19$	-14.4'	54.3
2	149°43.36	17.90	350°52.76	17.2'	00°32.79	-14.4'	54.3
3	164°43.52	18.82	5°28.91	17.2'	00°18.40	-14.4'	54.3
	SD = 16.0'	d = 0.9'		SI	D = 14.9'		
	<u> </u>	<u>u = 0.9</u>			J = 14.9		
ri	GHA	Dec	GHA	$\nu$	Dec	d	HP
)	179°43.69	N08° 19.74	20°5.07	17.2'	N00°4.01	-14.4'	54.3
L	194°43.86	20.66	34°41.24	17.2'	S00°10.38	14.4'	54.3
2	209°44.02	21.58	49°17.42	17.2'	00°24.75	14.4'	54.3
3	224°44.19	• • 22.49	63°53.60	17.2'	00°39.13	14.4'	54.2
ŀ	239°44.35	23.41	78° 29.79	17.2'	00°53.49	14.4'	54.2
5	254°44.52	24.33	93°5.99	17.2'	01°7.85	14.3'	54.2
5	269°44.68	N08°25.24	107°42.19	17.2'	S01°22.20	14.3'	54.2
7	284°44.84	26.16	122°18.39	17.2'	01°36.54	14.3'	54.2
3	299°45.01	27.08	136°54.59	17.2'	01°50.87	14.3'	54.2
9	314°45.17	• • 27.99	151°30.80	17.2'	02°5.19	14.3'	54.2
0	329°45.34	28.91	166°7.00	17.2'	$02^{\circ}19.49$	14.3'	54.2
1	344°45.50	29.83	180°43.20	17.2'	02°33.79	14.3'	54.2
2	359°45.67	N08°30.74	195° 19.40	17.2'	S02°48.07	14.3'	54.2
3	14°45.83	31.66	209°55.60	17.2'	03°2.34	14.3'	54.2
4	29°45.99	32.57	224°31.79	17.2'	03°16.59	14.2'	54.1
5	44°46.16	• • 33.49	239°7.98	17.2'	03°30.83	14.2'	54.1
6	59°46.32	34.40	253°44.16	17.2'	03°45.05	14.2'	54.1
7	74°46.48	35.31	268°20.33	17.2'	$03^{\circ}59.26$	14.2'	54.1
8	89°46.65	N08°36.23	282°56.49	17.2'	504°13.44	14.2'	54.1
9	104°46.81	37.14	297°32.64	17.1'	04°27.61	14.1'	54.1
0	119°46.97	38.05	312°8.79	17.1'	04°41.76	14.1'	54.1
1	134°47.14	• • 38.97	326°44.92	17.1'	04°55.89	14.1'	54.1
2	149°47.30	39.88	341°21.04	17.1'	$05^{\circ}10.00$	14.1'	54.1
3	164°47.46	40.79	355°57.15	17.1'	05°24.08	14.1'	54.1
	SD = 16.0'	d = 0.9'		SI	D = 14.8'		
at	GHA	Dec	GHA		Dec	d	HP
) )	179°47.62	N08°41.71	10° 33.24	u 17.1'	S05°38.15	14.0'	54.1
J L	179 47.62 194°47.79	42.62	25°9.31	17.1' 17.1'	05°52.19	14.0'	54.1
L 2	209°47.95	43.53	25 9.31 39°45.37	17.1 17.0'	05° 52.19	14.0'	54.1
<u>-</u> 3	209 47.95 224°48.11	44.44	54°21.41	17.0'	06° 20.20	14.0'	54.0
)  -	224 48.11 239°48.27	45.35	54 21.41 68°57.44	17.0'	06°20.20	13.9	54.0
<del>!</del> 5	254°48.43	45.35 46.26	83°33.44	17.0'	06°48.11	13.9'	54.0
		46.26 N08°47.18	98° 9.43	17.0'	507°2.02	13.9'	54.0
	260° 40 60	NUO 41.10			07° 15.90	13.9'	54.0
	269°48.60	40 00	1120 15 20	16 0'		13.9	
7	284°48.76	48.09	112°45.39	16.9'		12 0'	
7 3	284°48.76 299°48.92	49.00	127°21.33	16.9'	$07^{\circ}29.76$	13.8'	
7 3	284°48.76 299°48.92 314°49.08	49.00 •• 49.91	127°21.33 141°57.25	16.9' 16.9'	07° 29.76 07° 43.59	13.8'	54.0
7 3 9 0	284°48.76 299°48.92 314°49.08 329°49.24	49.00 •• 49.91 50.82	127°21.33 141°57.25 156°33.14	16.9' 16.9' 16.9'	07° 29.76 07° 43.59 07° 57.39	13.8' 13.8'	54.0 54.0
7 3 9 0 1	284°48.76 299°48.92 314°49.08 329°49.24 344°49.40	49.00 •• 49.91 50.82 51.73	127°21.33 141°57.25 156°33.14 171°9.01	16.9' 16.9' 16.9' 16.8'	07° 29.76 07° 43.59 07° 57.39 08° 11.16	13.8' 13.8' 13.7'	54.0 54.0 54.0
7 3 9 0 1 2	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56	49.00 •• 49.91 50.82 51.73 N08° 52.64	127°21.33 141°57.25 156°33.14 171°9.01 185°44.86	16.9' 16.9' 16.9' 16.8' 16.8'	07°29.76 07°43.59 07°57.39 08°11.16 508°24.89	13.8' 13.8' 13.7' 13.7'	54.0 54.0 54.0 54.0
7 3 9 0 1 2 3	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72	49.00 • 49.91 50.82 51.73 N08° 52.64 53.54	127°21.33 141°57.25 156°33.14 171°9.01 185°44.86 200°20.67	16.9' 16.9' 16.9' 16.8' 16.8' 16.8'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 508° 24.89 08° 38.59	13.8' 13.8' 13.7' 13.7' 13.7'	54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4	284°48.76 299°48.92 314°49.08 329°49.24 344°49.40 359°49.56 14°49.72 29°49.88	49.00 • 49.91 50.82 51.73 N08° 52.64 53.54 54.45	127°21.33 141°57.25 156°33.14 171°9.01 185°44.86 200°20.67 214°56.46	16.9' 16.9' 16.9' 16.8' 16.8' 16.8'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 \$08° 24.89 08° 38.59 08° 52.26	13.8' 13.8' 13.7' 13.7' 13.7' 13.6'	54.0 54.0 54.0 54.0 54.0 54.0
7 3 0 1 2 3 4 5	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04	49.00 • 49.91 50.82 51.73 N08° 52.64 53.54 54.45 • 55.36	127°21.33 141°57.25 156°33.14 171°9.01 185°44.86 200°20.67 214°56.46 229°32.22	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 \$08° 24.89 08° 38.59 08° 52.26 09° 5.90	13.8' 13.7' 13.7' 13.7' 13.6' 13.6'	54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20	49.00 • 49.91 50.82 51.73 N08° 52.64 53.54 54.45 • 55.36 56.27	127°21.33 141°57.25 156°33.14 171°9.01 185°44.86 200°20.67 214°56.46 229°32.22 244°7.95	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7' 16.7'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 \$08° 24.89 08° 38.59 08° 52.26 09° 5.90 09° 19.50	13.8' 13.8' 13.7' 13.7' 13.6' 13.6' 13.6'	54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5 6 7	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36	49.00 • 49.91 50.82 51.73 N08° 52.64 53.54 54.45 • 55.36 56.27 57.18	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7' 16.7'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 \$08° 24.89 08° 38.59 08° 52.26 09° 5.90 09° 19.50 09° 33.06	13.8' 13.7' 13.7' 13.7' 13.6' 13.6' 13.6' 13.5'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5 6 7 8	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36 89° 50.52	49.00 • 49.91 50.82 51.73 N08° 52.64 53.54 54.45 • 55.36 56.27 57.18 N08° 58.09	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65 273° 19.32	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7' 16.7' 16.7'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 S08° 24.89 08° 38.59 08° 52.26 09° 5.90 09° 19.50 09° 33.06 S09° 46.59	13.8' 13.7' 13.7' 13.7' 13.6' 13.6' 13.6' 13.5' 13.5'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0
5 7 8 9 0 1 2 3 4 5 6 7 8	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36 89° 50.52 104° 50.68	49.00 · 49.91 50.82 51.73 N08° 52.64 53.54 54.45 · 55.36 56.27 57.18 N08° 58.09 58.99	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65 273° 19.32 287° 54.95	16.9' 16.9' 16.8' 16.8' 16.8' 16.7' 16.7' 16.7' 16.6'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 508° 24.89 08° 38.59 08° 52.26 09° 5.90 09° 19.50 09° 33.06 \$09° 46.59 10° 0.08	13.8' 13.7' 13.7' 13.7' 13.6' 13.6' 13.6' 13.5' 13.5' 13.5'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5 6 7 8 9	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36 89° 50.52 104° 50.68 119° 50.84	49.00 · 49.91 50.82 51.73 N08° 52.64 53.54 54.45 · 55.36 56.27 57.18 N08° 58.09 58.99 08° 59.90	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65 273° 19.32 287° 54.95 302° 30.56	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7' 16.7' 16.7' 16.6' 16.6'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 508° 24.89 08° 38.59 08° 52.26 09° 5.90 09° 19.50 09° 33.06 509° 46.59 10° 0.08 10° 13.54	13.8' 13.7' 13.7' 13.7' 13.6' 13.6' 13.6' 13.5' 13.5' 13.5' 13.5'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5 6 7 8 9 0 1	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36 89° 50.52 104° 50.68 119° 50.84 134° 51.00	49.00 49.91 50.82 51.73 N08° 52.64 53.54 54.45 55.36 56.27 57.18 N08° 58.09 08° 59.90 09° 0.81	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65 273° 19.32 287° 54.95 302° 30.56 317° 6.13	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7' 16.7' 16.6' 16.6' 16.5'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 508° 24.89 08° 52.26 09° 5.90 09° 19.50 09° 33.06 509° 46.59 10° 0.08 10° 13.54 10° 26.95	13.8' 13.8' 13.7' 13.7' 13.6' 13.6' 13.5' 13.5' 13.5' 13.4' 13.4'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5 6 7 8 9 0 1 2 2 3 4 5 6 7 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36 89° 50.52 104° 50.68 119° 50.84 134° 51.00 149° 51.16	49.00 49.91 50.82 51.73 N08° 52.64 53.54 54.45 55.36 56.27 57.18 N08° 58.09 58.99 08° 59.90 09° 0.81 1.71	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65 273° 19.32 287° 54.95 302° 30.56 317° 6.13 331° 41.66	16.9' 16.9' 16.8' 16.8' 16.8' 16.7' 16.7' 16.6' 16.6' 16.5' 16.5'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 508° 24.89 08° 38.59 08° 52.26 09° 5.90 09° 19.50 09° 33.06 509° 46.59 10° 0.08 10° 13.54 10° 26.95 10° 40.33	13.8' 13.8' 13.7' 13.7' 13.6' 13.6' 13.5' 13.5' 13.5' 13.4' 13.4' 13.3'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0
7 3 9 0 1 2 3 4 5 6 7 8 9 0 1	284° 48.76 299° 48.92 314° 49.08 329° 49.24 344° 49.40 359° 49.56 14° 49.72 29° 49.88 44° 50.04 59° 50.20 74° 50.36 89° 50.52 104° 50.68 119° 50.84 134° 51.00	49.00 49.91 50.82 51.73 N08° 52.64 53.54 54.45 55.36 56.27 57.18 N08° 58.09 08° 59.90 09° 0.81	127° 21.33 141° 57.25 156° 33.14 171° 9.01 185° 44.86 200° 20.67 214° 56.46 229° 32.22 244° 7.95 258° 43.65 273° 19.32 287° 54.95 302° 30.56 317° 6.13	16.9' 16.9' 16.8' 16.8' 16.8' 16.8' 16.7' 16.7' 16.6' 16.6' 16.5'	07° 29.76 07° 43.59 07° 57.39 08° 11.16 508° 24.89 08° 52.26 09° 5.90 09° 19.50 09° 33.06 509° 46.59 10° 0.08 10° 13.54 10° 26.95	13.8' 13.8' 13.7' 13.7' 13.6' 13.6' 13.5' 13.5' 13.5' 13.4' 13.4'	54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0

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

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

	Sun			Moon				
Day	Eqn.of Time		Eqn.of Time Me		Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	12-14		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-99%		
10	01:21	01:13	12:01	22:37	10:18			
11	01:05	00:57	12:01	23:17	10:57			
12	00:50	00:42	12:01	23:56	11:36			

April 13, 14, 15 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	201°26.14	208°13.03 N02°8.80	80°54.71 N22°54.27	124°29.19 N22°37.05	204°25.31 <b>S</b> 03°25.60	
1	216°28.60	223°15.27 8.28	95°56.15 54.02	139°31.18 37.10	219°27.51 25.49	Alpheratz 357°34.92 29°13.63 Ankaa 353°7.33 -42°10.13
2	231°31.07	238°17.51 7.77	110° 57.59 53.76	154°33.17 37.14	234°29.70 25.39	Schedar 349°31.42 56°40.43
3	246°33.53	253°19.75 · · 7.26	125°59.03 · · 53.51	169°35.16 · · 37.19	249°31.90 · · 25.28	Diphda 348°47.41 -17°50.96
4 5	261°35.99 276°38.46	268°21.98 6.75 283°24.21 6.24	141°0.47 53.26 156°1.91 53.00	184°37.14 37.23 199°39.13 37.28	264°34.10 25.17 279°36.30 25.06	Achernar 335°20.58 -57°6.54
6	291°40.92	298°26.43 N02°5.73	171°3.35 N22°52.75	214°41.12 N22°37.32	294°38.50 S03°24.95	Hamal 327°51.33 23°34.83
7	306°43.39	313°28.66 5.22	186°4.79 52.49	229°43.11 37.37	309°40.70 24.84	Polaris 314°24.00 89°22.35 Acamar 315°12.00 -40°12.32
8	321°45.85	328° 30.87 4.72	201°6.23 52.24	244°45.10 37.41	324°42.90 24.73	Menkar 314°6.24 4°11.24
9	336° 48.31	343°33.09 · · 4.22	216°7.66 · · 51.99	259°47.09 · · 37.46	339°45.10 · · 24.62	Mirfak 308° 28.43 49° 57.09
10 11	351°50.78 6°53.24	358° 35.30 3.72 13° 37.50 3.22	231°9.10 51.73 246°10.54 51.48	274°49.08 37.50 289°51.06 37.55	354°47.30 24.52 9°49.50 24.41	Aldebaran 290°39.64 16°33.57
12	21°55.71	28°39.71 N02°2.72	261°11.97 N22°51.22	304°53.05 N22°37.59	24°51.70 S03°24.30	Rigel 281°3.87 -8°10.46
13	$36^{\circ}58.17$	43°41.91 2.23	276° 13.41 50.97	319°55.04 37.64	39°53.90 24.19	Capella 280°21.87 46°1.51 Bellatrix 278°22.85 6°22.29
14	52°0.63	58°44.10 1.74	291°14.84 50.71	334°57.03 37.68	54°56.10 24.08	Elnath 278°1.82 28°37.76
15 16	67°3.10 82°5.56	73°46.29 · · 1.25	306°16.28 · · 50.46	349°59.01 · · 37.73	69°58.30 · · 23.97	Alnilam 275°37.70 -1°11.24
16 17	82 5.50 97°8.03	88°48.48 0.76 103°50.66 02°0.27	321°17.71 50.20 336°19.15 49.95	5°1.00 37.77 20°2.99 37.82	85°0.50 23.87 100°2.70 23.76	Betelgeuse 270°52.02 7°24.65
18	112° 10.49	118°52.85 N01°59.78	351°20.58 N22°49.69	35°4.97 N22°37.87	115°4.90 S03°23.65	Canopus 263°52.49 -52°42.78
19	$127^{\circ}12.96$	133°55.02 59.30	6°22.01 49.43	50° 6.96 37.91	130°7.10 23.54	Sirius 258°26.16 -16°45.21 Adhara 255°5.79 -29°0.59
20	142° 15.42	148°57.20 58.82	21°23.44 49.18	65°8.95 37.96	145°9.30 23.43	Procyon 244°50.64 5°9.54
21 22	157° 17.88 172° 20.35	163°59.36 · · 58.34	36°24.88 · · 48.92	80°10.93 · · 38.00 95°12.92 38.05	160°11.50 · · 23.32	Pollux 243°17.06 27°57.96
23	172 20.35 187°22.81	179°1.53 57.86 194°3.69 57.38	51°26.31 48.66 66°27.74 48.41	95°12.92 38.05 110°14.90 38.09	175°13.71 23.22 190°15.91 23.11	Avior 234°14.58 -59°35.69
						Suhail 222°46.03 -43°32.32
Mer.	pass. 10:33	ν2.2′ d-0.5′ m-4.69	ν1.4' d-0.3' m0.66	ν2.0′ d0.0′ m-2.05	ν2.2' d-0.1' m1.17	Miaplacidus 221°37.96 -69°49.51 Alphard 217°47.43 -8°46.23
						Regulus 207°34.04 11°50.56
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.20 61°37.00
0 1	202°25.28 217°27.74	209°5.85 N01°56.90 224°8.01 56.43	81°29.17 N22°48.15 96°30.60 47.89	125°16.89 N22°38.14 140°18.87 38.18	205°18.11 \$03°23.00 220°20.31 22.89	Denebola 182°24.46 14°25.76
2	232°30.20	239° 10.16 55.96	111°32.03 47.64	155°20.86 38.23	235°22.51 22.78	Gienah 175°43.09 -17°41.09
3	247°32.67	254°12.30 · · 55.49	126°33.46 · · 47.38	170°22.84 · · 38.27	250°24.71 · · 22.67	Acrux 172°59.28 -63°14.50 Gacrux 171°50.92 -57°15.44
4	$262^{\circ}35.13$	269° 14.45 55.02	141°34.89 47.12	185°24.83 38.32	265°26.91 22.57	Alioth 166°12.20 55°49.32
5	277°37.60	284°16.59 54.55	156° 36.32 46.86	200°26.81 38.36	280°29.11 22.46	Spica 158°21.78 -11°17.74
6 7	292° 40.06 307° 42.52	299°18.72 N01°54.09 314°20.86 53.62	171°37.74 N22°46.61 186°39.17 46.35	215°28.80 N22°38.41	295°31.31 \$03°22.35 310°33.51 22.24	Alkaid 152°51.33 49°11.10
8	307 42.52 322°44.99	314°20.86 53.62 329°22.99 53.16	186°39.17 46.35 201°40.60 46.09	230°30.78 38.45 245°32.77 38.50	310°33.51 22.24 325°35.71 22.13	Hadar 148°35.13 -60°29.73
9	337° 47.45	344°25.11 · · 52.70	216° 42.03 · · 45.83	260°34.75 · · 38.54	340°37.91 · · 22.03	Menkent 147°57.01 -36°29.75 Arcturus 145°47.39 19°2.88
10	352°49.92	359°27.23 52.25	231°43.45 45.57	275°36.73 38.59	355°40.12 21.92	Arcturus 145°47.39 19°2.88   Rigil Kent. 139°39.43 -60°56.39
11	7°52.38	14°29.35 51.79	246° 44.88 45.31	290°38.72 38.63	10°42.32 21.81	Kochab 137°18.62 74°2.89
12	22°54.84	29°31.47 N01°51.34	261°46.30 N22°45.05	305°40.70 N22°38.68	25°44.52 \$03°21.70	Zuben'ubi 136°55.49 -16°8.92
13 14	37° 57.31 52° 59.77	44°33.58 50.88 59°35.68 50.43	276° 47.73 44.79 291° 49.15 44.54	320°42.68 38.72 335°44.67 38.77	40°46.72 21.59 55°48.92 21.49	Alphecca 126°3.25 26°37.55
15	68°2.24	74°37.79 · · 49.98	306°50.58 · · 44.28	350°46.65 · · 38.81	70°51.12 · · 21.38	Antares 112°15.34 -26°29.32 Atria 107°9.05 -69°4.19
16	83°4.70	89°39.89 49.54	321°52.00 44.02	5°48.63 38.86	85°53.32 21.27	Atria 107°9.05 -69°4.19 Sabik 102°2.36 -15°45.45
17	98°7.16	104°41.98 49.09	336°53.43 43.76	20°50.61 38.90	100°55.53 21.16	Shaula 96°9.89 -37°7.27
18 19	113°9.63 128°12.09	119°44.08 N01°48.65 134°46.17 48.20	351°54.85 N22°43.50 6°56.27 43.24	35°52.60 N22°38.95 50°54.58 38.99	115°57.73 \$03°21.06 130°59.93 20.95	Rasalhague 95°58.19 12°32.27
20	143° 14.56	149° 48.25 47.76	21°57.69 42.98	65°56.56 39.04	146°2.13 20.84	Eltanin 90°41.86 51°28.75
21	158° 17.02	164°50.33 · · 47.33	36°59.12 · · 42.72	80°58.54 · · 39.08	161°4.33 · · 20.73	Kaus Aust. 83°32.12 -34°22.30 Vega 80°32.98 38°48.07
22	173° 19.49	179°52.41 46.89	52°0.54 42.45	96° 0.52 39.13	176°6.53 20.62	Nunki 75°47.44 -26°15.91
23	188°21.95	194°54.49 46.45	67°1.96 42.19	111°2.51 39.17	191°8.74 20.52	Altair 61°59.78 8°55.90
Mer.	pass. 10:29	$\nu$ 2.2′ <i>d</i> -0.5′ m-4.70	$\nu 1.4' \ d\text{-}0.3' \ \text{m}0.68$	$\nu 2.0' \ d0.0' \ \text{m-}2.05$	$ u 2.2' \ d \text{-} 0.1' \ \text{m} 1.17$	Peacock 53°5.50 -56°39.03
						Deneb 49°25.80 45°21.88
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.77 9°59.26 Al Na'ir 27°32.92 -46°50.22
0	203°24.41	209°56.56 N01°46.02	82°3.38 N22°41.93	126°4.49 N22°39.21	206°10.94 <b>S</b> 03°20.41	Fomalhaut 15°14.56 -29°29.31
1	218° 26.88	224°58.63 45.59	97°4.80 41.67	141° 6.47 39.26	221°13.14 20.30	Scheat 13°45.31 28°12.98
2	233° 29.34 248° 31.81	240°0.69 45.16 255°2.75 · · 44.73	112°6.22 41.41 127°7.64 · · 41.15	156°8.45 39.30 171°10.43 · · 39.35	236°15.34 20.19 251°17.54 · · · 20.09	Markab 13°29.96 15°20.30
4	263°34.27	270°4.81 44.73	142°9.06 40.89	186°12.41 39.39	266°19.75 19.98	Apr 13 Sun SHA Mer.pass
5	278°36.73	285°6.86 43.88	157° 10.47 40.62	201°14.39 39.44	281°21.95 19.87	Venus 6° 46.89 10:06
6	293°39.20	300°8.91 N01°43.46	172°11.89 N22°40.36	216°16.37 N22°39.48	296°24.15 <b>S</b> 03°19.76	Mars 239°28.57 18:35
7	308°41.66	315°10.96 43.04	187° 13.31 40.10	231°18.35 39.53	311°26.35 19.66	Jupiter 283°3.05 15:40
8 9	323° 44.13 338° 46.59	330°13.00 42.62 345°15.04 · · 42.20	202°14.73 39.84 217°16.14 · · 39.57	246°20.33 39.57 261°22.31 · · 39.62	326°28.56 19.55 341°30.76 •• 19.44	Saturn 2°59.17 10:21
10	353° 49.05	0°17.08 41.79	217°16.14 · · 39.57 232°17.56 39.31	276°24.29 39.66	356°32.96 19.34	Apr 14 Mon SHA Mer.pass
11	8°51.52	15°19.11 41.37	247° 18.97 39.05	291°26.27 39.71	11°35.16 19.23	Venus 6° 40.58 10:02
12	23°53.98	30°21.14 N01°40.96	262°20.39 N22°38.79	306°28.25 N22°39.75	26°37.37 <b>S</b> 03°19.12	Mars 239°3.89 18:32 Jupiter 282°51.61 15:37
13	38° 56.45	45°23.16 40.55	277°21.81 38.52	321°30.23 39.80	41°39.57 19.01	Saturn 2°52.83 10:17
14 15	53°58.91 69°1.38	60°25.18 40.14 75°27.20 · · 39.74	292°23.22 38.26 307°24.63 · · 37.99	336°32.20 39.84 351°34.18 · · 39.89	56°41.77 18.91 71°43.98 · · 18.80	
15 16	69 1.38 84°3.84	90°29.21 39.33	307 24.03 · · 37.99 322°26.05 37.73	6°36.16 39.93	86°46.18 18.69	Apr 15 Tue SHA Mer.pass Venus 6°32.15 09:59
17	99°6.30	105°31.23 38.93	337°27.46 37.47	21°38.14 39.97	101°48.38 18.59	Mars 238°38.96 18:30
18	114°8.77	120°33.23 N01°38.53	352°28.87 N22°37.20	36°40.12 N22°40.02	116°50.58	Jupiter 282°40.07 15:34
19	129°11.23	135°35.24 38.13	7°30.29 36.94	51°42.10 40.06	131°52.79 18.37	Saturn 2°46.53 10:14
20 21	144° 13.70 159° 16.16	150°37.24 37.73 165°39.23 · · 37.34	22°31.70 36.67 37°33.11 · · 36.41	66°44.07 40.11 81°46.05 • 40.15	146°54.99 18.26 161°57.19 · · 18.16	Horizontal parallax
22	174° 18.62	180°41.23 36.94	52°34.52 36.14	96°48.03 40.20	176°59.40 18.05	Venus: 0.4
23	189°21.09	195°43.22 36.55	67°35.93 35.88	111°50.00 40.24	192°1.60 17.94	Mars: 0.1
Mer	pass. 10:25	ν2.1' d-0.4' m-4.72	ν1.4' d-0.3' m0.70	$\nu 2.0' \ d0.0' \ \text{m-}2.04$	ν2.2' d-0.1' m1.17	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.48	N09°3.53	$0^{\circ}52.62$	16.4'	<b>S</b> 11°6.96	13.3'	53.9'
1	194°51.64	4.43	15°28.04	16.4'	11°20.21	13.2'	53.9'
2	209°51.80 224°51.96	5.34 •• 6.24	30°3.43 44°38.77	16.3' 16.3'	11°33.41 11°46.58	13.2' 13.1'	53.9' 53.9'
4	239°52.12	7.15	59° 14.08	16.3'	11°59.70	13.1'	53.9'
5	254°52.27	8.05	73°49.34	16.2'	$12^{\circ}12.77$	13.0'	53.9'
6	269°52.43	N09°8.96	88°24.56	16.2'	\$12°25.80	13.0'	53.9'
7 8	284°52.59 299°52.75	9.86 10.77	102°59.74 117°34.88	16.1' 16.1'	12°38.78 12°51.72	12.9' 12.9'	53.9' 53.9'
9	314°52.91	• • 11.67	132°9.97	16.0'	13°4.60	12.8'	53.9'
10	329°53.07	12.58	$146^{\circ}45.02$	16.0'	$13^{\circ}17.44$	12.8'	53.9'
11	344°53.22	13.48	161°20.02	16.0'	13°30.22 \$13°42.96	12.7'	53.9'
12 13	359°53.38 14°53.54	N09° 14.38 15.28	175° 54.97 190° 29.87	15.9' 15.9'	13° 55.64	12.7' 12.6'	53.9' 53.9'
14	29°53.69	16.19	205°4.73	15.8'	14°8.27	12.6'	53.9'
15	44°53.85	• • 17.09	219° 39.54	15.8'	14° 20.85	12.5'	53.9'
16	59°54.01	17.99	234° 14.30 248° 49.01	15.7'	14° 33.37 14° 45.83	12.5'	53.9'
17 18	74°54.17 89°54.32	18.89 N09°19.79	248° 49.01 263° 23.66	15.7' 15.6'	14°45.83 \$14°58.24	12.4' 12.4'	53.9' 53.9'
19	104°54.48	20.70	277°58.27	15.6'	15° 10.60	12.3'	53.9'
20	119°54.63	21.60	292° 32.82	15.5'	15°22.89	12.2'	53.9'
21	134°54.79	• • 22.50	307°7.31	15.4'	15° 35.13 15° 47.30	12.2'	53.9'
22 23	149°54.95 164°55.10	23.40 24.30	321°41.76 336°16.14	15.4' 15.3'	15°47.30 15°59.42	12.1' 12.1'	53.9' 53.9'
	SD = 15.9'	d = 0.9'			0 = 14.7'		
	JD = 15.9′	u = 0.9°		)L	v = 14.7°		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°55.26	N09° 25.20	350° 50.47	15.3'	\$16° 11.47	12.0'	53.9'
1 2	194°55.41 209°55.57	26.10 27.00	5°24.75 19°58.97	15.2' 15.2'	16°23.46 16°35.39	11.9' 11.9'	53.9' 53.9'
3	209 55.57 224°55.72	• • 27.90	34° 33.13	15.1'	16° 47.26	11.8'	53.9
4	239°55.88	28.79	49°7.23	15.0'	$16^{\circ}59.06$	11.7'	53.9'
5	254°56.03	29.69	63°41.27	15.0'	17° 10.79	11.7'	53.9'
6 7	269°56.19 284°56.34	N09° 30.59 31.49	78° 15.25 92° 49.17	14.9' 14.9'	\$17°22.46 17°34.06	11.6' 11.5'	53.9' 53.9'
8	299°56.50	32.39	107°23.03	14.8'	17°45.59	11.5'	53.9'
9	314°56.65	• • 33.28	121°56.83	14.7'	$17^{\circ}57.05$	11.4'	53.9'
10	329°56.81 344°56.96	34.18	136° 30.57 151° 4.24	14.7'	18° 8.44 18° 19.76	11.3'	53.9'
11 12	359°57.12	35.08 N09°35.98	151 4.24 165° 37.85	14.6' 14.5'	18 19.76 \$18°31.01	11.2' 11.2'	53.9' 53.9'
13	14°57.27	36.87	180° 11.40	14.5'	18° 42.19	11.1'	53.9'
14	29°57.42	37.77	194° 44.88	14.4'	$18^{\circ}53.29$	11.0'	53.9'
15 16	44°57.58 59°57.73	· · 38.66 39.56	209° 18.30 223° 51.65	14.4' 14.3'	19°4.32 19°15.27	11.0' 10.9'	53.9' 53.9'
17	74°57.88	39.50 40.45	223 51.05 238° 24.93	14.3	19 15.27 19°26.14	10.9	53.9'
18	89°58.04	N09°41.35	252°58.15	14.2'	S19°36.94	10.7'	53.9'
19	104°58.19	42.24	267°31.30	14.1'	19°47.66	10.6'	53.9'
20 21	119°58.34 134°58.49	43.14 •• 44.03	282°4.38 296°37.40	14.0' 13.9'	19°58.30 20°8.86	10.6' 10.5'	53.9' 53.9'
22	149°58.65	44.03	311° 10.34	13.9'	20° 19.34	10.5	53.9'
23	164°58.80	45.82	325°43.22	13.8'	20°29.73	10.3'	54.0'
	SD = 15.9'	d = 0.9'		SE	0 = 14.7'		
Tue	GHA	Dec	GHA	ν 12.7'	Dec	d 10.0'	HP
0 1	179°58.95 194°59.10	N09° 46.71 47.61	340° 16.03 354° 48.77	13.7' 13.7'	\$20°40.04 20°50.27	10.2' 10.1'	54.0' 54.0'
2	209°59.25	48.50	9°21.43	13.6'	21°0.42	10.1	54.0'
3	224°59.41	• • 49.39	23°54.03	13.5'	21°10.48	10.0'	54.0'
4 5	239°59.56 254°59.71	50.28 51.18	38° 26.56 52° 59.01	13.5' 13.4'	21°20.45 21°30.33	9.9' 9.8'	54.0' 54.0'
6	254 59.71 269°59.86	N09° 52.07	67°31.40	13.4	521°40.13	9.8	54.0'
7	285°0.01	52.96	82°3.71	13.2'	21°49.83	9.6'	54.0'
8	300°0.16	53.85	96° 35.95	13.2'	21°59.45	9.5'	54.0'
9 10	315°0.31 330°0.46	· · 54.74 55.63	111°8.12 125°40.22	13.1' 13.0'	22°8.97 22°18.40	9.4' 9.3'	54.0' 54.0'
11	345°0.61	55.03 56.52	125 40.22 140° 12.24	13.0'	22 18.40 22°27.74	9.3 9.2'	54.0'
12	0°0.76	N09°57.41	154°44.19	12.9'	S22°36.99	9.1'	54.0'
13	15°0.91	58.30	169° 16.07	12.8'	22°46.14	9.1'	54.0'
14 15	30°1.06 45°1.21	09°59.19 10°0.08	183° 47.87 198° 19.60	12.7' 12.7'	22°55.19 23°4.15	9.0' 8.9'	54.0' 54.0'
16	60°1.36	0.08	212°51.26	12.6'	23° 13.00	8.8'	54.0'
17	75°1.51	1.86	$227^{\circ}22.85$	12.5'	23°21.76	8.7'	54.1'
18	90°1.66	N10°2.74	241°54.36	12.4'	\$23°30.42	8.6'	54.1'
19 20	105°1.81 120°1.96	3.63 4.52	256° 25.79 270° 57.16	12.4' 12.3'	23°38.98 23°47.44	8.5' 8.4'	54.1' 54.1'
21	135°2.11	· · 5.41	270 57.10 285° 28.45	12.3	23°55.80	8.3'	54.1'
22	150°2.26	6.29	299°59.66	12.1'	24°4.05	8.1'	54.1'
23	165°2.41	7.18	314°30.81	12.1'	24° 12.19	8.0'	54.1'
	SD = 15.9'	d = 0.9'		SE	0 = 14.7'		

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

Lat.		Moonris	е	Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	22:43			03:20	02:10	
<b>N</b> 70°	21:59			03:39	02:56	
68°	21:30	23:57		03:55	03:26	02:29
66°	21:08	23:08		04:08	03:49	03:20
64°	20:51	22:37		04:19	04:07	03:52
62°	20:38	22:14	23:58	04:28	04:22	04:16
60°	20:26	21:56	23:30	04:36	04:35	04:35
N 58°	20:16	21:40	23:07	04:43	04:46	04:51
56°	20:07	21:28	22:49	04:49	04:55	05:04
54°	19:59	21:16	22:34	04:55	05:04	05:16
52°	19:53	21:07	22:21	05:00	05:11	05:27
50°	19:46	20:58	22:10	05:04	05:18	05:36
45°	19:33	20:39	21:46	05:14	05:33	05:56
N 40°	19:22	20:24	21:27	05:23	05:45	06:12
35°	19:13	20:12	21:11	05:30	05:56	06:25
30°	19:05	20:01	20:58	05:36	06:05	06:37
20°	18:51	19:42	20:35	05:47	06:21	06:58
N 10° 0°	18:39	19:26	20:15	05:57	06:35	07:16
1	18:28	19:11	19:56	06:06	06:48	07:32
<b>S</b> 10°	18:16	18:56	19:38	06:15	07:01	07:49
20°	18:05	18:40	19:19	06:25	07:15	08:07
30°	17:51	18:22	18:56	06:37	07:32	08:28
35° 40°	17:43	18:11	18:43	06:43	07:41	08:40
40° 45°	17:35 17:24	17:59 17:45	18:28 18:10	06:51 06:59	07:52 08:05	08:55 09:11
_	1					
<b>S</b> 50°	17:12	17:28	17:48	07:10	08:21	09:32
52° 54°	17:07	17:20	17:37	07:15	08:28	09:42
54° 56°	17:00	17:11	17:26	07:20	08:36	09:54
56°	16:53 16:46	17:01 16:50	17:12 16:57	07:26 07:33	08:46 08:56	10:07 10:22
S 60°	16:46	16:37	16:38	07:33	09:08	10:22
3 00	10:57	10:57	10:30	07:41	09:00	10:40

	Sun			Moon		
Day	Day Eqn.of Time		Mer.	Mer.	Mer.Pass.	
- 4,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-96%
13	00:34	00:26	12:00	-:-	12:17	
14	00:19	00:12	12:00	00:38	12:59	
15	00:04	00:03	12:00	01:21	13:44	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	204° 23.55	210°45.20 N01°36.16	82°37.34 N22°35.61	126°51.98 N22°40.29	207°3.80 \$03°17.84	
1	$219^{\circ}26.02$	225° 47.19 35.77	97°38.75 35.35	141°53.96 40.33	222°6.01 17.73	Alpheratz 357°34.90 29°13.63 Ankaa 353°7.32 -42°10.11
2	234°28.48	240°49.17 35.38	112°40.16 35.08	156°55.94 40.38	237°8.21 17.62	Ankaa 353°7.32 -42°10.11   Schedar 349°31.40 56°40.42
3	249°30.94	255°51.14 · · 35.00	127°41.57 · · 34.82	171°57.91 · · 40.42	252°10.41 · · 17.52	Diphda 348°47.40 -17°50.95
4	264°33.41	270°53.11 34.61	142°42.98 34.55	186°59.89 40.46	267°12.62 17.41	Achernar 335°20.58 -57°6.52
5 6	279°35.87 294°38.34	285°55.08 34.23 300°57.05 N01°33.85	157° 44.39 34.28 172° 45.80 N22° 34.02	202°1.86 40.51 217°3.84 N22°40.55	282°14.82 17.30 297°17.02 \$03°17.20	Hamal 327°51.32 23°34.83
7	309° 40.80	315°59.01 33.47	187° 47.21 33.75	232°5.82 40.60	312°19.23 17.09	Polaris 314°24.22 89°22.33
8	324°43.27	331°0.97 33.10	202°48.61 33.48	247°7.79 40.64	327°21.43 16.98	Acamar 315°12.00 -40°12.30
9	339°45.73	346°2.92 · · 32.72	217°50.02 · · 33.22	262°9.77 · · 40.69	342°23.64 · · 16.88	Menkar 314°6.24 4°11.24 Mirfak 308°28.43 49°57.08
10	$354^{\circ}48.19$	1°4.88 32.35	232°51.43 32.95	277°11.74 40.73	357°25.84 16.77	Aldebaran 290°39.64 16°33.57
11	9°50.66	16°6.82 31.98	247°52.83 32.68	292°13.72 40.78	12°28.04 16.66	Rigel 281°3.88 -8°10.46
12	24°53.12	31°8.77 N01°31.61	262°54.24 N22°32.42	307°15.69 N22°40.82	27°30.25 \$03°16.56	Capella 280°21.89 46°1.50
13 14	39° 55.59 54° 58.05	46°10.71 31.24 61°12.65 30.88	277° 55.64 32.15 292° 57.05 31.88	322°17.67 40.86 337°19.64 40.91	42°32.45 16.45 57°34.66 16.34	Bellatrix 278°22.86 6°22.29
15	70°0.51	76°14.58 · · 30.51	307°58.45 · · 31.61	352°21.61 · · 40.95	72°36.86 · · 16.24	Elnath 278°1.83 28°37.75
16	85°2.98	91°16.51 30.15	322°59.86 31.34	7°23.59 41.00	87°39.06 16.13	Alnilam 275°37.70 -1°11.24
17	$100^{\circ}5.44$	106°18.44 29.79	338°1.26 31.08	22°25.56 41.04	102°41.27 16.02	Betelgeuse 270°52.03 7°24.65 Canopus 263°52.51 -52°42.77
18	$115^{\circ}7.91$	121°20.37 N01°29.43	353°2.66 N22°30.81	37°27.54 N22°41.09	117°43.47 <b>S</b> 03°15.92	Sirius 258°26.17 -16°45.21
19	130° 10.37	136°22.29 29.07	8°4.07 30.54	52°29.51 41.13	132°45.68 15.81	Adhara 255°5.80 -29°0.59
20	145° 12.84	151°24.20 28.72	23°5.47 30.27	67°31.48 41.17	147°47.88 15.70	Procyon 244°50.65 5°9.54
21 22	160° 15.30 175° 17.76	166°26.12 · · 28.37 181°28.03 28.01	38°6.87 · · 30.00 53°8.27 29.73	82°33.46 · · 41.22 97°35.43	162°50.09 · · 15.60 177°52.29	Pollux 243°17.07 27°57.96
23	190° 20.23	196°29.94 27.66	68°9.67 29.46	112°37.40 41.31	192°54.50 15.39	Avior 234°14.61 -59°35.70
_			-			Suhail 222°46.05 -43°32.33
Mer.	pass. 10:21	ν2.0′ d-0.4′ m-4.73	$\nu$ 1.4' d-0.3' m0.71	ν2.0′ d0.0′ m-2.04	$\nu 2.2' \ d$ -0.1' m1.17	Miaplacidus 221°37.99 -69°49.52 Alphard 217°47.44 -8°46.23
						Regulus 207°34.05 11°50.56
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.22 61°37.01
0	205°22.69	211°31.84 N01°27.32	83°11.07 N22°29.19	127°39.38 N22°41.35	207°56.70 S03°15.28	Denebola 182°24.46 14°25.77
1 2	220°25.16	226°33.74 26.97 241°35.64 26.62	98°12.47 28.92 113°13.87 28.65	142°41.35 41.40 157°43.32 41.44	222°58.91 15.17 238°1.11 15.07	Gienah 175°43.09 -17°41.10
3	235° 27.62 250° 30.08	256° 37.53 · · 26.28	113°13.87 28.65 128°15.27 · · 28.38	157° 43.32 41.44 172° 45.29 • 41.48	238°1.11 15.07 253°3.32 · · 14.96	Acrux 172°59.28 -63°14.52
4	265° 32.55	271°39.42 25.94	143°16.67 28.11	187°47.27 41.53	268°5.52 14.86	Gacrux 171°50.92 -57°15.45
5	280°35.01	286°41.31 25.60	158° 18.07 27.84	202°49.24 41.57	283°7.73 14.75	Alioth 166°12.21 55°49.34 Spica 158°21.77 -11°17.74
6	295°37.48	301°43.19 N01°25.26	173°19.47 N22°27.57	217°51.21 N22°41.62	298°9.93 <b>S</b> 03°14.64	Alkaid 152°51.33 49°11.12
7	310°39.94	316°45.07 24.93	188°20.87 27.30	232°53.18 41.66	313°12.14 14.54	Hadar 148°35.11 -60°29.75
8	325° 42.41	331°46.95 24.59	203°22.27 27.03	247°55.15 41.70	328°14.34 14.43	Menkent 147°57.00 -36°29.76
9 10	340° 44.87 355° 47.33	346°48.82 · · 24.26 1°50.69 23.93	218°23.66 · · 26.76 233°25.06 26.49	262°57.12 · · 41.75 277°59.09 41.79	343°16.55 · · 14.33 358°18.75 14.22	Arcturus 145°47.39 19°2.89
11	10°49.80	1 50.09 23.93 16°52.56 23.60	248° 26.46 26.22	293°1.07 41.84	358°18.75 14.22 13°20.96 14.11	Rigil Kent. 139°39.41 -60°56.41
12	25°52.26	31°54.42 N01°23.28	263°27.85 N22°25.94	308°3.04 N22°41.88	28°23.16 S03°14.01	Kochab 137°18.61 74°2.91
13	40°54.73	46°56.28 22.95	278°29.25 25.67	323°5.01 41.93	43°25.37 13.90	Zuben'ubi 136°55.48 -16°8.92 Alphecca 126°3.24 26°37.56
14	55°57.19	61°58.14 22.63	293°30.64 25.40	338° 6.98 41.97	58°27.57 13.80	Antares 112° 15.31 -26° 29.32
15	70°59.65	76°59.99 · · 22.31	308°32.04 · · 25.13	353°8.95 · · 42.01	73°29.78 · · 13.69	Atria 107°9.00 -69°4.20
16	86°2.12	92°1.84 21.99	323°33.43 24.86	8°10.92 42.06	88°31.99 13.58	Sabik 102°2.33 -15°45.45
17 18	101°4.58 116°7.05	107°3.69 21.67 122°5.53 N01°21.35	338°34.83 24.58 353°36.22 N22°24.31	23°12.89 42.10 38°14.86 N22°42.15	103°34.19 13.48 118°36.40 S03°13.37	Shaula 96°9.87 -37°7.27
19	131°9.51	137°7.37 21.04	8° 37.61 24.04	53°16.83 42.19	133°38.60 13.27	Rasalhague 95°58.17 12°32.28
20	146° 11.98	152°9.21 20.72	23°39.01 23.76	68°18.80 42.23	148°40.81 13.16	Eltanin 90°41.83 51°28.76
21	$161^{\circ}14.44$	167°11.05 · · 20.41	38°40.40 · · 23.49	83°20.76 · · 42.28	163°43.02 · · 13.06	Kaus Aust. 83°32.10 -34°22.30 Vega 80°32.95 38°48.08
22	176° 16.90	182°12.88 20.10	53°41.79 23.22	98°22.73 42.32	178°45.22 12.95	Nunki 75°47.42 -26°15.90
23	191° 19.37	197°14.70 19.80	68°43.18 22.94	113°24.70 42.36	193°47.43 12.85	Altair 61°59.75 8°55.90
Mer.	pass. 10:17	$\nu$ 1.9′ d-0.3′ m-4.74	$\nu 1.4' \ d$ -0.3' m0.73	$\nu 2.0' \ d0.0' \ \text{m-}2.03$	$ u 2.2' \ d \text{-} 0.1' \ \text{m} 1.17$	Peacock 53°5.47 -56°39.03
						Deneb 49°25.78 45°21.88
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.75 9°59.27
0	206° 21.83	212°16.53 N01°19.49	83°44.57 N22°22.67	128°26.67 N22°42.41	208°49.63 \$03°12.74	Al Na'ir 27°32.89 -46°50.21 Fomalhaut 15°14.54 -29°29.30
1	$221^{\circ}24.30$	227°18.35 19.19	98°45.97 22.40	143°28.64 42.45	223°51.84 12.63	Scheat 13°45.29 28°12.98
2	236°26.76	242°20.16 18.88	113° 47.36 22.12	158°30.61 42.50	238°54.05 12.53	Markab 13°29.95 15°20.30
3 4	251°29.22 266°31.69	257°21.98 · · 18.58 272°23.79 18.28	128° 48.75 · · 21.85 143° 50.14 21.57	173°32.58 · · 42.54 188°34.54	253°56.25 · · 12.42 268°58.46 12.32	
4 5	200 31.09 281°34.15	272°23.79 18.28 287°25.60 17.99	143°50.14 21.57 158°51.53 21.30	188°34.54 42.58 203°36.51 42.63	268°58.46 12.32 284°0.67 12.21	Apr 16 Wed         SHA         Mer.pass           Venus         6°21.65         09:56
6	281 34.15 296° 36.62	302°27.40 N01°17.69	173°52.91 N22°21.02	218°38.48 N22°42.67	299°2.87 S03°12.11	Mars 238°13.79 18:28
7	311°39.08	317°29.20 17.40	188°54.30 20.75	233°40.45 42.72	314°5.08 12.00	Jupiter 282°28.43 15:30
8	$326^{\circ}41.55$	332°31.00 17.11	203°55.69 20.47	248°42.41 42.76	329°7.29 11.90	Saturn 2°40.25 10:10
9	341°44.01	347°32.79 · · 16.82	218°57.08 · · 20.20	263°44.38 · · 42.80	344°9.49 · · 11.79	Apr 17 Thu SHA Mer.pass
10	356° 46.47	2°34.58 16.53	233°58.47 19.92	278°46.35 42.85	359°11.70 11.69	Venus 6°9.15 09:53
11	11° 48.94 26° 51.40	17°36.37 16.24 32°38.16 N01°15.96	248°59.85 19.65 264°1.24 N22°19.37	293°48.32 42.89 308°50.28 N22°42.93	14°13.91 11.58 29°16.11 \$03°11.48	Mars 237°48.38 18:26
12 13	26°51.40 41°53.87	47°39.94 15.67	279°2.63 19.09	308°50.28 N22°42.93 323°52.25 42.98	44°18.32 11.37	Jupiter 282°16.68 15:27
14	56° 56.33	62°41.72 15.39	294°4.01 18.82	338°54.22 43.02	59°20.53 11.27	Saturn 2°34.01 10:07
15	71°58.79	77°43.49 · · 15.11	309°5.40 · · 18.54	353°56.18 · · 43.07	74°22.73 · · 11.16	Apr 18 Fri SHA Mer.pass
16	87°1.26	92°45.26 14.84	324°6.78 18.27	8°58.15 43.11	89°24.94 11.06	Venus 5°54.69 09:50
17	102°3.72	107° 47.03 14.56	339°8.17 17.99	24°0.11 43.15	104°27.15 10.95	Mars 237°22.74 18:23
18	117°6.19	122°48.80 N01°14.29	354°9.55 N22°17.71	39°2.08 N22°43.20	119°29.36 \$03°10.85	Jupiter 282°4.84 15:24
19 20	132°8.65 147°11.12	137°50.56 14.01 152°52.32 13.74	9°10.94 17.43 24°12.32 17.16	54° 4.04 43.24 69° 6.01 43.28	134°31.56 10.74 149°33.77 10.64	Saturn 2°27.80 10:03
21	147 11.12 162° 13.58	167°54.07 · · 13.47	39° 13.71 · · 16.88	84°7.97 · · 43.33	164°35.98 · · 10.53	Horizontal parallax
22	177° 16.04	182°55.83 13.21	54° 15.09 16.60	99° 9.94 43.37	179°38.19 10.43	Venus: 0.4
23	192° 18.51	197° 57.58 12.94	69° 16.47 16.32	114°11.90 43.41	194°40.39 10.32	Mars: 0.1
Mer	pass. 10:13	ν1.8′ d-0.3′ m-4.74	ν1.4' d-0.3' m0.74	ν2.0' d0.0' m-2.03	ν2.2' d-0.1' m1.17	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°2.55	N10°8.07	329°1.87	12.0'	S24°20.24	7.9'	54.1'
1	195°2.70	8.95	343°32.87	11.9'	24°28.17	7.8'	54.1'
2	210°2.85 225°3.00	9.84 •• 10.73	358°3.79 12°34.64	11.8' 11.8'	24°36.00 24°43.72	7.7' 7.6'	54.1' 54.1'
4	240°3.14	11.61	27°5.42	11.7'	24°51.33	7.5'	54.1'
5	255°3.29	12.50	41°36.12	11.6'	24°58.83	7.4'	54.1'
6	270°3.44	N10°13.38	56°6.75	11.6'	\$25°6.22	7.3'	54.2'
7 8	285°3.59 300°3.73	14.27 15.15	70°37.31 85°7.80	11.5' 11.4'	25°13.50 25°20.67	7.2' 7.1'	54.2' 54.2'
9	315°3.88	• • 16.03	99°38.21	11.3'	25°27.72	6.9'	54.2'
10	330°4.03	16.92	114°8.55	11.3'	$25^{\circ}34.66$	6.8'	54.2'
11	345°4.17 0°4.32	17.80 N10°18.68	128°38.83 143°9.03	11.2'	25°41.48 \$25°48.19	6.7'	54.2'
12 13	15°4.32	19.57	143°9.03 157°39.16	11.1' 11.1'	25°54.78	6.6' 6.5'	54.2' 54.2'
14	30°4.61	20.45	172°9.22	11.0'	26°1.25	6.4	54.2'
15	45°4.76	• • 21.33	186° 39.21	10.9'	26°7.60	6.2'	54.3'
16	60°4.90 75°5.05	22.21	201°9.13 215°38.98	10.9'	26°13.84 26°19.95	6.1' 6.0'	54.3'
17 18	90°5.19	23.09 N10°23.97	215 38.98 230°8.76	10.8' 10.7'	26 19.95 S26°25.94	5.9'	54.3' 54.3'
19	105°5.34	24.86	244° 38.48	10.6'	26°31.81	5.7'	54.3'
20	120°5.48	25.74	259°8.13	10.6'	26°37.56	5.6'	54.3'
21	135°5.63 150°5.77	• • 26.62	273°37.71 288°7.22	10.5'	26°43.18 26°48.68	5.5' 5.4'	54.3'
22 23	165° 5.92	27.50 28.38	302° 36.67	10.5' 10.4'	26 48.08 26°54.05	5.4 5.2'	54.3' 54.4'
	SD = 15.9'	d = 0.9'			0 = 14.8'	J. <u>L</u>	
	JU = 15.9′	u = 0.9°		3L	- 14.δ		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°6.06	N10°29.26	317°6.06	10.3'	\$26°59.30	5.1'	54.4
1 2	195°6.21 210°6.35	30.14 31.01	331°35.38 346°4.64	10.3' 10.2'	27° 4.42 27° 9.41	5.0' 4.9'	54.4' 54.4'
3	210 0.33 225°6.49	• • 31.89	0°33.83	10.2	27 9.41 27°14.27	4.9 4.7'	54.4'
4	240°6.64	32.77	15°2.97	10.1'	$27^{\circ}19.01$	4.6'	54.4'
5	255°6.78	33.65	29°32.04	10.0'	27°23.61	4.5'	54.4'
6 7	270°6.92 285°7.07	N10°34.53 35.40	44°1.05 58°30.00	10.0' 9.9'	\$27°28.08 27°32.43	4.3' 4.2'	54.4' 54.5'
8	300°7.21	36.28	72°58.89	9.8'	27°36.63	4.1'	54.5
9	315°7.35	• • 37.16	87°27.73	9.8'	$27^{\circ}40.71$	3.9'	54.5'
10	330°7.50	38.03	101°56.51	9.7'	27°44.65 27°48.46	3.8'	54.5'
11 12	345°7.64 0°7.78	38.91 N10°39.79	116°25.23 130°53.90	9.7' 9.6'	\$27°52.13	3.7' 3.5'	54.5' 54.5'
13	15°7.92	40.66	145° 22.51	9.6'	27°55.67	3.4'	54.6'
14	30°8.06	41.54	159°51.07	9.5'	$27^{\circ}59.07$	3.3'	54.6'
15	45°8.21 60°8.35	• • 42.41	174° 19.58 188° 48.03	9.5' 9.4'	28° 2.33 28° 5.45	3.1' 3.0'	54.6' 54.6'
16 17	75°8.49	43.29 44.16	203° 16.44	9.4 9.4'	28 5.45 28°8.44	3.0 2.8'	54.6'
18	90°8.63	N10°45.04	217° 44.79	9.3'	S28°11.28	2.7'	54.6'
19	105°8.77	45.91	232°13.10	9.3'	28°13.99	2.6'	54.7'
20 21	120°8.91 135°9.05	46.78 •• 47.66	246°41.36 261°9.58	9.2' 9.2'	28°16.56 28°18.98	2.4' 2.3'	54.7' 54.7'
22	150°9.19	48.53	201 9.56 275° 37.75	9.2 9.1'	28°21.27	2.3	54.7'
23	165°9.33	49.40	290°5.87	9.1'	28°23.41	2.0'	54.7'
	SD = 15.9'	d = 0.9'		SD	0 = 14.8'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°9.47 195°9.61	N10°50.27 51.15	304°33.96 319°2.00	9.0' 9.0'	\$28°25.41 28°27.27	1.9' 1.7'	54.7' 54.8'
2	210° 9.75	52.02	333°30.00	9.0'	28°28.98	1.6'	54.8'
3	225°9.89	• • 52.89	347°57.96	8.9'	28°30.55	1.4'	54.8'
4 5	240°10.03 255°10.17	53.76 54.63	2°25.89 16°53.78	8.9' 8.9'	28°31.97 28°33.25	1.3' 1.1'	54.8' 54.8'
6	255 10.17 270° 10.31	54.63 N10°55.50	31° 21.63	8.8'	28 33.25 \$28°34.39	1.1	54.8 54.9'
7	285° 10.45	56.37	45°49.45	8.8'	28°35.37	0.8'	54.9'
8	300° 10.59	57.24	60° 17.24	8.8'	28°36.21	0.7'	54.9'
9 10	315° 10.72 330° 10.86	•• 58.11 58.98	74° 44.99 89° 12.72	8.7' 8.7'	28°36.91 28°37.46	0.5' 0.4'	54.9' 54.9'
11	345°11.00	58.98 10°59.85	103° 40.42	8.7'	28°37.46 28°37.86	0.4	54.9 55.0'
12	0°11.14	N11°0.72	118°8.08	8.6'	S28°38.11	0.1'	55.0'
13	15°11.28	1.58	132° 35.73	8.6'	28°38.21	-0.0'	55.0'
14 15	30°11.41 45°11.55	2.45 · · 3.32	147°3.34 161°30.94	8.6' 8.6'	28°38.17 28°37.97	-0.2' -0.3'	55.0' 55.0'
16	45 11.55 60°11.69	4.19	101 30.94 175° 58.51	8.6'	28°37.63	-0.5'	55.1'
17	75°11.83	5.05	190°26.06	8.5'	$28^{\circ}37.14$	-0.6'	55.1'
18	90°11.96	N11°5.92	204°53.59	8.5'	\$28°36.50	-0.8'	55.1'
19 20	105°12.10 120°12.24	6.79 7.65	219°21.10 233°48.60	8.5' 8.5'	28°35.70 28°34.76	-0.9' -1.1'	55.1' 55.2'
21	120 12.24 135°12.37	· · 8.52	248° 16.08	o.5 8.5'	28°33.67	-1.1 -1.2'	55.2'
22	150° 12.51	9.38	262°43.54	8.5'	28°32.43	-1.4'	55.2'
23	165°12.64	10.25	277° 10.99	8.4'	28°31.03	-1.5'	55.2'
	SD = 15.9'	d = 0.9'		SD	0 = 14.9'		

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

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

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-79%
16	00:10	00:17	12:00	02:08	14:32	
17	00:24	00:31	11:59	02:58	15:24	
18	00:38	00:45	11:59	03:50	16:17	

CHAP	h	Aries	Ve	nus	M	ars	lur	oiter	Sat	urn		Stars
2072 207   2175   227   216   216   216   216   217												
1 227254 229107 1241 997322 15147 224 15158 4330 224143 101. Anala 337. 324 24742 101. Anala 34743. 30. 337. 348 478. 349. 349. 349. 349. 349. 349. 349. 349										Dec		
2 277 589 0 245 281 1235 1147 000 15-01 15-01 174-170											Alpheratz	357°34.89
22-22-23-50 22-22-											I	
1.												
Section   Control   Cont												
Popular   1975												
9 347*531 348*1490 10.08	6	297°35.76	303°9.73	N01°11.13	174°26.14	N22°14.37	219°25.65	N22°43.72	299°55.85	S03°9.59	I	
Methods   Meth												
Ministra   1987   198												
12   12   14   16   16   16   18   12   12   18   18   18   18   18												
13											Aldebaran	290°39.64
14   279   51   77   77   77   77   77   77   77											Rigel	
Selection												
18   18   18   18   18   18   18   18												
Bertingstors	15	$72^{\circ}57.93$	78°25.14	• • 8.93	309°38.54	• • 11.85	354°43.32	• • 44.11	75°15.72	• • 8.65		
133-53												
18 137779 12878.00 101788.00 10178.00 10178.00 10178.00 10178.00 10178.00 10178.00 101788.00 10178.00 10178.00 10178.00 10178.00 10178.00 10178.00 101788.00 10178.00 10178.00 10178.00 10178.00 10178.00 10178.00 101788											1	
20   16  31  20   26  31  33  38  39  77,6   24  45,42   10,45   69  53  13  43,33   150  26,77   8,13   78  78  79  79  79  79  79  79  79  79  79  79												
163"12.72   168"35.27   7.54   39"46.79   1.01.77   888   89"55.09   44.41   130"31.9   7.92   7.0											Adhara	255°5.81
Policy   243   178   151.88   183   36.94   7.31   54   541.71   9.88   99   57.05   44.46   180   31.19   7.92   52.28   32												
Mer. pass. 10:09												
Sun   GHA   CHA   CHA   Dec   Dec   CHA												
Sun   GHA   GHA   Cha   Dec   CHA   Dec   CHA   Dec   CHA   Dec   CHA   Dec   CHA   Dec   CHA   Chapter	-	10.00	17/10			_						
CHA	ivier.p	Dass. 10:09	$\nu_{1.7}$ a-0	.3 m-4.75	$\nu$ 1.4 a-0	.3 mu.70	ν2.0 α0.	.0 m-2.03	ν2.2 a-0	.1 m1.17		
Solution   CHA												
0 208°20.11 1 233°22.55 228°4.10 0 6.04 88°5.90 1 N22°9.32 130°0.97 23°4.50 229°3.56 0 \$0.97.76 1 Glenshot 182°24.46 229°3.67 23°5.00 248°3.50 0 6.04 148°5.00 6.04 89°5.22 0 90.4 148°5.67 25°5.00 148°5.00 6.04 40.02 7.51 1 Glenshot 182°29.24 228°3.60 248°4.50 0 6.01 148°5.00 8.75 114°5.06 8.75 100°4.89 44.58 240°4.00 7.51 1 Glenshot 182°29.24 240°20 7.74 0 6.02 117°5.00 1 100°5.00 1											1	
2 238°25,04 248°343,62 6.43 114°53,66 8.75 160°4.89 44.58 240°40.02 7.71 Carbon 1.73°43.03 238°27.75 258°45.29 6.21 129°55,03 8.47 1176°6.85 44.63 255°42.23 7.740 Gaccut 1.71°29.03 6.20 140°6.00 8.19 190°6.81 44.67 270°44.44 7.30 63 650 7.20 1.70 1.70 1.70 1.70 1.70 1.70 1.70 1.7											Denebola	
233°27.50 258°45.29 · 6.21 129°55.03 · 8.47 175°6.65 · 44.63 25°42.23 · 7.40 Academy of 20°40.29 7273°46.94 · 5.99 144°56.40 8.19 109°6.81 · 44.67 20°44.47 · 7.30 Academy of 20°50.77 · 44.71 · 285°46.55 · 7.20 Academy of 20°50.77 · 44.71 · 285°46.55 · 7.20 Academy of 20°50.77 · 44.71 · 285°46.55 · 7.20 Academy of 20°50.77 · 44.71 · 285°46.55 · 7.20 Academy of 20°50.77 · 44.71 · 285°46.55 · 30°7.09 · 313°37.36 · 318°51.00 · 5.36 · 190°0.52 · 7.34 · 235°14.69 · 44.80 · 315°51.07 · 6.09 · 44.81 · 135°21.76 · 6.00 · 338°44.29 · 348°55.19 · 4.94 · 220°3.26 · 6.77 · 265°18.61 · 44.89 · 345°55.49 · 6.78 · 4.81 · 148°55.10 · 385°44.75 · 36°6.84 · 4.74 · 220°3.26 · 6.77 · 265°18.61 · 44.89 · 345°55.49 · 6.78 · 4.81 · 148°45.10 · 133°47.22 · 18°8.47 · 4.53 · 250°6.00 · 6.02 · 209°22.53 · 44.97 · 15°59.91 · 6.68 · 6.78 · 133°47.22 · 18°8.47 · 4.53 · 250°6.00 · 6.02 · 209°22.53 · 44.97 · 15°59.91 · 6.68 · 6.78 · 133°47.22 · 18°8.47 · 4.13 · 280°8.73 · 5.63 · 325°26.45 · 45.00 · 64°4.33 · 6.37 · 6.16 · 6.26 · 6.13 · 48°55.15 · 49°1.74 · 4.13 · 280°8.73 · 5.63 · 325°26.45 · 45.00 · 64°4.33 · 6.37 · 6.16 · 6.26 · 6.21											Gienah	175°43.08
2 868°29.97 2 73°46.94 5.99 144°66.40 8.19 100°8.81 44.67 270°44.44 7.30 Alloth 160°12.21 528°33.43 288°38.45 288°38												
283°32.43 288°48.60 5.78 159°57.78 7.90 209°10.77 44.71 288°46.65 7.20 504°10.76 2012.73 N22°44.76 300°48.66 50.70 504°10.76 74.71 2915°21.76 2012.73 N22°44.76 300°48.66 50.70 504°10.76 74.76 300°48.66 50.70 50												
298°349 0 303°50 28 N01°5.57 174°50.15 N22°762 220°12.73 N22°4.76 300°48.36 S03°7.09 Alkiadi 125°51.32 N32°4.09 Alkiadi 125°51.32 N33°35.35 150 0 5.00°1.09°0.52 N7 344 8.0 315°1.07 6.99 N33°5.32 6 6.88 N33°5.32 6 6.88 N33°5.35 5 5.15 20°61.86 0 6.77 20°50°1.66 44.89 345°5.49 0 6.78 Alkiadi 148°3.51.00 1386°4.47 5 3°55.84 4.74 233°4.63 6 6.49 280°2.0.57 44.93 30°57.70 6 6.88 Right Kent. 147°56.99 N32°1.22 18°4.84 7 4.53 250°6.00 6.20 280°2.0.57 44.93 10°57.70 6 6.88 Right Kent. 13°3.51.00 11 10°14.33 280°6.73 N22°5.92 310°2.44 9 N22°4.50 2 31°2.12 50°6.47 Zubeniudi 13°3.51.00 12°3.22 15°4.54 64°3.37 3.03 280°6.73 7 N22°5.92 310°2.44 9 N22°4.50 2 31°2.12 S03°6.47 Zubeniudi 13°3.51.00 11°3.51 20°4.00 10°4.00 10°												
7 313°37'36 318°51.90 5.36 190°0.52 7.34 235°14.69 44.80 315°51.07 6.99 8 328°37.35 55 51.5 205°1.89 7.05 205°1.85 4.84 34 330°3.26 6.89 9 343°42.29 348°55.19 4.94 220°3.26 6.67 255°16.65 44.84 333°3.26 6.88 Menkent 14°65.09 10 356°44.75 3°56.84 4.74 235°4.63 6.49 205°2.57 6.68 7.70 6.70 6.70 6.70 6.70 6.70 6.70 6.70												
8 328°99.83 338°55.55 5.15	7											
9 343°42.29 348°55.19 4.94 236°463 6.49 280°20.57 4.93 35°55.70 6.68   Arcturs 145°47.37 10 356°44.75 3°56.84 4.74 236°46.3 6.49 280°20.57 4.93 30°57.70 6.68   Rigille Ret. 139°39.39 11 13°47.22 18°56.47 4.53 250°6.00 6.20 295°22.53 44.97 15°59.91 6.57	8	$328^{\circ}39.83$					$250^{\circ}16.65$	44.84		6.88		
10 356°44.75 3"56.84 4.74 4.53 250°6.00 6.20 280°20.57 4.49.3 0"57.70 6.68   Rigil Kent. 139°39.39 11 13°47.22 18°58.47 4.53 250°6.00 6.20 250°22.33 44.97 15°59.91 6.57   Rigil Kent. 139°39.39 12 28°49.68 34°0.11 N01°4.33 250°8.73 N22°5.92 310°24.49 N22°45.02 31°2.12 503°6.47   Zuben'ubi 136°55.64   Alpheca 136°55.64   Rigil Kent. 139°39.39   Rigil Kent. 139°39.3												
13												
13 43°5215 49°1.74											Kochab	$137^{\circ}18.59$
14 58°54.61 64°3.37 3.93 295°10.10 5.38 340°28.40 45.10 61°6.54 6.26 Antares 112'15.29 15 73°57.07 79°4.99 3.74 310°11.47 5.05 355°3.03 6. 45.14 67°8.75 6.16 Antares 112'15.29 16 88°59.54 94°6.62 3.54 325°12.84 4.78 10°32.32 45.19 9°10.96 6.06 Sabik 100°2.31 119°4.47 124°9.85 N01°3.16 355°15.57 N22°4.21 40°36.24 N22°45.27 121°15.38 S03°5.85 Sabik 10°2.3.1 119°4.47 124°9.85 N01°3.16 355°15.57 N22°4.21 40°36.24 N22°45.27 121°15.38 S03°5.85 Sabik 10°2.3.1 119°4.47 124°9.85 N01°3.16 355°15.57 N22°4.21 40°36.24 N22°45.27 121°15.38 S03°5.85 Sabik 10°2.3.1 119°4.04 154°13.08 2.78 25°10.15 45.36 16°11.75 9 5.75 Etamin 90°41.80 12°11.64°11.86 169°14.69 2.25 9 40°19.67 3.35 85°42.11 45.40 166°22.01 5.544 Naci 41°24.22 5.44 Naci 41°24.22 1.79°14.32 184°16.29 2.24 1 55°21.03 3.06 100°44.07 45.44 181°24.22 5.44 Naci 41°24.22 5.44 N											Zuben'ubi	
15 73°57.07 79°4.99 · .3.74 310°11.47 · .5.06 355°30.36 · .45.14 66°8.75 · 6.16 6 845°55.4 44°6.62 3.54 325°22.45 4.78 10°2.32 45.19 0°10.96 6.06 5.06 5.00 109°8.24 3.35 340°14.20 4.49 25°34.28 45.23 106°13.17 5.95 5.00 10°3.18 119°4.47 124°9.85 No1°3.16 355°15.77 N22°4.21 40°36.24 N22°45.27 121°15.38 S03°5.85 5.75 5.75 121°16.94 3.39 25°38.19 45.32 136°17.59 5.75 5.75 121°16.94 3.39 25°38.19 45.32 136°17.59 5.75 5.75 121°16.94 3.39 25°38.19 45.32 136°17.59 5.75 5.75 121°16.94 3.39 25°38.19 45.32 136°17.59 5.75 5.75 121°16.94 3.39 25°38.19 45.32 136°17.59 5.75 5.75 121°16.80 16°22.01 15.54 4.75 121°16.99 121°												
16												
18   119   447   1249   85   NO12 316   355   15.57   N22 24.21   40 36.24   N22 45.27   121   121   136   Salulla   96° 8.08   19   134° 6.93   139° 11.47   2.97   10° 16.94   3.92   55° 38.19   45.32   136° 17.59   5.75   136° 18.74   130° 18.47   130° 18.27   121° 15.38   So3° 5.85   128° 18.30   130° 18.47   130° 18.27   121° 15.38   So3° 5.85   130° 18.75   121° 15.38   130° 18.75   121° 15.38   130° 18.28   121° 15.54   130° 18.24   122° 15.44   131° 24.22   148° 16.29   2.41   55° 21.03   3.06   100° 44.07   45.44   131° 24.22   5.44   131° 24.22   5.44   131° 24.22   5.44   130° 18.24   122° 18.25   122												
18		104°2.00	109°8.24		340°14.20	4.49			$106^{\circ}13.17$			
19 134°6.93 139°11.47 2.97 10°16.94 3.92 55°38.19 45.32 136°17.59 5.75 degree 120 149°9.40 156°13.08 2.78 25°18.30 3.63 70°40.15 45.36 151°19.80 5.64 Cast 160°14.69 · 2.59 40°19.67 · 3.35 85°42.11 · 45.40 166°22.01 · 5.54 Vegs 80°32.92 19°14.32 184°16.29 2.41 55°21.03 3.06 100°44.07 45.44 181°24.22 5.44 Vegs 80°32.92 Munki 75°47.38 22 19°14.32 184°16.79 19°17.89 2.22 70°22.40 2.77 115°46.02 48.49 196°26.43 5.33 Altair 61°59.73	18			N01°3.16		N22°4.21		N22°45.27		<b>S</b> 03°5.85		
20 146°9.40 154′13.08 2.78 25°18.30 3.63 70°40.15 45.30 151°19.80 5.64 Vega 80°32.92 22 179°14.32 184′16.29 2.41 55°21.03 3.06 100°44.07 45.44 181°24.22 5.44 Nunki 75°47.38 Mer.pass. 10:05 \(\nu \)1.7' \(\nu \)1.02' \(\mu \)-4.75 \\\nu \)1.4' \(\nu \)-0.3' \(\mu \)0.78 \\\nu \)2.0' \(\nu \)0.0' \(\mu \)-2.02' \\nu \)2.2' \(\nu \)2.2' \(\nu \)2.2' \(\nu \)2.2' \\nu \)2.2' \(\nu \)1.1' \\(\nu \)1.2' \(\mu \)-4.75 \\\nu \)1.4' \(\nu \)-0.3' \(\mu \)0.78 \\\nu \)2.0' \(\nu \)0.0' \(\mu \)-2.02' \\\nu \)2.2' \(\nu \)2.0' \(\nu \)1.17 \\\nu \)1.2' \(\nu \)2.0' \\\nu \)1.6' \(\nu \)2.0' \\\nu \)1.6' \(\nu \)2.0' \\\nu \)1.6' \(\nu \)2.2' \(\nu \)2.1' \\nu \)1.17 \\\\nu \)2.0' \(\nu \)1.6' \(\nu \)2.2' \(\nu \)1.3' \\nu \)1.8' \(\nu \)2.2' \(\nu \)1.3' \\nu \)1.8' \(\nu \)2.2' \(\nu \)2.2' \(\nu \)2.2' \(\nu \)2.1' \\nu \)1.17 \\\\nu \)2.2' \(\nu \)2.2' \(\nu \)2.2' \(\nu \)2.1' \\nu \)1.17 \\\nu \)2.2' \(\nu \)2.2' \(\nu \)2.2' \(\nu \)2.2' \(\nu \)1.1' \\nu \)1.17 \\\nu \)2.2' \(\nu \)1.4' \(\nu \)1.3' \(\mu \)0.7' \(\nu \)5' \(\nu \)2.2' \(\nu \)1.4' \(\nu \)1.3' \(\mu \)1.8' \\\nu \)2.2' \(\nu \)1.4' \(\nu \)1.3' \(\mu \)1.8' \\\nu \)2.2' \(\nu \)1.6' \(\nu \)2' \(\nu \)1.6' \(\nu	19			2.97		3.92		45.32		5.75	_	
22 179°14.32 184°16.29 2.41 55°21.03 3.06 100°44.07 45.44 181°24.22 5.44 23 194°16.79 199°17.89 2.22 70°22.40 2.77 115°46.02 45.49 196°26.43 5.33 Altair 61°59.73 Mer.pass. 10:05 \(\bullet \bullet 1.7 \) \(\bullet \bullet 0.2 \) \(\bullet 1.4 \) \(\bullet 0.3 \) \(\bullet 0.7 \) \(\bullet 0.2 \) \(\bullet 0.3 \) \(\bullet 0.3 \) \(\bullet 0.3 \) \(\bullet 0.2 \) \(\bullet 0.2 \) \(\bullet 0.3 \)												
Mor. pass. 10:05   ν1.7′ d-0.2′ m-4.75   ν1.4′ d-0.3′ m0.78   ν2.0′ d0.0′ m-2.02   ν2.2′ d-0.1′ m1.17   Paccock   S3°5.42   Denb   49°25.74   Denb   49°2											Vega	80°32.92
Mor. pass. 10:05         ν1.7′ d-0.2′ m-4.75         ν1.4′ d-0.3′ m0.78         ν2.0′ d0.0′ m-2.02         ν2.2′ d-0.1′ m1.17         Aftair below 6° 5° 5.42         Peacock 5° 5° 5.42         5° 5.42         Deec below 6° 25.74         Aftair below 6° 5° 5.43         Aftair below 6° 5° 5.42         Aftair below 6° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5°											Nunki	
Mon GHA GHA Dec GHA GHA Dec GHA GHA Dec GHA GHA Dec GHA												
Mon GHA GHA GHA Dec GHA GHA Dec GHA GHA Dec GHA GHA Dec GHA	Mer.p	oass. 10:05	$\nu 1.7' \ d$ -0	.2′ m-4.75	$\nu$ 1.4′ d-0	.3′ m0.78	$\nu 2.0' \ d0.$	.0′ m-2.02	$\nu$ 2.2′ d-0	.1' m $1.17$		
Mon GHA GHA CHA Dec   GHA   De												
0 209°19.25 214°19.49 N01°2.04 85°23.76 N22°2.49 130°47.98 N22°45.53 211°28.65 S03°5.23 1 224°21.72 229°21.09 1.86 10°25.13 2.20 145°49.94 45.57 226°30.86 5.13 2 23°32.418 24°22.68 1.68 115°26.49 1.91 160°51.89 45.62 241°33.07 5.02 325°42.66 4259°24.27 · 1.51 130°27.86 · 1.63 175°53.85 · 45.66 256°35.28 · 4.92 426°20.91 274°25.86 1.33 145°29.22 1.34 190°55.80 45.70 271°37.49 4.82 528°31.57 289°27.44 1.16 160°30.58 1.05 205°57.76 45.74 286°39.70 4.71 286°39.70 4.71 286°39.70 4.71 280°38.97 334°32.18 0.65 205°34.67 22°0.19 251°3.63 45.87 331°46.33 4.41 2 4.51 32°38.97 334°32.18 0.65 205°34.67 22°0.19 251°3.63 45.87 331°46.33 4.41 2 4.51 33°43.89 4°35.32 0.32 235°37.39 59.61 281°5.94 45.96 1°50.76 4.20 11 14°46.36 19°36.89 0.16 250°38.75 59.32 296°9.49 40.00 16°52.97 4.10 12 29°48.82 34°38.45 N01°0.00 265°40.11 N21°59.03 311°11.45 N22°46.04 31°55.18 503°3.99 13 44°51.29 49°40.01 00°59.84 280°41.47 58.75 326°13.40 46.08 46°57.39 3.89 14°55.27 59.68 29°42.83 58.46 341°15.36 46.13 61°59.60 3.79 15 74°56.21 79°43.13 · 59.52 310°44.19 · 58.17 356°17.31 · 46.17 77°1.82 · 3.69 122°8.45 503°3.38 19 135°6.07 139°49.32 58.92 10°49.62 57.01 56°25.13 46.34 137°10.66 3.28 11°19.27 46.21 92°4.03 3.58 140°10.40 122°8.45 503°3.38 19 135°6.07 139°49.32 58.92 10°49.62 57.01 56°25.13 46.34 137°10.66 3.28 129°13.40 120°36.11 14°40.50 130°49.32 58.92 10°49.62 57.01 56°25.13 46.34 137°10.66 3.28 129°13.40 120°36.11 14°40.77 N00°59.06 355°48.27 N21°57.00 46.23 150°20.34 46.34 137°10.66 3.28 129°13.40 120°36.11 120°36.11 120°36.11 120°36.11 120°36.11 120°36.11 120°36.11 120°36.11 120°36.11 140°47.77 N00°59.06 355°48.27 N21°57.00 46.23 150°20.34 46.34 137°10.66 3.28 129°13.40 120°36.11 140°47.77 N00°59.06 355°48.27 N21°57.00 46.23 150°20.34 46.34 137°10.66 3.28 129°13.40 120°36.11 140°47.77 N00°59.06 355°48.27 N21°57.00 46.23 150°20.34 46.34 137°10.66 3.28 120°36.11 140°40.77 N00°59.06 355°40.55 57.01 56°25.13 46.34 130°10.60 3.28 120°36.11 140°40.77 N00°59.06 355°40.55 57.01 56°25.13 46.34 130°10.60 3.28 120°36.34 120°36.11 120°36.11 120	Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
1 224°21.72 229°21.09 1.86 100°25.13 2.20 145°49.94 45.57 226°30.86 5.13 2 239°24.18 244°22.68 1.68 115°26.49 1.91 160°51.89 45.62 241°33.07 5.02 3254°26.64 259°24.27 1.51 130°27.86 1.63 175°53.85 45.66 266°35.28 4.92 4 269°29.11 274°25.86 1.33 145°29.22 1.34 190°55.80 45.70 271°37.49 4.82 4.71 4.72 4.72 4.72 4.72 4.72 4.72 4.72 4.72			214°19.49		85°23.76		130°47.98		211°28.65			
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13 44*51.29 49*40.01 00*99.84 280*41.47 58.75 320*13.40 46.08 40*57.39 3.89 14 59°53.75 64°41.57 59.68 295°42.83 58.46 341°15.36 46.13 61°59.60 3.79 15 74°56.21 79°43.13 · 59.52 310°44.19 · · 58.17 356°17.31 · · 46.17 77°1.82 · · 3.69 16 89°58.68 94°44.68 59.37 325°45.55 57.88 11°19.27 46.21 92°4.03 3.58 17 105°1.14 109°46.23 59.22 340°46.91 57.59 26°21.22 46.25 107°6.24 3.48 18 120°3.61 124°47.77 N00°59.06 355°48.27 N21°57.30 41°23.17 N22°46.30 122°8.45 503°3.38 19 135°6.07 139°49.32 58.92 10°49.62 57.01 56°25.13 46.34 137°10.66 3.28 20 150°8.53 154°50.86 58.77 25°50.98 56.72 71°27.08 46.38 152°12.87 3.17 21 165°11.00 169°52.40 · · 58.62 40°52.34 · · 56.43 86°29.03 · · 46.42 167°15.09 · · 3.07 22 180°13.46 184°53.93 58.48 55°53.70 56.14 101°30.99 46.47 182°17.30 2.97 23 195°15.93 199°55.46 58.33 70°55.05 55.84 116°32.94 46.51 197°19.51 2.87  Mars:												
14 59*53.75 64*41.57 59.68 299*42.83 58.46 341*15.36 46.13 61*59.60 3.79 15 74*56.21 79*43.13 \cdot > 59.52 310*44.19 \cdot > 58.17 356*17.31 \cdot \cdot \cdot \cdot 46.17 77*1.82 \cdot \cdot \cdot \cdot 3.69 16 89*58.68 94*44.68 59.37 325*45.55 57.88 11*19.27 46.21 92*4.03 3.58 17 105*1.14 109*46.23 59.22 340*46.91 57.59 26*21.22 46.25 107*6.24 3.48 18 120*3.61 124*47.77 N00*59.06 355*48.27 N21*57.30 41*23.17 N22*46.30 122*8.45 \$03*3.38 19 135*6.07 139*49.32 58.92 10*49.62 57.01 56*25.13 46.34 137*10.66 3.28 20 150*8.53 154*50.86 58.77 25*50.98 56.72 71*27.08 46.38 152*12.87 3.17 21 165*11.00 169*52.40 \cdot \cdot 58.62 40*52.34 \cdot \cdot \cdot 56.43 86*29.03 \cdot \cdot 46.42 167*15.09 \cdot \cdot 3.07 22 180*13.46 184*53.93 58.48 55*53.70 56.14 101*30.99 46.47 182*17.30 2.97 23 195*15.93 199*55.46 58.33 70*55.05 55.84 116*32.94 46.51 197*19.51 2.87  Mars:												
16       89°58.68       94°44.68       59.37       325°45.55       57.88       11°19.27       46.21       92°4.03       3.58       Venus       5°0.24         17       105°1.14       109°46.23       59.22       340°46.91       57.59       26°21.22       46.25       107°6.24       3.48       Mars       236°4.51         18       120°3.61       124°47.77       N00°59.06       355°48.27       N21°57.30       41°23.17       N22°46.30       122°8.45       503°3.38       Jupiter       281°28.73         19       135°6.07       139°49.32       58.92       10°49.62       57.01       56°25.13       46.34       137°10.66       3.28       Saturn       2°9.39         20       150°8.53       154°50.86       58.77       25°50.98       56.72       71°27.08       46.38       152°12.87       3.17         21       165°11.00       169°52.40       58.62       40°52.34       56.43       86°29.03       46.42       167°15.09       3.07         22       180°13.46       184°53.93       58.48       55°53.70       56.14       101°30.99       46.47       182°17.30       2.97         23       195°15.93       199°55.46       58.33       70°55.05       55.84												
17												
18												
19 135°6.07 139°49.32 58.92 10°49.62 57.01 56°25.13 46.34 137°10.66 3.28 20 150°8.53 154°50.86 58.77 25°50.98 56.72 71°27.08 46.38 152°12.87 3.17 21 165°11.00 169°52.40 58.62 40°52.34 56.43 86°29.03 46.42 167°15.09 3.07 22 180°13.46 184°53.93 58.48 55°53.70 56.14 101°30.99 46.47 182°17.30 2.97 23 195°15.93 199°55.46 58.33 70°55.05 55.84 116°32.94 46.51 197°19.51 2.87  Mars:												
20 150°8.53 154°50.86 58.77 25°50.98 56.72 71°27.08 46.38 152°12.87 3.17 21 165°11.00 169°52.40 · 58.62 40°52.34 · 56.43 86°29.03 · 46.42 167°15.09 · 3.07 22 180°13.46 184°53.93 58.48 55°53.70 56.14 101°30.99 46.47 182°17.30 2.97 23 195°15.93 199°55.46 58.33 70°55.05 55.84 116°32.94 46.51 197°19.51 2.87  Horizontal parallax Venus:		$135^{\circ}6.07$			$10^{\circ}49.62$							
22 180°13.46 184°53.93 58.48 55°53.70 56.14 101°30.99 46.47 182°17.30 2.97 Venus: 23 195°15.93 199°55.46 58.33 70°55.05 55.84 116°32.94 46.51 197°19.51 2.87 Mars:												
23 195°15.93 199°55.46 58.33 70°55.05 55.84 116°32.94 46.51 197°19.51 2.87 Mars:											Horizoi	
25 195 15:55 199 35:40 30:35 10 35:05 110 32:54 40:51 19:31 2:01												
Mer.pass. 10:01 $\nu$ 1.6' $d$ -0.2' m-4.76 $\nu$ 1.4' $d$ -0.3' m0.79 $\nu$ 2.0' $d$ 0.0' m-2.02 $\nu$ 2.2' $d$ -0.1' m1.17												141013.
	Mer.p	pass. 10:01	$\nu$ 1.6′ d-0	.2′ m-4.76	$\nu$ 1.4′ d-0	.3′ m0.79	$\nu 2.0' d0.$	.0′ m-2.02	$\nu$ 2.2′ d-0	.1′ m1.17		

Dec 29°13.63 -42°10.09 56° 40.41 -17° 50.94  $\text{-}57^{\circ}6.50$  $23^{\circ}34.83$ 89°22.32 -40°12.29 4°11.25 49°57.07 16°33.57 -8°10.45  $46^{\circ}1.49$  $6^{\circ}22.30$ 28°37.75 -1°11.23 7°24.65 -52°42.77 -16°45.20 -29°0.58 5°9.54 27°57.96 -59°35.70 -43°32.33 -69°49.52 -8°46.23 11°50.57  $61^{\circ}37.02$  $14^{\circ}25.77$  $-17^{\circ}41.10$ -63°14.53 -57°15.47 55°49.35 -11°17.74 49°11.13 -60°29.76 -36°29.77  $19^{\circ}2.90$ -60°56.42  $74^{\circ}2.92$ -16°8.93  $26^{\circ}37.57$ -26°29.32 -69°4.21  $-15^{\circ}45.44$  $-37^{\circ}7.28$  $12^{\circ}32.28$ 51°28.77 -34°22.30 38°48.09 -26°15.90 8°55.91 -56°39.02  $45^{\circ}21.88$ 9°59.27 -46°50.19 -29°29.28 28°12.98 15°20.30 Mer.pass 09:47 18:21 15:21 10:00 Mer.pass 09:44 18:19 15:18 09:56 Mer.pass 09:42 18:17 15:15 09:53

> 0.4 0.1

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°12.78	N11°11.11	291°38.43	8.4'	\$28°29.49	-1.7'	55.3'
1	195°12.92	11.98	$306^{\circ}5.86$	8.4'	28°27.79	-1.8'	55.3'
2	210°13.05	12.84	320° 33.29	8.4'	28°25.94	-2.0'	55.3'
3	225°13.19 240°13.32	· · 13.71 14.57	335°0.70 349°28.11	8.4'	28°23.95 28°21.80	-2.1'	55.3'
4 5	240°13.32 255°13.46	14.57 15.43	349°28.11 3°55.51	8.4' 8.4'	28° 21.80 28° 19.49	-2.3' -2.5'	55.4' 55.4'
6	270°13.59	N11°16.30	18° 22.91	8.4	S28° 17.04	-2.6'	55.4'
7	285°13.72	17.16	32°50.30	8.4'	28° 14.44	-2.8'	55.4'
8	300°13.86	18.02	47° 17.70	8.4'	$28^{\circ}11.68$	-2.9'	55.5'
9	315°13.99	•• 18.88	61°45.09	8.4'	28°8.77	-3.1'	55.5'
10	330°14.13 345°14.26	19.74	76° 12.49	8.4'	28°5.72	-3.2'	55.5'
11 12	0°14.39	20.61 N11°21.47	90°39.89 105°7.29	8.4' 8.4'	28°2.51 <b>S</b> 27°59.14	-3.4' -3.5'	55.5' 55.6'
13	15°14.53	22.33	105 7.29 119°34.70	8.4'	27°55.63	-3.5' -3.7'	55.6'
14	30°14.66	23.19	134°2.11	8.4'	27°51.97	-3.8'	55.6'
15	45°14.79	• • 24.05	148° 29.54	8.4'	$27^{\circ}48.15$	-4.0'	55.6'
16	60°14.93	24.91	162° 56.97	8.4'	27°44.18	-4.1'	55.7'
17	75°15.06	25.77	177°24.41	8.5'	27°40.07	-4.3'	55.7'
18 19	90°15.19 105°15.32	N11°26.62 27.48	191°51.86 206°19.33	8.5' 8.5'	\$27°35.80 27°31.38	-4.4' -4.6'	55.7' 55.8'
20	105 15.32 120°15.45	28.34	200° 19.33 220° 46.80	6.5 8.5'	27°26.81	-4.0 -4.7'	55.8'
21	135°15.59	29.20	235° 14.30	8.5'	27°22.09	-4.9'	55.8'
22	150°15.72	30.06	249°41.81	8.5'	27° 17.22	-5.0'	55.8'
23	165°15.85	30.92	264°9.33	8.5'	$27^{\circ}12.20$	-5.2'	55.9'
	SD = 15.9'	d = 0.9'		SI	D = 15.1'		
Sun	<b>GHA</b> 180°15.98	<b>Dec</b> N11°31.77	GHA	ν	Dec	d 5 2'	HP
0 1	180°15.98 195°16.11	N11°31.77 32.63	278°36.88 293°4.44	8.6' 8.6'	\$27°7.03 27°1.71	-5.3' -5.5'	55.9' 55.9'
2	210°16.24	33.49	307°32.02	8.6'	26° 56.25	-5.6'	56.0'
3	225°16.37	• • 34.34	321°59.62	8.6'	26°50.63	-5.8'	56.0'
4	240°16.50	35.20	336°27.25	8.6'	$26^{\circ}44.87$	-5.9'	56.0'
5	255°16.63	36.05	$350^{\circ}54.90$	8.7'	$26^{\circ}38.95$	-6.1'	56.0'
6	270°16.76	N11°36.91	5°22.57	8.7'	\$26°32.89	-6.2	56.1'
7	285°16.89 300°17.02	37.76 38.62	19°50.27 34°17.99	8.7' 8.7'	26°26.69 26°20.33	-6.4'	56.1' 56.1'
8 9	300°17.02 315°17.15	38.62	48° 45.74	8.7	26° 20.33 26° 13.83	-6.5' -6.6'	56.2'
10	330°17.28	40.32	63° 13.52	8.8'	26°7.19	-6.8'	56.2'
11	345°17.41	41.18	77°41.32	8.8'	26°0.39	-6.9'	56.2'
12	0°17.54	N11°42.03	92°9.16	8.9'	\$25°53.46	-7.1'	56.3'
13	15°17.67	42.88	106° 37.02	8.9'	25° 46.37	-7.2'	56.3'
14	30°17.80	43.74	121°4.92	8.9'	25°39.15	-7.4	56.3'
15	45°17.93 60°18.05	•• 44.59 45.44	135°32.84 150°0.80	9.0' 9.0'	25°31.78 25°24.26	-7.5'	56.4'
16 17	75°18.18	45.44 46.29	164°28.79	9.0' 9.0'	25 24.26 25°16.61	-7.7' -7.8'	56.4' 56.4'
18	90°18.31	N11°47.14	178° 56.82	9.1'	\$25°8.81	-7.9'	56.5'
19	105°18.44	47.99	193°24.87	9.1'	25°0.87	-8.1'	56.5'
20	120°18.56	48.84	207°52.97	9.1'	24°52.79	-8.2'	56.5'
21	135°18.69	• • 49.69	222°21.09	9.2'	24°44.56	-8.4'	56.6'
22	150°18.82	50.54	236° 49.26	9.2'	24°36.20	-8.5'	56.6'
23	165°18.95	51.39	251°17.46	9.2'	24°27.70	-8.6'	56.6'
	SD = 15.9'	d = 0.9'		SI	D = 15.2'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°19.07	N11°52.24	265° 45.69	9.3'	\$24°19.06	-8.8'	56.7'
1	195°19.20	53.09	280° 13.96	9.3'	24°10.28	-8.9'	56.7'
2	210°19.32	53.94	294° 42.27	9.3'	24°1.36	-9.1'	56.7'
3 4	225°19.45 240°19.58	• • 54.79 55.64	309° 10.62 323° 39.01	9.4' 9.4'	23°52.31 23°43.12	-9.2' -9.3'	56.8' 56.8'
4 5	240 19.58 255°19.70	55.04 56.48	323 39.01 338°7.43	9.4 9.5'	23 43.12 23°33.79	-9.5'	56.8'
6	270°19.83	N11°57.33	352°35.90	9.5'	\$23°24.33	-9.6'	56.9'
7	285°19.95	58.18	7°4.40	9.5'	$23^{\circ}14.74$	-9.7'	56.9'
8	300°20.08	59.02	21°32.94	9.6'	23°5.01	-9.9'	56.9'
9	315°20.20	11°59.87	36°1.52	9.6'	22°55.15	-10.0'	57.0'
10	330°20.33 345°20.45	12°0.72	50°30.14 64°58.80	9.7'	22°45.15 22°35.03	-10.1'	57.0'
11 12	345°20.45 0°20.57	1.56 N12°2.41	64°58.80 79°27.50	9.7' 9.7'	22°35.03 \$22°24.77	-10.3' -10.4'	57.1' 57.1'
13	15°20.70	3.25	93° 56.25	9.1 9.8'	22° 14.38	-10.4	57.1'
14	30°20.82	4.09	108° 25.03	9.8'	22°3.87	-10.5	57.1°
15	45°20.95	• • 4.94	122°53.85	9.9'	$21^{\circ}53.22$	-10.8'	57.2'
16	60°21.07	5.78	137° 22.71	9.9'	21° 42.45	-10.9'	57.2'
17	75°21.19	6.63	151°51.62	9.9'	21°31.55	-11.0'	57.3'
18	90°21.32	N12°7.47	166° 20.56	10.0'	\$21°20.53	-11.1'	57.3'
19 20	105°21.44 120°21.56	8.31 9.15	180° 49.54 195° 18.57	10.0' 10.1'	21°9.38 20°58.11	-11.3' -11.4'	57.3' 57.4'
21	120 21.50 135°21.68	9.15 · · 10.00	209° 47.63	10.1	20° 58.11 20° 46.71	-11.4 -11.5'	57.4' 57.4'
22	150°21.81	10.84	224° 16.73	10.1	20°35.19	-11.6'	57.5'
23	165°21.93	11.68	238° 45.88	10.2'	20°23.55	-11.8'	57.5'
	SD = 15.9'	d = 0.8'		SI	D = 15.5'		
			-				

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

		/loonrise		ľ	√loonset	
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°	_					_
68°						
66°			05:43			07:32
64°			04:44			08:30
62°		04:23	04:10		07:00	09:04
60°   0	03:21	03:39	03:45	06:09	07:44	09:28
	2:41	03:10	03:25	06:49	08:12	09:47
	02:13	02:48	03:09	07:17	08:35	10:03
	1:51	02:29	02:54	07:38	08:53	10:17
	1:33	02:14	02:42	07:56	09:08	10:29
	1:18	02:00	02:31	08:12	09:21	10:39
45° (	00:47	01:32	02:08	08:42	09:48	11:01
	00:23	01:10	01:50	09:06	10:10	11:18
	00:04	00:52	01:34	09:25	10:27	11:33
30°		00:36	01:20	09:42	10:42	11:46
20°	•• ••	00:09	00:57	10:10	11:08	12:07
	23:46		00:37	10:34	11:30	12:26
0°   2	23:25	•• ••	00:18	10:57	11:51	12:43
S 10° 2	23:03	23:59		11:19	12:11	13:00
	22:40	23:39		11:43	12:33	13:18
	22:13	23:15		12:11	12:58	13:39
	21:57	23:01		12:27	13:12	13:51
	21:38	22:45	23:56	12:46	13:29	14:05
45° 2	21:16	22:26	23:41	13:09	13:49	14:22
	20:47	22:01	23:22	13:39	14:15	14:42
	20:33	21:50	23:13	13:53	14:27	14:51
	20:16	21:36	23:03	14:10	14:41	15:02
	L9:57	21:21	22:52	14:30	14:57	15:14
	19:32	21:02	22:39	14:54	15:16	15:27
<b>S</b> 60°	18:59	20:39	22:24	15:28	15:39	15:43

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	210° 18.39	214°56.99 N00°58.		131°34.89 N22°46.55	212°21.72	
1	225°20.86	229°58.52 58.0		146°36.85 46.59	227°23.94 2.66	Alpheratz 357°34.87 29°13.63
2	240°23.32	245°0.04 57.		161°38.80 46.64	242°26.15 2.56	Ankaa 353°7.28 -42°10.08
3	255°25.78	260°1.56 · · 57.		176°40.75 · · 46.68	257°28.36 · · 2.46	Schedar 349°31.36 56°40.40
4	270°28.25	275°3.08 57.0		191°42.70 46.72	272°30.57 2.35	Diphda 348°47.38 -17°50.92
5	285°30.71	290°4.60 57.	51 161°3.18 54.10	206°44.66 46.76	287°32.79 2.25	Achernar 335°20.56 -57°6.48
6	300°33.18	305°6.11 N00°57.	38 176°4.54 N21°53.80	221°46.61 N22°46.81	302°35.00 \$03°2.15	Hamal 327°51.31 23°34.83 Polaris 314°24.70 89°22.30
7	315°35.64	320°7.62 57.5	25 191°5.89 53.51	236°48.56 46.85	317°37.21 2.05	Acamar 315°12.00 -40°12.27
8	330°38.10	335°9.13 57.	12 206°7.25 53.22	251°50.51 46.89	332°39.43 1.95	Menkar 314°6.23 4°11.25
9	345°40.57	350°10.63 · · 57.0		266°52.46 · · 46.93	347°41.64 · · 1.84	Mirfak 308°28.43 49°57.07
10	0°43.03	5°12.13 56.		281°54.42 46.97	2°43.85 1.74	Aldebaran 290°39.65 16°33.57
11	15° 45.50	20° 13.63 56.		296°56.37 47.02	17°46.06 1.64	Rigel 281°3.89 -8°10.45
12	30° 47.96	35°15.12 N00°56.		311°58.32 N22°47.06	32°48.28	Capella 280°21.90 46°1.49
13 14	45° 50.42 60° 52.89	50° 16.62 56.8 65° 18.11 56.3	_	327°0.27 47.10 342°2.22 47.14	47°50.49 1.44 62°52.70 1.33	Bellatrix 278°22.87 6°22.30
15	75°55.35	65° 18.11 56.3 80° 19.59 •• 56.3		357° 4.17 · · 47.18	62°52.70 1.33 77°54.92 · · 1.23	Elnath 278°1.84 28°37.75
16	90° 57.82	95°21.08 56.		12°6.12 47.23	92°57.13 1.13	Alnilam 275°37.72 -1°11.23
17	106°0.28	110°22.56 56.0		27°8.07 47.27	107°59.35 1.03	Betelgeuse 270°52.04 7°24.66
18	121°2.75	125°24.04 N00°55.		42°10.02 N22°47.31	123°1.56 \$03°0.93	Canopus 263°52.56 -52°42.76
19	136°5.21	140°25.52 55.5		57°11.97 47.35	138°3.77 0.83	Sirius 258°26.19 -16°45.20
20	151°7.67	155°26.99 55.	72 26°23.46 49.70	72°13.92 47.40	153°5.99 0.72	Adhara 255°5.82 -29°0.58
21	166°10.14	170°28.46 · · 55.	51 41°24.81 · · 49.40	87°15.87 · · 47.44	168°8.20 · · 0.62	Procyon 244°50.67 5°9.55
22	181°12.60	185°29.93 55.		102°17.82 47.48	183°10.41 0.52	Pollux 243°17.09 27°57.96 Avior 234°14.67 -59°35.70
23	$196^{\circ}15.07$	200°31.39 55.4	40 71°27.50 48.81	117°19.77 47.52	198°12.63 0.42	Suhail 222°46.08 -43°32.34
Merr	pass. 09:57	$\nu 1.5' \ d$ -0.1' m-4.7	$\frac{1}{6} \frac{1.4' \text{ d-0.3' m0.81}}{\nu}$	ν2.0' d0.0' m-2.01	$\nu 2.2' \ d$ -0.1' m1.17	Miaplacidus 221°38.08 -69°49.53
14101.		ν 1.5 α 0.1 III-4.7			U V.I IIII.II	Alphard 217°47.45 -8°46.23
						Regulus 207°34.06 11°50.57
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.25 61°37.03
0 1	211° 17.53 226° 19.99	215°32.86 N00°55.3 230°34.31 55.3		132°21.72 N22°47.56 147°23.67 47.60	213°14.84 \$03°0.32 228°17.06 0.22	Denebola 182°24.46 14°25.77
2	241°22.46	245°35.77 55.		162°25.62 47.65	243°19.27 0.11	Gienah 175°43.08 -17°41.11
3	256°24.92	260°37.23 · · 55.0	_	177°27.57 · · 47.69	258°21.48 03°0.01	Acrux 172°59.29 -63°14.55
4	271°27.39	275°38.68 54.9		192°29.51 47.73	273°23.70 02°59.91	Gacrux 171°50.92 -57°15.48
5	286° 29.85	290°40.13 54.8		207°31.46 47.77	288°25.91 59.81	Alioth 166°12.21 55°49.36
6	301°32.31	305°41.57 N00°54.		222°33.41 N22°47.81	303°28.13 <b>S</b> 02°59.71	Spica 158°21.76 -11°17.75 Alkaid 152°51.32 49°11.14
7	$316^{\circ}34.78$	320°43.02 54.	53 191°38.28 46.44	237°35.36 47.86	318°30.34 59.61	Hadar 148°35.09 -60°29.78
8	331°37.24	335°44.46 54.	55 206°39.62 46.15	252°37.31 47.90	333°32.56 59.51	Menkent 147°56.98 -36°29.78
9	346°39.71	350°45.89 · · 54.4		267°39.25 · · 47.94	348°34.77 · · 59.41	Arcturus 145°47.37 19°2.90
10	1°42.17	5°47.33 54.3		282°41.20 47.98	3°36.99 59.30	Rigil Kent. 139°39.37 -60°56.44
11	16°44.63	20°48.76 54.3		297°43.15 48.02	18°39.20 59.20	Kochab 137°18.58 74°2.94
12	31° 47.10	35°50.19 N00°54.		312°45.10 N22°48.06	33°41.42 S02°59.10	Zuben'ubi 136°55.45 -16°8.93
13	46°49.56	50°51.62 54.		327°47.04 48.11 342°48.99 48.15	48°43.63 59.00 63°45.85 58.90	Alphecca 126°3.21 26°37.57
14 15	61°52.03 76°54.49	65°53.04 54.0 80°54.47 · · · 53.0		342°48.99 48.15 357°50.94 · · 48.19	63°45.85 58.90 78°48.06 •• 58.80	Antares 112°15.27 -26°29.33
16	91°56.95	95°55.88 53.	_	12°52.88 48.23	93°50.28 58.70	Atria 107°8.90 -69°4.22
17	106°59.42	110°57.30 53.5		27°54.83 48.27	108°52.49 58.60	Sabik 102°2.29 -15°45.45
18	122°1.88	125°58.72 N00°53.		42°56.78 N22°48.31	123°54.71 S02°58.50	Shaula 96°9.81 -37°7.28
19	137°4.35	141°0.13 53.		57°58.72 48.36	138°56.92 58.40	Rasalhague 95°58.13 12°32.29
20	152°6.81	156°1.53 53.0		73° 0.67 48.40	153°59.14 58.29	Eltanin 90°41.78 51°28.78 Kaus Aust. 83°32.03 -34°22.30
21	167°9.28	171°2.94 · · 53.		88° 2.62 · · 48.44	169°1.35 · · 58.19	Kaus Aust. 83°32.03 -34°22.30 Vega 80°32.90 38°48.09
22	182°11.74	186°4.34 53.	47 56°58.42 41.97	103° 4.56 48.48	184°3.57 58.09	Nunki 75°47.36 -26°15.90
23	$197^{\circ}14.20$	201°5.74 53.4	41 71°59.76 41.67	118° 6.51 48.52	199°5.78 57.99	Altair 61°59.70 8°55.91
Mer r	pass. 09:53	$\nu 1.5' \ d$ -0.1' m-4.7	$\nu 1.3' \ d$ -0.3' m0.82	$\nu$ 1.9' d0.0' m-2.01	ν2.2' d-0.1' m1.17	Peacock 53°5.38 -56°39.01
		7 210 4 012 111 111				Deneb 49°25.72 45°21.88
						Enif 33°38.70 9°59.28
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.83 -46°50.18
0 1	212° 16.67 227° 19.13	216°7.14 N00°53.3 231°8.54 53.3		133°8.45 N22°48.56 148°10.40 48.60	214°8.00 S02°57.89 229°10.22 57.79	Fomalhaut 15°14.49 -29°29.27
2	242°21.60	246°9.93 53.:		163°12.34 48.65	244°12.43 57.69	Scheat 13°45.24 28°12.98
3	242 21.00 257°24.06	261°11.32 · · · 53.		178°14.29 · · 48.69	259°14.65 · · 57.59	Markab 13°29.91 15°20.30
4	272°26.52	276°12.71 53.		193°16.23 48.73	274°16.86 57.49	Apr 22 Tue SHA Mer.pass
5	287°28.99	291°14.09 53.0		208°18.18 48.77	289°19.08 57.39	Venus 4°38.60 09:39
6	302°31.45	306°15.48 N00°53.		223°20.12 N22°48.81	304°21.30 S02°57.29	Mars 235°38.02 18:15
7	$317^{\circ}33.92$	321°16.86 52.9	95 192° 10.47 39.27	238°22.07 48.85	319°23.51 57.19	Jupiter 281°16.50 15:12
8	$332^{\circ}36.38$	336°18.23 52.		253°24.01 48.89	334°25.73 57.09	Saturn 2°3.33 09:49
9	347°38.84	351°19.61 · · 52.		268°25.96 · · 48.94	349°27.94 · · 56.99	Apr 23 Wed SHA Mer.pass
10	2°41.31	6°20.98 52.5		283°27.90 48.98	4°30.16 56.89	Venus 4°15.33 09:37
11	17° 43.77	21°22.35 52.		298°29.84 49.02	19°32.38 56.79	Mars 235°11.32 18:12
12	32° 46.24	36°23.72 N00°52.		313°31.79 N22°49.06	34°34.59 <b>S</b> 02°56.69	Jupiter 281°4.19 15:09
13 14	47° 48.70 62° 51.16	51°25.08 52.0 66°26.44 52.0		328°33.73 49.10 343°35.67 49.14	49°36.81 56.59 64°39.03 56.49	Saturn 1°57.31 09:46
14 15	77°53.63	81°27.80 · · 52.		358°37.62 · · 49.18	79°41.24 · · 56.39	Apr 24 Thu SUA Max
16	92°56.09	96°29.16 52.		13°39.56 49.22	94°43.46 56.29	Apr 24 Thu         SHA         Mer.pass           Venus         3° 50.48         09:35
17	107°58.56	111°30.51 52.		28°41.50 49.26	109°45.68 56.19	Mars 234°44.43 18:10
18	123°1.02	126°31.86 N00°52.		43°43.45 N22°49.31	124°47.89 S02°56.09	Jupiter 280°51.79 15:05
19	138°3.48	141°33.21 52.4		58°45.39 49.35	139°50.11 55.99	Saturn 1°51.33 09:42
20	153°5.95	156°34.56 52.		73°47.33 49.39	154°52.33 55.89	
21	168°8.41	171°35.90 · · 52.		88°49.27 · · 49.43	169°54.55 · · 55.79	Horizontal parallax
22	183°10.88	186°37.24 52.3		103°51.22 49.47	184°56.76 55.69	Venus: 0.4
23	198° 13.34	201°38.58 52.3	33 72°31.83 34.42	118°53.16 49.51	199°58.98 55.59	Mars: 0.1
Mer.p	oass. 09:49	$ u 1.4' \ d$ -0.1' m-4.7	5 $\nu 1.3' \ d$ -0.3' m0.84	$\nu 1.9'~d0.0'~\text{m-}2.01$	$ u 2.2' \ d  0.1' \ \text{m} 1.17$	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°22.05	N12°12.52	$253^{\circ}15.06$	10.2'	S20°11.78	-11.9'	57.5'
1	195°22.17	13.36	267°44.29	10.3'	19°59.90	-12.0'	57.6'
2	210°22.29 225°22.41	14.20 •• 15.04	282°13.55 296°42.85	10.3' 10.3'	19°47.90 19°35.78	-12.1' -12.2'	57.6' 57.6'
4	240°22.53	15.88	311°12.19	10.4	19°23.54	-12.4'	57.7'
5	255°22.65	16.72	$325^{\circ}41.57$	10.4'	$19^{\circ}11.18$	-12.5'	57.7'
6	270°22.78	N12°17.56	340°10.98	10.5'	\$18°58.71	-12.6'	57.8'
7 8	285°22.90 300°23.02	18.40 19.23	354°40.44 9°9.93	10.5' 10.5'	18°46.13 18°33.43	-12.7' -12.8'	57.8' 57.8'
9	315°23.14	20.07	23°39.46	10.6'	18°20.62	-12.9'	57.9'
10	330°23.26	20.91	$38^{\circ}9.02$	10.6'	18°7.70	-13.0'	57.9'
11	345°23.37	21.75	52°38.62	10.6'	17°54.66	-13.1'	58.0'
12 13	0°23.49 15°23.61	N12°22.58 23.42	67°8.26 81°37.93	10.7' 10.7'	\$17°41.52 17°28.27	-13.3' -13.4'	58.0' 58.0'
14	30°23.73	24.26	96°7.64	10.7	17° 14.91	-13.5'	58.1
15	45°23.85	• • 25.09	$110^{\circ}37.38$	10.8'	$17^{\circ}1.44$	-13.6'	58.1'
16	60°23.97	25.93	125°7.15	10.8'	16°47.87	-13.7'	58.1'
17 18	75°24.09 90°24.21	26.76 N12°27.60	139°36.95 154°6.79	10.8' 10.9'	16°34.19 \$16°20.41	-13.8' -13.9'	58.2' 58.2'
19	105°24.32	28.43	168°36.66	10.9	16°6.53	-13.9 -14.0'	58.3'
20	120°24.44	29.27	183°6.56	10.9'	15°52.54	-14.1'	58.3'
21	135°24.56	• • 30.10	$197^{\circ}36.49$	11.0'	15°38.45	-14.2'	58.3'
22	150°24.68	30.93	212°6.45	11.0'	15°24.27	-14.3'	58.4'
23	165°24.79	31.77	226°36.44	11.0'	15°9.99	-14.4'	58.4'
	SD = 15.9'	d = 0.8'		SI	O = 15.7'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°24.91	N12°32.60	241°6.46	11.0'	<b>S</b> 14°55.60	-14.5'	58.5'
1	195°25.03	33.43	255°36.51	11.1'	14°41.13	-14.6'	58.5'
2	210°25.14 225°25.26	34.26 •• 35.09	270°6.58 284°36.68	11.1' 11.1'	14°26.56 14°11.89	-14.7' -14.8'	58.5' 58.6'
4	240°25.37	35.92	299°6.80	11.1'	13°57.13	-14.8 -14.9'	58.6'
5	255°25.49	36.75	313°36.95	11.2'	13°42.28	-14.9'	58.7'
6	270°25.61	N12°37.59	328°7.12	11.2'	S13°27.34	-15.0'	58.7'
7	285°25.72	38.42	342°37.31	11.2'	13°12.31	-15.1'	58.7'
8 9	300°25.84 315°25.95	39.25 •• 40.07	357°7.52 11°37.76	11.2' 11.3'	12°57.19 12°41.99	-15.2' -15.3'	58.8' 58.8'
10	330°26.07	40.90	26°8.01	11.3'	12 41.99 12°26.70	-15.3 -15.4'	58.9'
11	345°26.18	41.73	40°38.29	11.3'	12°11.32	-15.5'	58.9'
12	0°26.29	N12°42.56	55°8.58	11.3'	S11°55.86	-15.5'	58.9'
13 14	15°26.41 30°26.52	43.39 44.22	69°38.89 84°9.21	11.3' 11.3'	11°40.32 11°24.70	-15.6' -15.7'	59.0' 59.0'
14 15	30 26.52 45°26.64	· · 45.04	98°39.55	11.3 11.4'	11 24.70 11°9.00	-15.7 -15.8'	59.0'
16	60°26.75	45.87	113°9.91	11.4	10°53.22	-15.9'	59.1'
17	75°26.86	46.70	$127^{\circ}40.27$	11.4'	$10^{\circ}37.37$	-15.9'	59.1'
18	90°26.98	N12°47.52	142°10.65	11.4'	\$10°21.44	-16.0'	59.2'
19 20	105°27.09 120°27.20	48.35 49.17	156°41.04 171°11.44	11.4' 11.4'	10°5.43 09°49.35	-16.1'	59.2' 59.2'
21	135°27.31	• • 50.00	171 11.44 185°41.85	11.4'	09 49.33 09°33.20	-16.2'	59.2 59.3'
22	150°27.43	50.82	200°12.27	11.4'	09°16.98	-16.3	59.3'
23	165°27.54	51.65	214°42.69	11.4'	09°0.69	-16.4'	59.3'
	SD = 15.9'	d = 0.8'		SI	O = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	НР
0	180°27.65	N12°52.47	229°13.12	11.4'	S08°44.33	-16.4'	59.4'
1	195°27.76	53.29	243°43.56	11.4'	08°27.91	-16.5'	59.4'
2	210°27.87 225°27.98	54.12 •• 54.94	258°13.99 272°44.43	11.4' 11.4'	08°11.42 07°54.86	-16.6' -16.6'	59.5' 59.5'
4	240°28.09	55.76	272 44.43 287°14.87	11.4'	07°38.25	-16.0 -16.7'	59.5'
5	255°28.21	56.58	$301^{\circ}45.31$	11.4'	$07^{\circ}21.57$	-16.7'	59.6'
6	270°28.32	N12°57.41	316°15.75	11.4'	S07°4.84	-16.8'	59.6'
7	285°28.43 300°28.54	58.23	330°46.19	11.4' 11.4'	06°48.04	-16.8'	59.6'
8 9	300°28.54 315°28.65	59.05 12°59.87	345°16.62 359°47.05	11.4' 11.4'	06°31.20 06°14.29	-16.9' -17.0'	59.7' 59.7'
10	330°28.76	13°0.69	14°17.48	11.4'	05°57.33	-17.0'	59.7'
11	345°28.86	1.51	28°47.89	11.4'	$05^{\circ}40.32$	-17.1'	59.8'
12	0°28.97	N13°2.33	43°18.30	11.4'	S05°23.26	-17.1'	59.8'
13 14	15°29.08 30°29.19	3.15 3.97	57°48.69 72°19.08	11.4' 11.4'	05°6.15 04°49.00	-17.2' -17.2'	59.9' 59.9'
14 15	45°29.30	3.97 • • 4.78	72 19.08 86°49.45	11.4 11.4'	04 49.00 04°31.80	-17.2'	59.9' 59.9'
16	60°29.41	5.60	101°19.81	11.3'	$04^{\circ}14.55$	-17.3	60.0'
17	75°29.52	6.42	115°50.16	11.3'	03°57.26	-17.3'	60.0'
18	90°29.62	N13°7.24	130°20.49	11.3'	503°39.93	-17.4'	60.0'
19 20	105°29.73 120°29.84	8.05 8.87	144°50.80 159°21.09	11.3' 11.3'	03°22.56 03°5.15	-17.4' -17.4'	60.1' 60.1'
21	135°29.95	• • 9.69	173°51.37	11.3'	03° 47.71	-17.4	60.1
22	150°30.05	10.50	$188^{\circ}21.62$	11.2'	02°30.23	-17.5'	60.2'
23	165°30.16	11.32	202°51.85	11.2'	02°12.72	-17.5'	60.2'
	SD = 15.9'	d = 0.8'		SI	0 = 16.2'		

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

Lat.		Moonris	e		Moonset	;
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°		05:22	04:30		11:32	14:09
<b>N</b> 70°	06:07	04:56	04:19	08:59	11:55	14:17
68°	05:17	04:37	04:10	09:47	12:12	14:23
66°	04:45	04:21	04:03	10:18	12:27	14:28
64°	04:22	04:08	03:56	10:40	12:38	14:32
62°	04:03	03:56	03:51	10:58	12:48	14:35
60°	03:47	03:47	03:46	11:13	12:56	14:38
<b>N</b> 58°	03:33	03:38	03:42	11:25	13:03	14:41
56°	03:22	03:31	03:38	11:36	13:10	14:44
54°	03:12	03:24	03:34	11:45	13:15	14:46
52°	03:03	03:18	03:31	11:54	13:20	14:48
50°	02:54	03:13	03:28	12:01	13:25	14:49
45°	02:37	03:01	03:22	12:17	13:35	14:53
<b>N</b> 40°	02:23	02:51	03:17	12:30	13:43	14:56
35°	02:10	02:43	03:12	12:41	13:50	14:59
30°	02:00	02:35	03:08	12:51	13:56	15:02
20°	01:41	02:22	03:01	13:07	14:06	15:06
<b>N</b> 10°	01:25	02:11	02:55	13:21	14:15	15:09
0°	01:10	02:00	02:49	13:34	14:24	15:12
<b>S</b> 10°	00:55	01:49	02:43	13:47	14:32	15:16
20°	00:38	01:38	02:37	14:01	14:41	15:19
30°	00:19	01:24	02:30	14:17	14:51	15:23
35°	80:00	01:17	02:26	14:26	14:56	15:25
40°	•• ••	01:08	02:21	14:36	15:03	15:28
45°		00:58	02:16	14:48	15:10	15:30
<b>S</b> 50°		00:45	02:09	15:02	15:19	15:34
52°		00:39	02:06	15:09	15:23	15:35
54°		00:32	02:03	15:16	15:27	15:37
56°		00:25	01:59	15:25	15:32	15:39
58°		00:17	01:55	15:34	15:38	15:41
<b>S</b> 60°		00:07	01:50	15:44	15:44	15:43

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	40-20%	
22	01:28	01:34	11:58	07:22	19:47		
23	01:40	01:45	11:58	08:12	20:36		
24	01:51	01:56	11:58	09:01	21:25		

h .	Aries	Ve	nus	M	ars	Juj	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	213° 15.80	216°39.92	N00°52.31	87°33.16	N21°34.12	133°55.10	N22°49.55	215°1.20	S02°55.49	Alpheratz	357°34.86	29°13.63
1 2	228° 18.27 243° 20.73	231°41.25 246°42.58	52.28 52.26	102°34.49 117°35.82	33.82 33.51	148°57.04 163°58.98	49.59 49.63	230°3.42 245°5.63	55.39 55.29	Ankaa	353°7.27	-42°10.06
3	258° 23.20	261°43.91	• • 52.24	132°37.15	33.21	179° 0.92	• • 49.67	260°7.85	• • 55.19	Schedar	349°31.35	56°40.39
4	273° 25.66	276° 45.24	52.22	147°38.48	32.90	194° 2.87	49.72	275°10.07	55.09	Diphda	348° 47.37	-17°50.91
5	288°28.12	291°46.56	52.20	162°39.82	32.60	209°4.81	49.76	290°12.29	54.99	Achernar	335°20.56 327°51.31	-57°6.47 23°34.83
6	303°30.59	306°47.88	N00°52.19	177°41.15	N21°32.29	224° 6.75	N22°49.80	305°14.50	S02°54.89	Hamal Polaris	314°25.03	23 34.63 89°22.29
7	318° 33.05	321°49.20	52.17	192°42.48	31.98	239°8.69	49.84	320°16.72	54.79	Acamar	315°12.01	-40°12.26
8	333° 35.52	336°50.52	52.16	207°43.80	31.68	254°10.63	49.88	335°18.94	54.69	Menkar	314°6.24	4°11.26
9 10	348° 37.98 3° 40.44	351°51.83 6°53.14	• • 52.15	222°45.13 237°46.46	• • 31.37	269°12.57 284°14.51	• • 49.92	350°21.16 5°23.38	• • 54.59	Mirfak	308°28.44	49°57.06
11	3 40.44 18°42.91	0 53.14 21°54.45	52.14 52.13	252° 47.79	31.07 30.76	284 14.51 299°16.45	49.96 50.00	5 23.38 20°25.60	54.49 54.39	Aldebaran	290°39.65	$16^{\circ}33.57$
12	33°45.37	36°55.76	N00°52.13	267°49.12	N21°30.45	314°18.39	N22°50.04	35°27.81	502°54.29	Rigel	281°3.90	-8°10.44
13	48° 47.84	51°57.06	52.12	282° 50.45	30.15	329°20.33	50.08	50°30.03	54.19	Capella	280°21.91	46°1.49
14	63°50.30	66°58.37	52.12	297°51.78	29.84	344°22.27	50.12	65°32.25	54.09	Bellatrix Elnath	278°22.88 278°1.85	6°22.30 28°37.75
15	78°52.77	81°59.66	• • 52.11	312°53.10	• • 29.53	359°24.21	•• 50.16	80°34.47	• • 53.99	Alnilam	276 1.65 275°37.73	-1°11.22
16	93°55.23	97°0.96	52.11	327°54.43	29.23	14°26.15	50.20	95°36.69	53.89	Betelgeuse	270°52.05	7°24.66
17	108° 57.69	112°2.26	52.11	342°55.76	28.92	29°28.09	50.25	110°38.91	53.79	Canopus	263°52.58	-52°42.75
18 19	124°0.16 139°2.62	127°3.55 142°4.84	N00°52.12 52.12	357°57.08 12°58.41	N21°28.61 28.30	44°30.03 59°31.97	N22°50.29 50.33	125°41.13 140°43.34	\$02°53.70 53.60	Sirius	258°26.20	$-16^{\circ}45.19$
20	159° 2.02 154° 5.09	142 4.04 157°6.12	52.12	27° 59.73	28.00	74°33.91	50.33	155°45.56	53.50	Adhara	255°5.84	-29° 0.57
21	169°7.55	172°7.41	• 52.13	43°1.06	• • 27.69	89°35.84	• • 50.41	170°47.78	• • 53.40	Procyon	244°50.68	5°9.55
22	184° 10.01	187°8.69	52.14	58°2.38	27.38	104°37.78	50.45	185°50.00	53.30	Pollux	243°17.11	27°57.97
23	199° 12.48	202°9.97	52.15	73°3.71	27.07	119°39.72	50.49	200°52.22	53.20	Avior	234°14.71 222°46.10	-59°35.70 -43°32.34
Mor	pass. 09:45	11 3 <sup>1</sup> d 0	.0′ m-4.75	11 3' d C	0.3' m0.85	11 0' d0	.0′ m-2.00	"3 3' d C	.1′ m1.17	Suhail Miaplacidus	221°38.13	-43 32.34 -69°49.53
IVICI.	pass. 09.43	ν1.5 u-0	.0 111-4.75	ν1.5 u-0	7.5 1110.05	ν1.9 d0	.0 111-2.00	ν2.2 <b>u</b> -0	.1 1111.17	Alphard	217° 47.47	-8°46.23
										Regulus	207°34.07	11°50.57
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°40.27	61°37.04
0	214° 14.94	217°11.25 232°12.52	N00°52.16	88°5.03	N21°26.76	134°41.66	N22°50.53	215°54.44	\$02°53.10	Denebola	$182^{\circ}24.47$	$14^{\circ}25.78$
1 2	229° 17.41 244° 19.87	232 12.52 247°13.79	52.18 52.19	103°6.36 118°7.68	26.45 26.14	149°43.60 164°45.54	50.57 50.61	230°56.66 245°58.88	53.00 52.90	Gienah	175° 43.09	-17°41.11
3	259° 22.33	262° 15.06	• 52.19	133°9.00	• • 25.83	179°47.47	• • 50.65	245 56.66 261°1.10	• • 52.80	Acrux	172°59.30	-63°14.56
4	274° 24.80	277°16.33	52.23	148° 10.33	25.53	194°49.41	50.69	276°3.32	52.71	Gacrux	171°50.93	-57°15.49
5	289° 27.26	292°17.60	52.24	163°11.65	25.22	209°51.35	50.73	291°5.54	52.61	Alioth Spica	166° 12.21 158° 21.76	55°49.38 -11°17.75
6	304°29.73	307°18.86	N00°52.27	178° 12.97	N21°24.91	224°53.29	N22°50.77	306°7.76	S02°52.51	Alkaid	150 21.70 152°51.32	49°11.16
7	$319^{\circ}32.19$	$322^{\circ}20.12$	52.29	193°14.30	24.60	239°55.22	50.81	$321^{\circ}9.98$	52.41	Hadar	148° 35.08	-60°29.79
8	334°34.65	337°21.38	52.31	208° 15.62	24.29	254°57.16	50.85	336°12.20	52.31	Menkent	147°56.98	-36°29.79
9	349° 37.12	352°22.63	• • 52.34	223°16.94	• • 23.98	269°59.10	• • 50.89	351°14.42	• • 52.21	Arcturus	145°47.36	19°2.91
10	4° 39.58 19° 42.05	7°23.89 22°25.14	52.36 52.39	238° 18.26 253° 19.58	23.66 23.35	285°1.03 300°2.97	50.93 50.97	6°16.64 21°18.86	52.11 52.02	Rigil Kent.	139°39.37	-60°56.45
11 12	34° 44.51	37°26.38	N00°52.42	268° 20.90	N21°23.04	315° 4.91	N22°51.01	36°21.08	52.02 \$02°51.92	Kochab	137° 18.56	74°2.95
13	49° 46.97	52°27.63	52.45	283°22.22	22.73	330° 6.84	51.05	51°23.30	51.82	Zuben'ubi	136°55.44	-16°8.93
14	64°49.44	67°28.87	52.49	298° 23.54	22.42	345°8.78	51.09	66°25.52	51.72	Alphecca	126°3.20	26°37.59 -26°29.33
15	$79^{\circ}51.90$	82°30.12	• • 52.52	313°24.86	• • 22.11	0°10.72	• • 51.13	81°27.74	• • 51.62	Antares Atria	112°15.26 107°8.86	-20 29.33 -69°4.23
16	94°54.37	97°31.36	52.55	$328^{\circ}26.18$	21.80	15°12.65	51.17	96°29.96	51.52	Sabik	107 0.00 102°2.27	-15°45.45
17	109°56.83	112°32.59	52.59	343°27.50	21.49	30°14.59	51.21	111°32.18	51.43	Shaula	96°9.79	-37°7.29
18	124° 59.29	127°33.83	N00°52.63		N21°21.17		N22°51.25	126°34.40	S02°51.33	Rasalhague	$95^{\circ}58.11$	12°32.29
19	140°1.76	142°35.06	52.67	13°30.14	20.86	60°18.46	51.29	141°36.62	51.23	Eltanin	90°41.75	$51^{\circ}28.79$
20 21	155° 4.22 170° 6.69	157°36.29 172°37.52	52.71 •• 52.76	28°31.46 43°32.77	20.55	75°20.39 90°22.33	51.33 •• 51.37	156°38.84 171°41.06	51.13 •• 51.03	Kaus Aust.	83°32.01	-34°22.30
22	185°9.15	187°38.74	52.80	58° 34.09	19.92	105°24.27	51.41	186°43.28	50.93	Vega	80°32.88	38°48.10
23	200°11.61	202°39.96	52.85	73°35.41	19.61	120°26.20	51.45	201°45.50	50.84	Nunki	75°47.34	-26°15.90
		1 3/ 40	.0′ m-4.75		0.3′ m0.87		.0′ m-2.00	2 2/ 4 0	.1′ m1.17	Altair Peacock	61°59.68 53°5.34	8°55.92 -56°39.01
wier.	pass. 09:41	$\nu_{1.5}$ au.	.U m-4.75	$\nu$ 1.5 $a$ -0	7.5 1110.67	ν1.9 d0	.0 M-2.00	ν2.2 <b>α</b> -0	7.1 M1.17	Deneb	49° 25.69	45°21.88
										Enif	33°38.69	9°59.28
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°32.80	-46°50.17
0	215° 14.08		N00°52.89		N21°19.30	135°28.13			S02°50.74	Fomalhaut	15° 14.48	-29°29.26
1 2	230° 16.54 245° 19.01	232°42.40 247°43.62	52.94 52.99	103°38.04 118°39.36	18.98 18.67	150°30.07 165°32.00	51.53 51.57	231°49.95 246°52.17	50.64 50.54	Scheat	13°45.23	28°12.98
3	260°21.47	262° 44.83	• • 53.04	133° 40.68	• 18.36	180°33.94	•• 51.61	261°54.39	• • 50.44	Markab	13°29.89	15°20.31
4	275° 23.94	277°46.04	53.10	148°41.99	18.04	195°35.87	51.65	276°56.61	50.35	Apr 25 Fri	SHA	Mer.pass
5	290° 26.40	292°47.25	53.15	163°43.31	17.73	210°37.81	51.69	291°58.83	50.25	Venus	3°24.11	09:32
6	305°28.86	307°48.46	N00°53.21	178°44.62	N21°17.41	225°39.74		307°1.05	S02°50.15	Mars	234° 17.36	18:08
7	$320^{\circ}31.33$	322°49.66	53.27	193°45.94	17.10	240°41.67	51.77	322°3.27	50.05	Jupiter	280°39.29	15:02
8	335°33.79	337°50.87	53.33	208°47.25	16.78	255°43.61	51.81	337°5.50	49.95	Saturn	1°45.39	09:38
9	350° 36.26	352°52.07	• • 53.39	223°48.57	• • 16.47	270°45.54	• • 51.85	352°7.72	• • 49.86	Apr 26 Sat	SHA	Mer.pass
10	5°38.72	7°53.26	53.45	238°49.88	16.15	285°47.48	51.89	7°9.94	49.76	Venus	2°56.30	09:30
11	20°41.18	22°54.46	53.51	253°51.19	15.84	300°49.41	51.93	22°12.16	49.66	Mars	233°50.09	18:06
12 13	35°43.65 50°46.11	37°55.65 52°56.84	N00°53.58 53.64	268° 52.51 283° 53.82	N21°15.52 15.21	315°51.34 330°53.27	N22°51.97 52.01	37°14.38 52°16.61	S02°49.56 49.47	Jupiter	280°26.72	14:59
14	65° 48.58	67°58.03	53.04	203 55.02 298°55.13	14.89	345°55.21	52.01	67°18.83	49.47	Saturn	1°39.50	09:35
15	80°51.04	82°59.22	• • 53.78	313°56.45	• • 14.58	0°57.14	• • 52.09	82°21.05	49.27	Apr 27 Sun	SHA	Mer.pass
16	95° 53.50	98°0.40	53.85	328° 57.76	14.26	15°59.07	52.13	97°23.27	49.17	Venus	2°27.11	09:28
17	110°55.97	113°1.58	53.93	343°59.07	13.94	31°1.00	52.17	112°25.49	49.08	Mars	233°22.65	18:04
18	125° 58.43	128°2.76	N00°54.00	359°0.38	N21°13.63	46°2.94	N22°52.21		<b>S</b> 02°48.98	Jupiter	280°14.06	14:56
19	141°0.90	143°3.94	54.07	14°1.69	13.31	61°4.87	52.25	142°29.94	48.88	Saturn	1°33.65	09:31
20	156°3.36	158°5.11	54.15	29°3.00	12.99	76°6.80	52.29	157°32.16	48.78	Harisa	ntal parallax	
21	171°5.82	173°6.29	• • 54.23	44°4.31	12.68	91°8.73	• • 52.32	172°34.38	48.69	norizoi	Venus:	0.3
22 23	186°8.29 201°10.75	188°7.46 203°8.63	54.31 54.39	59°5.62 74°6.93	12.36 12.04	106°10.66 121°12.60	52.36 52.40	187°36.61 202°38.83	48.59 48.40		Mars:	0.3
									48.49			
Mer.	pass. 09:37	$\nu$ 1.2′ d0.	.0′ m-4.74	$\nu$ 1.3′ d-0	).3′ m0.88	u 1.9' d0	.0′ m-2.00	$\nu$ 2.2′ d-0	$1.1' \; \text{m} \; 1.17$			

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.27	N13° 12.13	217°22.06	11.2'	S01°55.18	-17.6'	60.2'
1	195°30.37	12.95	231°52.24	11.2'	01°37.60	-17.6'	60.2'
2	210°30.48	13.76	246°22.39	11.1'	01°20.00	-17.6'	60.3'
3	225°30.59 240°30.69	· · 14.58 15.39	260°52.52 275°22.62	11.1'	01°2.38 00°44.73	-17.7'	60.3' 60.3'
4 5	240 30.69 255°30.80	16.20	275 22.02 289°52.68	11.1' 11.0'	00° 44.73	-17.7' -17.7'	60.4
6	270°30.90	N13° 17.01	304°22.72	11.0'	500°9.36	-17.7'	60.4'
7	285°31.01	17.83	318°52.72	11.0'	N00°8.36	17.7'	60.4'
8	300°31.11	18.64	333°22.69	10.9'	00°26.09	17.7'	60.5'
9	315°31.22 330°31.32	19.45	347°52.62	10.9'	00°43.83	17.8'	60.5'
10 11	345°31.43	20.26 21.07	2°22.52 16°52.37	10.9' 10.8'	01°1.59 01°19.36	17.8' 17.8'	60.5' 60.5'
12	0°31.53	N13°21.88	31°22.19	10.8	N01°37.15	17.8	60.6'
13	15°31.63	22.69	$45^{\circ}51.97$	10.7'	$01^{\circ}54.94$	17.8'	60.6'
14	30°31.74	23.50	60°21.70	10.7'	02°12.73	17.8'	60.6'
15 16	45°31.84 60°31.94	· · 24.31 25.12	74°51.39 89°21.03	10.6' 10.6'	02°30.53 02°48.34	17.8' 17.8'	60.6' 60.7'
17	75°32.05	25.12	103°50.63	10.5	02 46.34 03°6.14	17.8	60.7
18	90°32.15	N13°26.74	118°20.18	10.5'	N03°23.94	17.8'	60.7'
19	105°32.25	27.55	$132^{\circ}49.68$	10.4'	$03^{\circ}41.74$	17.8'	60.7'
20	120°32.35	28.35	147° 19.13	10.4'	03°59.54	17.8'	60.8'
21 22	135°32.46 150°32.56	· · 29.16 29.97	161°48.53 176°17.87	10.3' 10.3'	04°17.32 04°35.10	17.8' 17.8'	60.8' 60.8'
23	165°32.66	30.77	190°47.16	10.3	04°52.87	17.8	60.8
	SD = 15.9'	d = 0.8'			D = 16.4'		
	<u>JD = 13.9</u>	<u>u = 0.0</u>		31	J = 10.4		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°32.76 195°32.86	N13°31.58 32.38	205°16.40 219°45.57	10.2' 10.1'	N05°10.62 05°28.36	17.7' 17.7'	60.9' 60.9'
2	210°32.96	33.19	234° 14.69	10.1	05°46.08	17.7	60.9
3	225°33.06	• • 33.99	248°43.75	10.0'	06°3.78	17.7'	60.9'
4	240°33.16	34.80	263°12.75	9.9'	$06^{\circ}21.45$	17.7'	60.9'
5	255°33.26	35.60	277°41.68	9.9'	06°39.11	17.6'	61.0'
6 7	270°33.36 285°33.46	N13°36.41 37.21	292°10.56 306°39.36	9.8' 9.7'	N06°56.74 07°14.34	17.6' 17.6'	61.0' 61.0'
8	300°33.56	38.01	321°8.10	9.7' 9.7'	07°14.34	17.5	61.0'
9	315°33.66	• • 38.81	335°36.78	9.6'	07°49.45	17.5'	61.0'
10	330°33.76	39.62	350°5.38	9.5'	$08^{\circ}6.96$	17.5'	61.1'
11	345°33.86	40.42	4°33.92	9.5'	08°24.43	17.4	61.1'
12 13	0°33.96 15°34.06	N13°41.22 42.02	19°2.38 33°30.77	9.4' 9.3'	N08°41.86 08°59.25	17.4' 17.3'	61.1' 61.1'
14	30°34.16	42.82	47°59.09	9.2'	00° 39.23	17.3	61.1'
15	45°34.26	• • 43.62	62°27.34	9.2'	09°33.90	17.3'	61.1'
16	60°34.35	44.42	76°55.51	9.1'	09°51.15	17.2'	61.2'
17 18	75°34.45 90°34.55	45.22 N13°46.02	91°23.60 105°51.61	9.0' 8.9'	10°8.36 N10°25.51	17.2' 17.1'	61.2' 61.2'
19	105°34.65	46.82	105 51.01 120° 19.55	8.9'	10° 42.61	17.1	61.2
20	120°34.74	47.61	134°47.40	8.8'	10°59.65	17.0'	61.2'
21	135°34.84	• • 48.41	149° 15.17	8.7'	11°16.64	16.9'	61.2'
22	150°34.94	49.21	163°42.86	8.6'	11°33.56 11°50.42	16.9'	61.2'
23	165°35.03	50.01	178° 10.47	8.5'		16.8'	61.2'
	SD = 15.9'	d = 0.8'		SI	O = 16.6'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°35.13	N13°50.80	192°38.00	8.4'	N12°7.22	16.7'	61.2'
1 2	195°35.22 210°35.32	51.60 52.39	207°5.43 221°32.79	8.4' 8.3'	12°23.94 12°40.60	16.7' 16.6'	61.3' 61.3'
3	210 35.32 225°35.41	52.39 · · 53.19	221 32.79 236°0.05	8.2'	12 40.60 12°57.19	16.5	61.3
4	240°35.51	53.98	250°27.23	8.1'	13° 13.70	16.4'	61.3
5	255°35.61	54.78	264°54.32	8.0'	13°30.13	16.4'	61.3'
6	270°35.70	N13° 55.57	279°21.32	7.9'	N13°46.48	16.3'	61.3'
7 8	285°35.79 300°35.89	56.37 57.16	293°48.23 308°15.04	7.8' 7.7'	14°2.76 14°18.95	16.2' 16.1'	61.3' 61.3'
9	315°35.98	•• 57.95	322°41.77	7.6'	14° 35.05	16.0'	61.3
10	330°36.08	58.74	337°8.40	7.5'	14°51.06	15.9'	61.3'
11	345°36.17	13°59.54	351°34.94	7.4'	15°6.98	15.8'	61.3'
12 13	0°36.26 15°36.36	N14°0.33 1.12	6°1.39 20°27.74	7.4' 7.3'	N15°22.81 15°38.55	15.7' 15.6'	61.3' 61.3'
13 14	30°36.45	1.12	20° 27.74 34° 54.00	7.3° 7.2'	15° 38.55 15° 54.18	15.5	61.3
15	45°36.54	. 2.70	49°20.16	7.1'	16°9.72	15.4	61.3
16	60°36.64	3.49	63°46.22	7.0'	16°25.15	15.3'	61.3'
17	75°36.73	4.28	78° 12.19	6.9'	16°40.48	15.2'	61.3'
18 19	90°36.82 105°36.91	N14°5.07 5.86	92°38.06 107°3.83	6.8' 6.7'	N16°55.70 17°10.82	15.1' 15.0'	61.3' 61.3'
20	120°37.00	6.65	107 3.83 121°29.51	6.6'	17° 10.82	14.9'	61.3
21	135°37.09	• • 7.44	135°55.08	6.5'	17°40.70	14.8'	61.3'
22	150°37.19	8.22	150° 20.56	6.4'	17°55.47	14.7'	61.3'
23	165°37.28	9.01	164°45.94	6.3'	18° 10.12	14.5'	61.3'
	SD = 15.9'	d = 0.8'		SI	D = 16.7'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
_ 43	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	27-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	12-1%	
25	02:01	02:06	11:58	09:50	22:15		
26	02:11	02:16	11:58	10:41	23:08		
27	02:21	02:25	11:58	11:35	-:-		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	216° 13.22	218°9.79 N00°54.47	89°8.24 N21°11.72	136°14.53 N22°52.44	217°41.05	
1	231° 15.68	233°10.96 54.56	104°9.55 11.41	151°16.46 52.48	232°43.28 48.30	Alpheratz 357°34.84 29°13.63 Ankaa 353°7.26 -42°10.05
2	$246^{\circ}18.15$	248° 12.12 54.64	119°10.86 11.09	166°18.39 52.52	247°45.50 48.20	Ankaa 353°7.26 -42°10.05 Schedar 349°31.32 56°40.38
3	261°20.61	263°13.28 · · 54.73	134°12.17 · · 10.77	181°20.32 · · 52.56	262°47.72 · · 48.10	Diphda 348° 47.36 -17° 50.90
4	276°23.07	278°14.44 54.82	149°13.48 10.45	196°22.25 52.60	277°49.95 48.01	Achernar 335°20.55 -57°6.45
5	291°25.54	293°15.59 54.91	164°14.79 10.13	211°24.18 52.64	292°52.17 47.91	Hamal 327°51.30 23°34.82
6 7	306°28.00 321°30.47	308°16.74 N00°55.00 323°17.89 55.09	179°16.10 N21°9.81 194°17.40 9.49	226°26.11 N22°52.68 241°28.04 52.72	307°54.39	Polaris 314°24.91 89°22.27
8	336° 32.93	338°19.04 55.18	209° 18.71 9.17	256°29.97 52.76	337°58.84 47.62	Acamar 315°12.01 -40°12.24
9	351°35.39	353°20.19 · · 55.28	224° 20.02 · · 8.86	271°31.90 · · 52.80	353°1.06 · · 47.52	Menkar 314°6.23 4°11.26
10	6°37.86	8°21.33 55.38	239° 21.33 8.54	286°33.83 52.84	8°3.29 47.43	Mirfak 308°28.44 49°57.05 Aldebaran 290°39.66 16°33.57
11	21°40.32	23°22.48 55.47	254°22.63 8.22	301°35.76 52.87	23°5.51 47.33	Aldebaran 290°39.66 16°33.57   Rigel 281°3.91 -8°10.44
12	36° 42.79	38°23.62 N00°55.57	269°23.94 N21°7.90	316°37.69 N22°52.91	38°7.73 S02°47.23	Capella 280°21.92 46°1.48
13	51°45.25	53°24.75 55.67	284°25.24 7.58	331°39.62 52.95	53°9.96 47.14	Bellatrix 278°22.88 6°22.30
14 15	66° 47.72 81° 50.18	68°25.89 55.78 83°27.02 •• 55.88	299°26.55 7.26 314°27.86 · · 6.94	346°41.55 52.99 1°43.48 · · 53.03	68°12.18 47.04 83°14.41 •• 46.94	Elnath 278°1.86 28°37.74
16	96° 52.64	98°28.15 55.99	329°29.16 6.61	16°45.41 53.07	98°16.63 46.85	Alnilam 275°37.74 -1°11.22
17	111°55.11	113°29.28 56.09	344°30.47 6.29	31°47.34 53.11	113°18.85 46.75	Betelgeuse 270°52.06 7°24.66
18	126° 57.57	128°30.41 N00°56.20	359°31.77 N21°5.97	46°49.27 N22°53.15	128°21.08	Canopus 263°52.60 -52°42.75 Sirius 258°26.21 -16°45.19
19	142°0.04	143°31.53 56.31	14°33.07 5.65	61°51.20 53.19	143°23.30 46.56	Sirius 258°26.21 -16°45.19   Adhara 255°5.86 -29°0.57
20	157°2.50	158°32.66 56.42	29°34.38 5.33	76°53.13 53.23	158°25.53 46.46	Procyon 244°50.69 5°9.55
21	172°4.96	173°33.78 · · 56.53	44°35.68 · · 5.01	91°55.05 · · 53.26	173°27.75 · · 46.36	Pollux 243°17.12 27°57.97
22	187°7.43 202°9.89	188°34.90 56.65	59°36.99 4.69	106°56.98 53.30	188°29.98 46.27	Avior 234°14.73 -59°35.70
23		203°36.01 56.76	74°38.29 4.36	121°58.91 53.34	203°32.20 46.17	Suhail 222°46.12 -43°32.34
Mer.p	pass. 09:34	$ u 1.2' \; d 0.1' \; \text{m-4.74}$	$\nu 1.3' \ d$ -0.3' m0.90	$ u 1.9' \ d 0.0' \ \text{m-} 1.99$	$ u 2.2' \ d$ -0.1' m1.17	Miaplacidus 221°38.17 -69°49.54
						Alphard 217°47.48 -8°46.23
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.08 11°50.58 Dubhe 193°40.30 61°37.05
0	$217^{\circ}12.36$	218°37.13 N00°56.88	89°39.59 N21°4.04	137°0.84 N22°53.38	218°34.43 <b>S</b> 02°46.08	Denebola 182°24.47 14°25.78
1	$232^{\circ}14.82$	233°38.24 56.99	104°40.89 3.72	152° 2.77 53.42	233°36.65 45.98	Gienah 175° 43.09 -17° 41.11
2	247° 17.29	248°39.35 57.11	119°42.20 3.40	167° 4.69 53.46	248°38.88 45.88	Acrux 172°59.31 -63°14.58
3	262° 19.75	263°40.46 · · 57.23	134°43.50 · · 3.07	182°6.62 · · 53.50	263°41.10 · · 45.79	Gacrux 171°50.93 -57°15.51
4 5	277°22.21 292°24.68	278°41.56 57.36 293°42.67 57.48	149°44.80 2.75 164°46.10 2.43	197° 8.55 53.54 212° 10.48 53.57	278°43.33 45.69 293°45.55 45.59	Alioth 166°12.23 55°49.39
6	307°27.14	308°43.77 N00°57.60	164°46.10 2.43 179°47.40 N21°2.10	212°10.48 53.57 227°12.40 N22°53.61	308°47.78 S02°45.50	Spica 158°21.76 -11°17.75
7	322°29.61	323°44.87 57.73	194°48.70 1.78	242°14.33 53.65	323°50.00 45.40	Alkaid 152°51.32 49°11.17
8	337°32.07	338°45.97 57.86	209° 50.00 1.46	257°16.26 53.69	338°52.23 45.31	Hadar 148° 35.07 -60° 29.81
9	352°34.53	353°47.06 · · 57.99	224°51.30 · · 1.13	272°18.18 · · 53.73	353°54.45 · · 45.21	Menkent 147°56.97 -36°29.80 Arcturus 145°47.36 19°2.92
10	7°37.00	8°48.15 58.12	239°52.60 0.81	287°20.11 53.77	8°56.68 45.11	Rigil Kent. 139°39.36 -60°56.46
11	22°39.46	23°49.25 58.25	254°53.90 0.48	302°22.04 53.81	23°58.91 45.02	Kochab 137°18.57 74°2.97
12	37°41.93	38°50.33 N00°58.38	269°55.20 N21°0.16	317°23.96 N22°53.84	39°1.13	Zuben'ubi 136°55.44 -16°8.93
13 14	52° 44.39 67° 46.86	53°51.42 58.52 68°52.51 58.65	284°56.50 20°59.84 299°57.80 59.51	332°25.89 53.88 347°27.82 53.92	54°3.36 44.83 69°5.58 44.73	Alphecca 126°3.19 26°37.60
15	82°49.32	83°53.59 · · 58.79	314°59.10 · · 59.19	2°29.74 · · 53.96	84°7.81 · · 44.64	Antares 112°15.24 -26°29.33
16	97°51.78	98°54.67 58.93	330°0.40 58.86	17°31.67 54.00	99°10.04 44.54	Atria 107°8.82 -69°4.24
17	112°54.25	113°55.75 59.07	345°1.70 58.54	32°33.59 54.04	114°12.26 44.44	Sabik 102°2.25 -15°45.44 Shaula 96°9.76 -37°7.28
18	127°56.71	128°56.83 N00°59.21	0°2.99 N20°58.21	47°35.52 N22°54.08	129°14.49 <b>S</b> 02°44.35	Rasalhague 95°58.09 12°32.30
19	142°59.18	143°57.90 59.35	15°4.29 57.88	62°37.45 54.11	144°16.71 44.25	Eltanin 90°41.73 51°28.80
20	158°1.64	158°58.97 59.49	30°5.59 57.56	77°39.37 54.15	159°18.94 44.16	Kaus Aust. 83°31.99 -34°22.30
21	173°4.11 188°6.57	174°0.04 · · 59.64 189°1.11 59.79	45°6.89 · · 57.23 60°8.18 56.91	92°41.30 · · 54.19 107°43.22 54.23	174°21.17 · · 44.06 189°23.39 43.97	Vega 80°32.85 38°48.11
22 23	203° 9.03	189°1.11 59.79 204°2.18 59.93	60°8.18 56.91 75°9.48 56.58	107°43.22 54.23 122°45.15 54.27	189°23.39 43.97 204°25.62 43.87	Nunki 75°47.31 -26°15.89
						Altair 61°59.66 8°55.93
Mer.p	pass. 09:30	$\nu 1.1' \ d0.1' \ \text{m-4.73}$	$\nu 1.3' \ d$ -0.3' m0.91	$\nu 1.9' \ d0.0' \ \text{m-}1.99$	$\nu 2.2' \ d$ -0.1' m1.17	Peacock 53°5.31 -56°39.00
						Deneb 49°25.66 45°21.89 Enif 33°38.66 9°59.29
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.78 -46°50.16
0	218° 11.50	219°3.24 N01°0.08	90°10.77 N20°56.25	137°47.07 N22°54.31	219°27.85	Fomalhaut 15°14.46 -29°29.25
1	233°13.96	234°4.31 0.23	105°12.07 55.93	152°49.00 54.34	234°30.07 43.68	Scheat 13°45.21 28°12.98
2	248° 16.43 263° 18.89	249°5.37 0.39 264°6.42 · 0.54	120°13.37 55.60 135°14.66 •• 55.27	167°50.92 54.38 182°52.84 •• 54.42	249°32.30 43.59 264°34.53 · · 43.49	Markab 13°29.87 15°20.31
4	278° 21.35	279°7.48 0.70	150°15.96 54.94	197°54.77 54.46	279°36.76 43.40	Apr 28 Mon SHA Mer.pass
5	293°23.82	294°8.54 0.85	165° 17.25 54.62	212°56.69 54.50	294°38.98 43.30	Venus 1° 56.58 09:27
6	308° 26.28	309°9.59 N01°1.01	180°18.55 N20°54.29	227°58.62 N22°54.53	309°41.21 <b>S</b> 02°43.21	Mars 232°55.03 18:02
7	323°28.75	324°10.64 1.17	195° 19.84 53.96	243° 0.54 54.57	324°43.44 43.11	Jupiter 280°1.31 14:53
8	338°31.21	339°11.69 1.33	210°21.13 53.63	258° 2.46 54.61	339°45.66 43.02	Saturn 1°27.84 09:28
9	353°33.68	354°12.73 · · 1.49	225°22.43 · · 53.30	273°4.39 · · 54.65	354°47.89 · · 42.92	Apr 29 Tue SHA Mer.pass
10 11	8°36.14 23°38.60	9°13.78 1.65 24°14.82 1.82	240°23.72 52.97 255°25.01 52.65	288° 6.31 54.69 303° 8.23 54.72	9°50.12 42.83 24°52.35 42.73	Venus 1°24.77 09:25
12	38° 41.07	39°15.86 N01°1.98	270°26.31 N20°52.32	318°10.16 N22°54.76	39°54.58 S02°42.64	Mars 232°27.23 18:00
13	53° 43.53	54°16.90 2.15	285° 27.60 51.99	333°12.08 54.80	54°56.80 42.54	Jupiter 279° 48.48 14:50
14	68°46.00	69°17.94 2.32	300°28.89 51.66	348°14.00 54.84	69°59.03 42.45	Saturn 1°22.07 09:24
15	83°48.46	84°18.97 · · 2.49	315°30.18 · · 51.33	3°15.93 · · 54.88	85°1.26 · · 42.35	Apr 30 Wed SHA Mer.pass
16	98°50.93	99°20.00 2.66	330°31.47 51.00	18°17.85 54.91	100°3.49 42.26	Venus 0°51.75 09:23
17	113°53.39	114°21.03 2.83	345°32.77 50.67	33°19.77 54.95	115°5.72 42.16	Mars 231°59.28 17:58
18	128° 55.85	129°22.06 N01°3.00	0°34.06 N20°50.34	48°21.69 N22°54.99 63°23.62 55.03	130°7.94 S02°42.07 145°10.17 41.97	Jupiter 279°35.57 14:47
19 20	143°58.32 159°0.78	144°23.09 3.18 159°24.11 3.35	15°35.35 50.01 30°36.64 49.68	63°23.62 55.03 78°25.54 55.07	145°10.17 41.97 160°12.40 41.88	Saturn 1°16.35 09:21
21	174°3.25	174°25.14 · · 3.53	45° 37.93 · · 49.35	93°27.46 · · 55.10	175°14.63 · · 41.78	Horizontal parallax
22	189°5.71	189° 26.16 3.71	60°39.22 49.02	108°29.38 55.14	190°16.86 41.69	Venus: 0.3
23	204°8.17	204°27.17 3.89	75°40.51 48.69	123°31.30 55.18	205°19.09 41.60	Mars: 0.1
Mer r	pass. 09:26	ν1.1' d0.2' m-4.72	ν1.3' d-0.3' m0.92	ν1.9' d0.0' m-1.99	ν2.2' d-0.1' m1.17	

			$\Delta I = II$				
h	Su	n			Moon		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180° 37.37	N14° 9.80	179°11.23	6.2'	N18°24.65	14.4'	61.3'
1	195° 37.46 210° 37.55	10.58 11.37	193°36.41 208°1.50	6.1' 6.0'	18°39.06 18°53.34	14.3'	61.3' 61.3'
2	210 37.55 225° 37.64	. 12.16	208 1.50 222°26.48	5.9'	18 53.34 19°7.49	14.2' 14.0'	61.3
4	240° 37.73	12.10	236°51.37	5.8'	19°21.51	13.9	61.3
5	255° 37.82	13.73	251°16.16	5.7'	19°35.40	13.8'	61.3
6	270°37.91	N14°14.51	265°40.85	5.6'	N19°49.16	13.6'	61.3
7	285°38.00	15.29	280°5.44	5.5'	20°2.77	13.5'	61.3'
8	300°38.09	16.08	294°29.94	5.4'	20°16.25	13.3'	61.2'
9	315°38.17	• • 16.86	308°54.33	5.3'	20°29.59	13.2'	61.2'
10	330°38.26	17.64	323°18.63	5.2'	20°42.79	13.0'	61.2'
11	345°38.35	18.43	337°42.84	5.1'	20°55.84	12.9'	61.2'
12	0°38.44	N14°19.21	352°6.94	5.0'	N21°8.74	12.8'	61.2
13 14	15°38.53 30°38.61	19.99 20.77	6°30.95 20°54.87	4.9' 4.8'	21°21.49 21°34.09	12.6' 12.4'	61.2' 61.2'
15	45° 38.70	. 21.55	35°18.69	4.7	21°46.54	12.4	61.2
16	60°38.79	22.33	49°42.42	4.6'	21°58.83	12.1	61.2
17	75°38.88	23.11	64°6.05	4.5'	22°10.96	12.0'	61.1
18	90°38.96	N14°23.89	78°29.60	4.5'	N22°22.93	11.8'	61.1'
19	105°39.05	24.67	92°53.05	4.4'	22°34.74	11.6'	61.1'
20	120°39.14	25.45	107°16.41	4.3'	22°46.39	11.5'	61.1'
21	135°39.22	• • 26.23	121°39.69	4.2'	$22^{\circ}57.87$	11.3'	61.1'
22	150° 39.31	27.00	136°2.87	4.1'	23°9.18	11.1'	61.1'
23	165°39.39	27.78	150°25.97	4.0'	23°20.33	11.0'	61.0'
	SD = 15.9'	d = 0.8'		S	D = 16.7'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	180° 39.48	N14°28.56	164°48.98	3.9'	N23°31.30	10.8'	61.0
1	195° 39.56	29.34	179°11.91	3.8'	23°42.10	10.6'	61.0'
2	210°39.65	30.11	193°34.76	3.8'	$23^{\circ}52.72$	10.4'	61.0'
3	225°39.73	• • 30.89	207°57.52	3.7'	24°3.17	10.3'	61.0'
4	240°39.82	31.66	222°20.21	3.6'	24°13.44	10.1'	61.0'
5	255°39.90	32.44	236°42.81	3.5'	24°23.53	9.9'	60.9'
6	270°39.99	N14°33.21	251°5.34	3.5'	N24°33.44	9.7'	60.9'
7	285° 40.07	33.99	265°27.80	3.4'	24°43.16	9.5'	60.9'
8 9	300° 40.15 315° 40.24	34.76 •• 35.53	279°50.18 294°12.49	3.3' 3.2'	24°52.70 25°2.06	9.4' 9.2'	60.9' 60.8'
10	330° 40.32	36.31	308°34.73	3.2'	25°2.00	9.2	60.8
11	345° 40.40	37.08	322°56.90	3.1'	25°20.20	8.8'	60.8
12	0° 40.49	N14°37.85	337°19.01	3.0'	N25°28.98	8.6'	60.8
13	15°40.57	38.62	351°41.05	3.0'	25°37.58	8.4'	60.8
14	30°40.65	39.39	6°3.03	2.9'	$25^{\circ}45.98$	8.2'	60.7'
15	45° 40.73	• • 40.16	20°24.96	2.9'	25°54.19	8.0'	60.7'
16	60° 40.81	40.93	34°46.82	2.8'	26°2.20	7.8'	60.7
17	75°40.90 90°40.98	41.70 N14°42.47	49°8.63 63°30.39	2.8'	26°10.01 N26°17.63	7.6' 7.4'	60.7' 60.6'
18 19	90°40.98 105°41.06	N14 42.47 43.24	77°52.10	2.7'	26°25.05	7.4 7.2'	60.6
20	120°41.14	44.01	92°13.76	2.6'	26°32.27	7.0'	60.6
21	135° 41.22	• • 44.78	106°35.37	2.6'	26°39.28	6.8	60.5
22	150°41.30	45.55	120°56.94	2.5'	26°46.10	6.6'	60.5
23	165°41.38	46.31	135°18.47	2.5'	$26^{\circ}52.71$	6.4'	60.5'
	SD = 15.9'	d = 0.8'		S	D = 16.6'		
Ved	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 41.46	N14°47.08	149°39.97	2.5'	N26°59.12	6.2'	60.5
1	195°41.54	47.85	164°1.43	2.4'	27°5.32	6.0'	60.4
2	210°41.62	48.61	178°22.85	2.4'	27°11.32	5.8'	60.4
3	225°41.70	• • 49.38	192°44.25	2.4'	$27^{\circ}17.12$	5.6'	60.4'
4	240°41.78	50.14	207°5.62	2.3'	27°22.70	5.4'	60.3'
5	255°41.86	50.91	221°26.97	2.3'	27°28.08	5.2'	60.3'
6	270°41.94	N14°51.67	235°48.29	2.3'	N27°33.26	5.0'	60.3'
7	285° 42.01	52.44	250°9.60	2.3'	27°38.22	4.8'	60.2'
8 9	300°42.09 315°42.17	53.20 •• 53.96	264°30.89 278°52.17	2.3' 2.3'	27°42.98 27°47.53	4.5' 4.3'	60.2' 60.2'
9 10	315 42.17 330° 42.25	54.73	278 52.17 293°13.44	2.3'	27°47.53 27°51.87	4.3° 4.1'	60.2
11	345° 42.25	54.73 55.49	293 13.44 307°34.71	2.3'	27°56.00	4.1 3.9'	60.2
12	0°42.40	N14°56.25	321°55.97	2.3'	N27°59.92	3.7'	60.1
13	15° 42.48	57.01	336°17.22	2.3'	28°3.63	3.5'	60.1
14	30° 42.56	57.77	350°38.49	2.3'	28°7.14	3.3'	60.0
15	45°42.63	• • 58.53	4°59.75	2.3'	28°10.43	3.1'	60.0'
16	60°42.71	14°59.29	19°21.03	2.3'	28°13.51	2.9'	60.0'
17	75° 42.79	15° 0.05	33°42.31	2.3'	28°16.39	2.7'	59.9'
18	90°42.86	N15° 0.81	48° 3.62	2.3'	N28°19.05	2.5'	59.9'
19	105° 42.94	1.57	62°24.93	2.3'	28°21.51	2.2'	59.8'
20	120°43.01	2.33	76°46.27	2.4'	28°23.76	2.0'	59.8'
21 22	135° 43.09 150° 43.16	· · 3.09 3.84	91°7.64 105°29.03	2.4' 2.4'	28°25.79 28°27.62	1.8' 1.6'	59.8' 59.7'
22	165°43.16	3.84 4.60	105°29.03 119°50.45	2.4	28°27.62 28°29.25	1.6	59.7' 59.7'
_5	SD = 15.9'	d = 0.8'			D = 16.5'	1.7	33.1
				<u> </u>	— Ih h'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-7%	
28	02:29	02:34	11:57	12:33	00:03		
29	02:38	02:42	11:57	13:35	01:03		
30	02:46	02:50	11:57	14:39	02:07		

h	Aries	Ve	nus	M	ars	Jup	oiter	Sat	turn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	219° 10.64	219°28.19	N01°4.07	90°41.80	N20°48.35	138°33.23	N22°55.22	220°21.32	S02°41.50	
1	234° 13.10	234°29.21	4.25	105°43.09	48.02	150° 35.23 153° 35.15	55.25	235°23.54	41.41	Alpheratz
2	249° 15.57	249°30.22	4.44	120°44.38	47.69	168°37.07	55.29	250°25.77	41.31	Ankaa
3	264° 18.03	264°31.23	• • 4.62	135° 45.67	47.36	183°38.99	55.33	265°28.00	• • 41.22	Schedar
4	279°20.50	279°32.24	4.81	150° 46.95	47.03	198°40.91	55.37	280°30.23	41.12	Diphda
5	294°22.96	294°33.25	5.00	165°48.24	46.70	213°42.83	55.40	295°32.46	41.03	Achernar
6	309°25.42	309°34.25	N01°5.19	180°49.53	N20°46.36	228°44.75	N22°55.44	310°34.69	S02°40.94	Hamal
7	324°27.89	324°35.26	5.38	195°50.82	46.03	243°46.67	55.48	325°36.92	40.84	Polaris
8	339°30.35	339°36.26	5.57	210°52.11	45.70	258°48.59	55.52	340°39.15	40.75	Acamar
9	354° 32.82	354° 37.26	5.76	225°53.39	• • 45.37	273°50.51	• • 55.55	355°41.38	• • 40.65	Menkar
10	9°35.28	9°38.25	5.96	240°54.68	45.03	288°52.43	55.59	10°43.61	40.56	Mirfak
11	24°37.75	24°39.25	6.15	255°55.97	44.70	303°54.35	55.63	25°45.84	40.47	Aldebaran
12	39°40.21	39°40.24	N01°6.35	270°57.25	N20°44.37	318°56.27	N22°55.67	40°48.07	S02°40.37	Rigel
13	54°42.67	54°41.23	6.55	285°58.54	44.03	333°58.19	55.70	55°50.30	40.28	Capella
14	69°45.14	69°42.22	6.75	300°59.83	43.70	349°0.11	55.74	70°52.53	40.18	Bellatrix Elnath
15	84°47.60	84°43.21	• • 6.95	$316^{\circ}1.11$	• • 43.36	4°2.03	• • 55.78	85°54.76	• • 40.09	Alnilam
16	99°50.07	99°44.20	7.15	331°2.40	43.03	19° 3.95	55.82	100°56.99	40.00	Betelgeuse
17	114°52.53	114°45.18	7.35	346°3.68	42.70	34° 5.87	55.85	$115^{\circ}59.22$	39.90	Canopus
18	129°54.99	129°46.17	N01°7.56	1°4.97	N20°42.36	49°7.79	N22°55.89	131°1.45	S02°39.81	Sirius
19	144°57.46	144°47.15	7.76	16°6.25	42.03	64°9.71	55.93	146°3.68	39.72	Adhara
20	159°59.92	159°48.12	7.97	31°7.54	41.69	79°11.63	55.96	161°5.91	39.62	Procyon
21	175°2.39	174°49.10	• • 8.18	46°8.82	• • 41.36	94°13.55	• • 56.00	176°8.14	• • 39.53	Pollux
22	190°4.85	189°50.08	8.39	61°10.10	41.02	109°15.47	56.04	191°10.37	39.44	Avior
23	205°7.32	204°51.05	8.60	76°11.39	40.69	124°17.39	56.08	206°12.60	39.34	Suhail
Mer r	pass. 09:22	$\nu 1.0' d0$	2′ m-4.72	$\nu 1.3' d-0$	0.3' m0.94	$\nu 1.9' d0$	.0′ m-1.98	$\nu^2 2' d-0$	).1' m1.17	Miaplacidus
										Alphard
			_		_		_		_	Regulus
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe
0	220°9.78	219°52.02	N01°8.81	91°12.67	N20°40.35	139°19.31	N22°56.11	221°14.83	S02°39.25	Denebola
1	235° 12.24	234°52.99	9.03	106° 13.95	40.01	154°21.22	56.15	236°17.06	39.16	Gienah
2	250° 14.71	249°53.96	9.24	121°15.24	39.68	169°23.14	56.19	251°19.29	39.06	Acrux
3	265° 17.17	264°54.92	• • 9.46	136° 16.52	• • 39.34	184°25.06	• • 56.22	266°21.52	• • 38.97	Gacrux
4	280° 19.64	279°55.89	9.68	151°17.80	39.01	199°26.98	56.26	281°23.76	38.88	Alioth
5	295°22.10	294°56.85	9.89	166° 19.08	38.67	214°28.90	56.30	296°25.99	38.78	Spica
6	310°24.57	309°57.81	N01°10.11	181°20.36	N20°38.33	229°30.81 244°32.73	N22°56.33	311°28.22	S02°38.69	Alkaid
7	325°27.03 340°29.49	324°58.77 339°59.72	10.34	196°21.65 211°22.93	38.00	244 32.73 259°34.65	56.37	326°30.45	38.60	Hadar
8 9	340° 29.49 355° 31.96		10.56 •• 10.78	211°22.93 226°24.21	37.66 · · 37.32	259°34.65 274°36.57	56.41 •• 56.45	341°32.68 356°34.91	38.50	Menkent
	355 31.96 10°34.42	355°0.68 10°1.63		241°25.49	36.98	274 30.57 289°38.48		350 34.91 11°37.14	38.41	Arcturus
10 11	10 34.42 25°36.89	25°2.58	11.01 11.23	241 25.49 256°26.77	36.98 36.65	289 38.48 304°40.40	56.48 56.52	26°39.38	38.32 38.23	Rigil Kent.
12	40°39.35	40°3.53	N01°11.46	271°28.05	N20°36.31	319°42.32	N22°56.56	41°41.61	502°38.13	Kochab
13	55°41.81	55° 4.48	11.69	286°29.33	35.97	334°44.23	56.59	56°43.84	38.04	Zuben'ubi
14	70°44.28	70°5.42	11.09	301°30.61	35.63	349°46.15	56.63	71°46.07	37.95	Alphecca
15	85° 46.74	85°6.37	. 12.15	316°31.89	• • 35.29	4°48.07	• • 56.67	86°48.30	•• 37.85	Antares
16	100°49.21	100°7.31	12.13	331° 33.17	34.95	19°49.98	56.70	101°50.54	37.76	Atria
17	115°51.67	115°8.25	12.62	346°34.45	34.62	34°51.90	56.74	116°52.77	37.67	Sabik
18	130°54.14	130°9.19	N01°12.85	1°35.73	N20°34.28	49°53.82	N22°56.78	131°55.00	S02°37.58	Shaula
19	145°56.60	145°10.12	13.09	16°37.00	33.94	64°55.73	56.81	146°57.23	37.48	Rasalhague
20	160°59.06	160°11.06	13.33	31°38.28	33.60	79°57.65	56.85	161°59.47	37.39	Eltanin
21	176°1.53	175°11.99	· · 13.57	46°39.56	33.26	94°59.56	• • 56.89	177°1.70	37.30	Kaus Aust.
22	191°3.99	190°12.92	13.81	61°40.84	32.92	110° 1.48	56.92	192°3.93	37.21	Vega
23	206°6.46	205°13.85	14.05	76°42.12	32.58	125° 3.40	56.96	207°6.16	37.11	Nunki
										Altair
Mer.p	pass. 09:18	$\nu$ 1.0′ d0.	.2′ m-4.71	$\nu$ 1.3′ d-0	).3′ m0.95	$\nu$ 1.9′ d0.	.0′ m-1.98	$\nu 2.2' \ d-0$	$0.1^\prime$ m $1.17$	Peacock
										Deneb
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif
0	221°8.92	220°14.78	N01°14.29	91°43.39	N20°32.24	140° 5.31	N22°57.00	222°8.40	S02°37.02	Al Na'ir
1	236°11.39	235°15.70	14.53	106° 44.67	31.90	155° 7.23	57.03	237°10.63	36.93	Fomalhaut Scheat
2	251° 13.85	250°16.63	14.78	121°45.95	31.56	170°9.14	57.07	252°12.86	36.84	Markab
3	266° 16.31	265°17.55	• • 15.02	136° 47.22	• • 31.22	185°11.06	• • 57.10	267°15.10	• • 36.74	IVIdIKaD
4	281° 18.78	280°18.47	15.27	151°48.50	30.88	200°12.97	57.14	282°17.33	36.65	May 01 Thu
5	296°21.24	295°19.39	15.52	166°49.78	30.53	215°14.89	57.18	$297^{\circ}19.56$	36.56	Venus
6	311°23.71	310°20.30	N01°15.77	181°51.05	N20°30.19	230°16.80	N22°57.21	312°21.80	S02°36.47	Mars
7	326°26.17	325°21.22	16.02	196°52.33	29.85	245°18.72	57.25	327°24.03	36.38	Jupiter
8	341°28.63	$340^{\circ}22.13$	16.27	211°53.60	29.51	260°20.63	57.29	342°26.26	36.28	Saturn
9	356°31.10	355°23.04	• • 16.53	226° 54.88	• • 29.17	275°22.55	• • 57.32	357°28.50	• • 36.19	May 02 Eri
10	11°33.56	10°23.95	16.78	241°56.15	28.83	290°24.46	57.36	12°30.73	36.10	May 02 Fri Venus
11	26°36.03	25°24.86	17.04	256° 57.43	28.48	305°26.37	57.39	27°32.96	36.01	Venus
12	41°38.49	40°25.77	N01°17.30	271°58.70	N20°28.14	320°28.29	N22°57.43	42°35.20	S02°35.92	Jupiter
13	56° 40.96	55°26.67	17.55	286°59.98	27.80	335°30.20	57.47	57°37.43	35.83	Saturn
14	71°43.42	70°27.57	17.81	302°1.25	27.46	350°32.12	57.50	72°39.67	35.73	
15	86°45.88	85°28.47	• • 18.07	317°2.52	27.11	5°34.03	• • 57.54	87°41.90	• • 35.64	May 03 Sat
16	101°48.35	100°29.37	18.34	332°3.80	26.77	20°35.94	57.58	102°44.13	35.55	Venus
17	116°50.81	115°30.27	18.60	347°5.07	26.43	35°37.86	57.61	117°46.37	35.46	Mars
18	131°53.28	130°31.17	N01°18.86	2°6.34	N20°26.08	50°39.77	N22°57.65	132°48.60	S02°35.37	Jupiter
19	146°55.74	145°32.06	19.13	17°7.62	25.74	65°41.68	57.68	147°50.84	35.28	Saturn
20	161°58.20	160°32.95	19.40	32°8.89	25.40	80°43.60	57.72	162°53.07	35.18	Horizont
21	177°0.67	175°33.84	19.67	47°10.16	• • 25.05	95°45.51	•• 57.75	177°55.31	• • 35.09	1101120111
22	192°3.13	190°34.73	19.93	62°11.43	24.71	110°47.42	57.79 57.93	192°57.54	35.00	
23	207°5.60	205°35.62	20.21	77°12.70	24.36	125°49.33	57.83	207°59.78	34.91	
Mer.	pass. 09:14	$\nu$ 0.9′ d0.	.2′ m-4.70	$\nu$ 1.3 $^{\prime}$ d-0	).3′ m0.97	$\nu$ 1.9′ d0.	.0′ m-1.98	$\nu$ 2.2′ d-0	).1′ m1.17	

Mirfak Aldebaran Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	308° 28.42 290° 39.65 281° 3.91 280° 21.92 278° 22.88 278° 1.86 275° 37.73 270° 52.06 263° 52.62 255° 5.86 244° 50.70 222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	49° 57.04 16° 33.57 -8° 10.43 46° 1.47 6° 22.30 28° 37.74 -1° 11.22 7° 24.66 -52° 42.74 -16° 45.19 -29° 0.56 5° 9.55 27° 57.96 -59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Rigel Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	281°3.91 280°21.92 278°1.86 275°37.73 270°52.06 263°52.62 255°5.86 244°50.70 243°17.13 234°14.76 222°46.13 221°38.21 217°47.48 207°34.08 193°40.32 182°24.47 175°43.09 172°59.31 171°50.93 166°12.23 158°21.75 152°51.32 148°35.06 147°56.96 147°56.96 145°47.35	-8° 10.43 46° 1.47 6° 22.30 28° 37.74 -1° 11.22 7° 24.66 -52° 42.74 -16° 45.19 -29° 0.56 5° 9.55 27° 57.96 -59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Capella Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	280° 21.92 278° 1.86 275° 37.73 270° 52.06 263° 52.62 255° 5.86 244° 50.70 243° 17.13 234° 14.76 222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 147° 56.96 147° 56.96 145° 47.35	46°1.47 6°22.30 28°37.74 -1°11.22 7°24.66 -52°42.74 -16°45.19 -29°0.56 5°9.55 27°57.96 -59°35.70 -43°32.35 -69°49.55 -8°46.23 11°50.58 61°37.06 14°25.79 -17°41.12 -63°14.59 -57°15.52 55°49.40 -11°17.75 49°11.18 -60°29.82 -36°29.81
Bellatrix Elnath Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	278° 22.88 278° 1.86 275° 37.73 270° 52.06 263° 52.62 258° 26.22 255° 5.86 244° 50.70 243° 17.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	6° 22.30 28° 37.74 -1° 11.22 7° 24.66 -52° 42.74 -16° 45.19 -29° 0.56 5° 9.55 27° 57.96 -59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 81° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Alnilam Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	275° 37.73 270° 52.06 263° 52.62 255° 5.86 244° 50.70 243° 17.13 234° 14.76 222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-1°11.22 7°24.66 -52°42.74 -16°45.19 -29°0.56 5°9.55 27°57.96 -59°35.70 -43°32.35 -69°49.55 -8°46.23 11°50.58 61°37.06 14°25.79 -17°41.12 -63°14.59 -57°15.52 55°49.40 -11°17.75 49°11.18 -60°29.82 -36°29.81
Betelgeuse Canopus Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	270° 52.06 263° 52.62 258° 26.22 255° 5.86 244° 50.70 243° 17.13 234° 14.76 222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	7°24.66 -52°42.74 -16°45.19 -29°0.56 5°9.55 27°57.96 -59°35.70 -43°32.35 -69°49.55 -8°46.23 11°50.58 61°37.06 14°25.79 -17°41.12 -63°14.59 -57°15.52 55°49.40 -11°17.75 49°11.18 -60°29.82 -36°29.81
Canopus Sirius Adhara Procyon Pollux Avior Suhail Viaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	263° 52.62 258° 26.22 255° 5.86 244° 50.70 243° 17.13 222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-52° 42.74 -16° 45.19 -29° 0.56 5° 9.55 27° 57.96 -59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Sirius Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	258° 26.22 255° 5.86 244° 50.70 243° 14.76 222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 147° 56.96 145° 47.35	-16° 45 .19 -29° 0.56 5° 9.55 27° 57.96 -59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Adhara Procyon Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	255°5.86 244°50.70 243°17.13 234°14.76 222°46.13 221°38.21 217°47.48 207°34.08 193°40.32 182°24.47 175°43.09 172°59.31 171°50.93 166°12.23 158°21.75 152°51.32 148°35.06 147°56.96 145°47.35	-29°0.56 5°9.55 27°57.96 -59°35.70 -43°32.35 -69°49.55 -8°46.23 11°50.58 61°37.06 14°25.79 -17°41.12 -63°14.59 -57°15.52 55°49.40 -11°17.75 49°11.18 -60°29.82 -36°29.81
Pollux Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	243°17.13 234°14.76 222°46.13 221°38.21 217°47.48 207°34.08 193°40.32 182°24.47 175°43.09 172°59.31 171°50.93 166°12.23 158°21.75 152°51.32 148°35.06 147°56.96 145°47.35	27° 57.96 -59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Avior Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	234°14.76 222°46.13 221°38.21 217°47.48 207°34.08 193°40.32 182°24.47 175°43.09 172°59.31 171°50.93 166°12.23 158°21.75 152°51.32 48°35.06 147°56.96 145°47.35	-59° 35.70 -43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Suhail Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	222° 46.13 221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-43° 32.35 -69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Miaplacidus Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	221° 38.21 217° 47.48 207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-69° 49.55 -8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 49° 11.18 -60° 29.82 -36° 29.81
Alphard Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	217°47.48 207°34.08 193°40.32 182°24.47 175°43.09 172°59.31 171°50.93 166°12.23 158°21.75 152°51.32 148°35.06 147°56.96 145°47.35	-8° 46.23 11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Regulus Dubhe Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	207° 34.08 193° 40.32 182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	11° 50.58 61° 37.06 14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Denebola Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	182° 24.47 175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	14° 25.79 -17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Gienah Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	175° 43.09 172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-17° 41.12 -63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Acrux Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	172° 59.31 171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-63° 14.59 -57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Gacrux Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	171° 50.93 166° 12.23 158° 21.75 152° 51.32 148° 35.06 147° 56.96 145° 47.35	-57° 15.52 55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Alioth Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	166°12.23 158°21.75 152°51.32 148°35.06 147°56.96 145°47.35	55° 49.40 -11° 17.75 49° 11.18 -60° 29.82 -36° 29.81
Spica Alkaid Hadar Menkent Arcturus Rigil Kent.	152°51.32 148°35.06 147°56.96 145°47.35	-11°17.75 49°11.18 -60°29.82 -36°29.81
Alkaid Hadar Menkent Arcturus Rigil Kent.	148°35.06 147°56.96 145°47.35	-60° 29.82 -36° 29.81
Menkent Arcturus Rigil Kent.	147°56.96 145°47.35	-36°29.81
Arcturus Rigil Kent.	145°47.35	
Rigil Kent.		
0	139°39.33	19°2.93 -60°56.48
Kochab	137° 18.57	74°2.99
Zuben'ubi	136°55.42	-16°8.94
Alphecca	$126^{\circ}3.18$	26°37.61
Antares		-26°29.33
		-69°4.25 -15°45.44
		-15 45.44 -37°7.29
	95°58.07	12°32.31
Eltanin	90°41.70	51°28.81
Kaus Aust.	83°31.96	-34°22.29
_		38°48.12 -26°15.89
		-26° 15.89 8° 55.94
Peacock		-56° 39.00
Deneb	49°25.63	45°21.90
Enif	33°38.64	9°59.30
		-46° 50.15
		-29° 29.23 28° 12.99
Markab	13° 29.85	15° 20.32
I 01 TI	CIIA	NA
-		Mer.pass 09:21
Mars		17:56
Jupiter	279°22.59	14:44
Saturn	1°10.68	09:17
May 02 Fri	SHA	Mer.pass
Venus	$359^{\circ}42.24$	09:20
Mars	231°2.89	17:54
		14:41
		09:14
•	SHA	Mer.pass
		09:18 17:52
		17:52
Saturn	0°59.48	09:10
11011201	Venus:	0.3
	Mars:	0.1
	Alphecca Antares Atria Sabik Shaula Rasalhague Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  lay 01 Thu Venus Mars Jupiter Saturn  May 02 Fri Venus Mars Jupiter Saturn  May 03 Sat Venus Mars Jupiter Saturn  May 03 Sat Venus Mars Jupiter Saturn	Alphecca Antares Antares Antares Atria Atria 107°8.77 Sabik 102°2.23 Sabula 96°9.73 Rasalhague 95°58.07 Eltanin Vega 80°32.83 Nunki 75°47.28 Altair 61°59.63 Enif Al Na'ir Fomalhaut 15°14.43 Scheat 13°45.18 Markab 13°29.85 Mars 231°31.16 Jupiter 279°22.59 Saturn 1°10.68 Mars Jupiter 279°9.53 Saturn 278°5.86 Mars 231°2.89 Jupiter 279°9.53 Saturn 278°5.86 Mars 230°34.47 Jupiter 278°5.80 Mars Jupiter 279°5.86 Mars 230°34.47 Jupiter 278°5.86 Mars 359°5.86 Mars 230°34.47 Jupiter 278°5.87 Mars 230°34.47 Jupiter 278°5.89 Saturn 0°59.48 Mors 230°5.48 Mars 230°34.47 Jupiter 278°5.89 Saturn 0°59.48 Mors 230°5.48 Mars 230°

Stars SHA

 $357^{\circ}34.82$ 

353°7.24

349°31.29

348°47.34

 $335^{\circ}20.54$ 

 $327^{\circ}51.28$ 

314°24.59

 $315^{\circ}12.00$ 

Dec

 $29^{\circ}13.63$ 

-42°10.03

56° 40.38 -17° 50.89

 $\text{-}57^{\circ}6.43$ 

 $23^{\circ}34.83$ 

89°22.26

-40°12.23

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.31	N15°5.36	134°11.90	2.5'	N28°30.66	1.2'	59.7'
1 2	195°43.39 210°43.46	6.11 6.87	148°33.38 162°54.91	2.5' 2.6'	28°31.87 28°32.87	1.0' 0.8'	59.6' 59.6'
3	225°43.53	7.62	177° 16.48	2.6'	28°33.67	0.6'	59.6'
4	240°43.61	8.38	$191^{\circ}38.09$	2.7'	28°34.26	0.4'	59.5'
5	255°43.68 270°43.76	9.13 N15 <sup>o</sup> 9.89	205°59.75 220°21.46	2.7'	28°34.64 N28°34.82	0.2'	59.5'
6 7	270 43.76 285°43.83	N15 9.89 10.64	220 21.46 234°43.22	2.8'	N28 34.82 28°34.80	-0.0' -0.2'	59.5' 59.4'
8	300°43.90	11.39	249°5.04	2.9'	28°34.58	-0.4	59.4'
9	315°43.97	• • 12.15	263°26.91	2.9'	28°34.15	-0.6'	59.3'
10 11	330°44.05 345°44.12	12.90 13.65	277° 48.85 292° 10.85	3.0' 3.1'	28°33.53 28°32.70	-0.8' -1.0'	59.3' 59.3'
12	0°44.19	N15° 14.40	306°32.92	3.1'	N28°31.68	-1.2'	59.2
13	15°44.26	15.15	$320^{\circ}55.06$	3.2'	28°30.46	-1.4'	59.2'
14	30°44.33	15.90	335° 17.27 349° 39.55	3.3'	28°29.04	-1.6'	59.1'
15 16	45°44.40 60°44.47	· · 16.65 17.40	349°39.55 4°1.91	3.4' 3.4'	28°27.43 28°25.62	-1.8' -2.0'	59.1' 59.1'
17	75°44.55	18.15	18° 24.35	3.5'	28°23.62	-2.2'	59.0'
18	90°44.62	N15° 18.90	32°46.88	3.6'	N28°21.43	-2.4'	59.0'
19 20	105°44.69 120°44.76	19.65 20.40	47°9.48 61°32.18	3.7' 3.8'	28°19.05 28°16.48	-2.6' -2.8'	59.0' 58.9'
21	135°44.83	21.14	75°54.96	3.9'	28°13.72	-2.8 -2.9'	58.9'
22	150°44.90	21.89	90°17.83	4.0'	28°10.77	-3.1'	58.8'
23	165°44.96	22.64	104°40.79	4.1'	28°7.64	-3.3'	58.8'
	SD = 15.9'	d = 0.8'		S	D = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.03	N15°23.38	$119^{\circ}3.85$	4.2'	N28° 4.33	-3.5'	58.8'
1	195°45.10	24.13	133°27.01	4.3'	28°0.83	-3.7'	58.7'
2	210°45.17 225°45.24	24.87 •• 25.62	147°50.27 162°13.62	4.4' 4.5'	27°57.15 27°53.29	-3.9' -4.0'	58.7' 58.6'
4	240°45.31	26.36	176°37.08	4.6'	27°49.26	-4.2	58.6'
5	255°45.38	27.11	191°0.65	4.7'	27°45.04	-4.4'	58.6'
6 7	270°45.44 285°45.51	N15°27.85 28.59	205°24.32 219°48.09	4.8' 4.9'	N27°40.66 27°36.10	-4.6' -4.7'	58.5' 58.5'
8	300°45.58	29.33	234°11.98	5.0'	27°31.36	-4.7 -4.9'	58.4
9	315°45.65	• • 30.08	248°35.98	5.1'	$27^{\circ}26.46$	-5.1'	58.4'
10 11	330°45.71 345°45.78	30.82 31.56	263°0.09 277°24.32	5.2' 5.3'	27°21.39 27°16.15	-5.2' -5.4'	58.4' 58.3'
12	0°45.85	N15°32.30	277 24.32 291°48.66	5.5'	N27°10.15	-5.4 -5.6'	58.3
13	15°45.91	33.04	$306^{\circ}13.11$	5.6'	27°5.18	-5.7'	58.2'
14	30°45.98	33.78	320°37.69 335°2.38	5.7'	26°59.45 26°53.56	-5.9'	58.2'
15 16	45°46.04 60°46.11	· · 34.52 35.26	335°2.38 349°27.19	5.8' 5.9'	26°53.56 26°47.51	-6.0' -6.2'	58.2' 58.1'
17	75°46.17	36.00	3°52.13	6.1'	26°41.30	-6.4	58.1'
18	90°46.24	N15°36.73	18° 17.18	6.2'	N26°34.94	-6.5	58.0'
19 20	105°46.30 120°46.37	37.47 38.21	32°42.36 47°7.66	6.3' 6.4'	26°28.43 26°21.77	-6.7' -6.8'	58.0' 58.0'
21	135°46.43	38.95	61°33.09	6.6	26°14.95	-0.0' -7.0'	57.9'
22	150°46.50	39.68	$75^{\circ}58.64$	6.7'	$26^{\circ}7.99$	-7.1'	57.9'
23	165°46.56	40.42	90°24.32	6.8'	26°0.88	-7.3'	57.8'
	SD = 15.9'	d = 0.7'		S	D = 16.0'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°46.62	N15°41.15	104°50.12	6.9'	N25°53.62	-7.4'	57.8'
1 2	195°46.69 210°46.75	41.89 42.62	119° 16.06 133° 42.12	7.1' 7.2'	25°46.23 25°38.69	-7.5' -7.7'	57.8' 57.7'
3	225°46.81	• • 43.35	148°8.30	7.3'	25°31.01	-7.8'	57.7'
4	240°46.88	44.09	162°34.62	7.4'	25°23.19	-8.0'	57.7'
5 6	255°46.94 270°47.00	44.82 N15° 45.55	177°1.06 191°27.64	7.6' 7.7'	25°15.24 N25°7.16	-8.1' -8.2'	57.6' 57.6'
7	285°47.06	46.29	205°54.34	7.8'	24°58.94	-8.3	57.5
8	300°47.12	47.02	220°21.17	8.0'	24°50.59	-8.5'	57.5'
9 10	315°47.19 330°47.25	· · 47.75 48.48	234°48.14 249°15.23	8.1' 8.2'	24°42.12 24°33.51	-8.6' -8.7'	57.5' 57.4'
11	330 47.25 345°47.31	48.48 49.21	249 15.23 263°42.45	8.4'	24 33.51 24°24.78	-8.7 -8.9'	57.4' 57.4'
12	0°47.37	N15°49.94	278°9.80	8.5'	N24°15.93	-9.0'	57.3'
13	15°47.43 30°47.49	50.67	292°37.28 307°4.89	8.6'	24°6.96 23°57.86	-9.1'	57.3'
14 15	30°47.49 45°47.55	51.40 •• 52.12	307°4.89 321°32.63	8.7' 8.9'	23°57.86 23°48.65	-9.2' -9.3'	57.3' 57.2'
16	60°47.61	52.85	$336^{\circ}0.50$	9.0'	23°39.32	-9.4'	57.2'
17	75°47.67	53.58	350°28.50	9.1'	23°29.88	-9.6'	57.2'
18 19	90°47.73 105°47.79	N15°54.31 55.03	4°56.63 19°24.88	9.3' 9.4'	N23°20.32 23°10.65	-9.7' -9.8'	57.1' 57.1'
20	120°47.85	55.76	33°53.26	9.4 9.5'	23° 0.87	-9.8'	57.0'
21	135°47.91	• • 56.49	48°21.77	9.6'	22°50.98	-10.0'	57.0'
22 23	150°47.96 165°48.02	57.21 57.93	62°50.41 77°19.18	9.8' 9.9'	22°40.99 22°30.89	-10.1' -10.2'	57.0' 56.9'
23		$\frac{37.93}{d = 0.7'}$	17 19.10			-10.2	30.9
	SD = 15.9'	a = 0.7		5	D = 15.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	15-34%	
01	02:53	02:57	11:57	15:43	03:11		
02	03:00	03:03	11:57	16:44	04:14		
03	03:06	03:09	11:57	17:39	05:12		

h	Aries	Ven	ıus	M	ars	Jup	oiter	Sat	urn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	222°8.06		N01°20.48	92°13.98	N20°24.02	140°51.25	N22°57.86	223°2.01	S02°34.82	
1	237° 10.53	235°37.39	20.75	107° 15.25	23.67	155°53.16	57.90	238°4.25	34.73	Alpheratz
2	$252^{\circ}12.99$	250°38.27	21.02	$122^{\circ}16.52$	23.33	170°55.07	57.93	253°6.48	34.64	Ankaa Schedar
3	$267^{\circ}15.45$	$265^{\circ}39.15$	• • 21.30	$137^{\circ}17.79$	• • 22.98	185°56.98	•• 57.97	268°8.72	• • 34.54	Diphda
4	282° 17.92	280°40.03	21.58	152° 19.06	22.64	200°58.90	58.01	283°10.95	34.45	Achernar
5	297°20.38	295°40.90	21.85	167°20.33	22.29	216° 0.81	58.04	298°13.19	34.36	Hamal
6 7	312°22.85 327°25.31	310°41.78 325°42.65	N01°22.13 22.41	182°21.60 197°22.87	N20°21.95 21.60	231°2.72 246°4.63	N22°58.08 58.11	313°15.42 328°17.66	\$02°34.27 34.18	Polaris
8	342° 27.77	340°43.52	22.41	212° 24.14	21.00	240 4.03 261° 6.54	58.15	343°19.89	34.10	Acamar
9	357°30.24	355°44.39	• • 22.98	227°25.41	20.91	276° 8.45	58.18	358°22.13	• • 34.00	Menkar
10	12°32.70	10°45.26	23.26	242°26.68	20.56	291°10.37	58.22	13°24.37	33.91	Mirfak
11	27°35.17	25°46.13	23.54	257°27.95	20.22	$306^{\circ}12.28$	58.25	28°26.60	33.82	Aldebaran Rigel
12	42°37.63	40°46.99	N01°23.83	272°29.21	N20°19.87	321°14.19	N22°58.29	43°28.84	S02°33.73	Capella
13	57°40.09	55° 47.86	24.12	287°30.48	19.52	336°16.10	58.33	58°31.07	33.64	Bellatrix
14 15	72° 42.56 87° 45.02	70°48.72 85°49.58	24.41 •• 24.70	302°31.75 317°33.02	19.18 •• 18.83	351°18.01 6°19.92	58.36 •• 58.40	73°33.31 88°35.55	33.54 •• 33.45	Elnath
16	102° 47.49	100° 50.44	24.70	332° 34.29	18.48	21°21.83	58.43	103°37.78	33.36	Alnilam
17	117°49.95	115°51.29	25.28	347°35.55	18.13	36°23.74	58.47	118°40.02	33.27	Betelgeuse
18	132°52.42	130°52.15	N01°25.57	2°36.82	N20°17.78	51°25.65	N22°58.50	133°42.26	S02°33.18	Canopus
19	147°54.88	145°53.00	25.87	17°38.09	17.44	66°27.56	58.54	148°44.49	33.09	Sirius Adhara
20	162°57.34	160°53.85	26.16	32°39.36	17.09	81°29.47	58.57	163°46.73	33.00	Procyon
21	177°59.81	175°54.70	• • 26.46	47° 40.62	• • 16.74	96°31.38	• • 58.61	178°48.97	• • 32.91	Pollux
22	193°2.27	190°55.55	26.76	62°41.89	16.39	111°33.29	58.64	193°51.20 208°53.44	32.82	Avior
23	208°4.74	205°56.40	27.05	77°43.15	16.04	126°35.20	58.68		32.73	Suhail
Mer.	pass. 09:10	$\nu$ 0.9 $'$ d0.3	8′ m-4.69	$\nu$ 1.3′ d-0	0.3′ m0.98	$\nu 1.9' \ d0.$	.0′ m-1.97	$\nu$ 2.2′ d-0	$.1^\prime$ m $1.17$	Miaplacidus
										Alphard
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus
0	223°7.20	220°57.24	N01°27.35	92°44.42	N20°15.69	141°37.11	N22°58.71	223°55.68	S02°32.64	Dubhe Denebola
1	238°9.66	235°58.08	27.66	107°45.69	15.34	156°39.02	58.75	238°57.91	32.55	Gienah
2	253° 12.13	250°58.93	27.96	122°46.95	14.99	171°40.93	58.78	254°0.15	32.46	Acrux
3	268° 14.59	265°59.77	• • 28.26	137° 48.22	• • 14.65	186°42.84	• • 58.82	269°2.39	• • 32.37	Gacrux
4 5	283° 17.06 298° 19.52	281°0.60 296°1.44	28.57 28.87	152° 49.48 167° 50.75	14.30 13.95	201°44.75 216°46.66	58.85 58.89	284°4.63 299°6.86	32.28 32.19	Alioth
6	313°21.98		N01°29.18	182° 52.01	N20°13.60	210 40.00 231°48.57	N22°58.92	314° 9.10	502°32.10	Spica
7	328°24.45	326°3.11	29.49	197°53.28	13.24	246°50.48	58.96	329°11.34	32.01	Alkaid
8	343°26.91	341°3.94	29.80	212°54.54	12.89	261°52.39	58.99	344°13.58	31.92	Hadar Menkent
9	$358^{\circ}29.38$	356°4.77	• • 30.11	227°55.80	• • 12.54	276°54.30	• • 59.03	359°15.82	• • 31.83	Arcturus
10	13°31.84	11°5.60	30.42	242°57.07	12.19	291°56.20	59.06	14°18.05	31.74	Rigil Kent.
11	28°34.31	26°6.43	30.73	257° 58.33	11.84	306°58.11	59.10	29°20.29	31.65	Kochab
12	43° 36.77 58° 39.23	41°7.25	N01°31.04	272°59.59 288°0.86	N20°11.49	322°0.02 337°1.93	N22°59.13	44°22.53 59°24.77	S02°31.56	Zuben'ubi
13 14	58 39.23 73°41.70	56°8.08 71°8.90	31.36 31.68	303°2.12	11.14 10.79	352° 3.84	59.17 59.20	59 24.77 74°27.01	31.47 31.38	Alphecca
15	88°44.16	86°9.72	• • 31.99	318°3.38	. 10.44	7° 5.74	• • 59.24	89°29.24	31.29	Antares
16	103°46.63	101°10.54	32.31	333°4.64	10.08	22°7.65	59.27	104°31.48	31.20	Atria
17	118°49.09	$116^{\circ}11.35$	32.63	348°5.91	9.73	37° 9.56	59.31	119°33.72	31.11	Sabik Shaula
18	133°51.55		N01°32.95	3°7.17	N20° 9.38	52°11.47	N22°59.34	134°35.96	S02°31.02	Rasalhague
19	148°54.02	146°12.98	33.27	18°8.43	9.03	67°13.38	59.38	149°38.20	30.93	Eltanin
20	163° 56.48	161°13.80	33.60	33°9.69	8.67	82°15.28	59.41	164°40.44	30.84	Kaus Aust.
21 22	178°58.95 194°1.41	176° 14.61 191° 15.42	· · 33.92 34.25	48° 10.95 63° 12.21	· · 8.32 7.97	97°17.19 112°19.10	• • 59.45 59.48	179°42.68 194°44.92	· · 30.75 30.67	Vega
23	209°3.87	206° 16.22	34.57	78° 13.47	7.61	127°21.00	59.52	209°47.16	30.58	Nunki
										Altair
Mer.	pass. 09:06	$\nu$ 0.8′ d0.3	3′ m-4.68	$\nu$ 1.3′ $d$ -0	0.3′ m0.99	$\nu$ 1.9′ d0.	.0′ m-1.97	$\nu 2.2' \ d-0$	.1′ m1.16	Peacock Deneb
										Enif
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir
0	224°6.34		N01°34.90	93°14.73	N20°7.26	142°22.91	N22°59.55	224°49.39	S02°30.49	Fomalhaut
1	239°8.80 254°11.27	236° 17.83 251° 18.64	35.23	108° 15.99	6.91	157°24.82	59.58 50.63	239°51.63	30.40	Scheat
2	254° 11.27 269° 13.73	251° 18.64 266° 19.44	35.56 •• 35.89	123° 17.26 138° 18.51	6.55 •• 6.20	172°26.72 187°28.63	59.62 •• 59.65	254°53.87 269°56.11	30.31 · · 30.22	Markab
4	284° 16.19	281°20.24	36.22	153° 19.77	5.84	202°30.54	59.69	284°58.35	30.13	May 04 Sun
5	299° 18.66	296°21.04	36.55	168°21.03	5.49	217°32.44	59.72	300°0.59	30.04	Venus
6	314°21.12	311°21.83	N01°36.89	183°22.29	N20°5.14	232°34.35	N22°59.76	315°2.83	S02°29.95	Mars
7	329°23.59	326°22.63	37.22	198°23.55	4.78	247°36.26	59.79	330°5.07	29.86	Jupiter
8	344°26.05	341°23.42	37.56	213°24.81	4.43	262°38.16	59.82	345°7.31	29.78	Saturn
9	359°28.51	356°24.21	• • 37.90	228° 26.07	• • 4.07	277°40.07	• • 59.86	0°9.55	• • 29.69	May 05 Mon
10 11	14° 30.98 29° 33.44	11°25.00 26°25.79	38.24 38.58	243°27.33 258°28.59	3.72 3.36	292°41.97 307°43.88	59.89 22°59.93	15°11.79 30°14.03	29.60 29.51	Venus
12	44°35.91		N01°38.92	273° 29.84	N20° 3.00	322°45.79	N22°59.96	45°16.27	502°29.42	Mars
13	59° 38.37	56° 27.37	39.26	288°31.10	2.65	337°47.69	0.00	60°18.51	29.33	Jupiter
14	74°40.84	71°28.15	39.60	303°32.36	2.29	352°49.60	0.03	75°20.75	29.24	Saturn
15	89°43.30	86°28.93	• • 39.95	318° 33.62	• 1.94	7°51.50	• • 0.06	90°23.00	• • 29.15	May 06 Tue
16	104° 45.76	101°29.71	40.29	333°34.87	1.58	22°53.41	0.10	105°25.24	29.07	Venus
17	119°48.23	116°30.49	40.64	348°36.13	1.22	37°55.31	0.13	120°27.48	28.98	Mars
18 19	134° 50.69 149° 53.16	131°31.27 146°32.05	N01°40.98 41.33	3°37.39 18°38.64	N20° 0.87 0.51	52°57.22 67°59.12	N23°0.17 0.20	135°29.72 150°31.96	S02°28.89 28.80	Jupiter
20	164° 55.62	161°32.82	41.68	33°39.90	20°0.15	83°1.03	0.20	165°34.20	28.71	Saturn
21	179° 58.08	176°33.60	• • 42.03	48°41.16	19°59.79	98° 2.93	• • 0.27	180°36.44	• • 28.62	Horizon
22	195°0.55	191°34.37	42.39	63°42.41	59.44	113° 4.83	0.30	195°38.68	28.54	
23	210°3.01	206°35.14	42.74	78°43.67	59.08	128° 6.74	0.33	210°40.92	28.45	
Mer.	pass. 09:02	$\nu$ 0.8′ d0.3	B' m-4.67	$\nu 1.3' \ d-0$	0.4′ m1.00	$\nu$ 1.9′ d0.	.0′ m-1.97	ν2.2′ d-0	.1′ m1.16	

Stars SHA

357°34.79 353°7.22

349°31 27

348°47.32

 $335^{\circ}20.52$ 

 $327^{\circ}51.27$ 

314°24.51

 $315^{\circ}12.00$ 

 $314^{\circ}6.22$ 

308°28.41

290°39.65

281°3.91

 $280^{\circ}21.92$ 

278°22.88

278°1.86

275°37.74

270°52.06

263°52.64

258°26.23

255°5.87

244°50.70

 $243^{\circ}17.13$ 

234°14.79

222°46.15

221°38.26

217°47.49

207°34.09

 $193^{\circ}40.33$ 

 $182^{\circ}24.48$ 

 $175^{\circ}43.09$ 

 $172^{\circ}59.32$ 

171°50.94

 $166^{\circ}12.23$ 

158°21.75

152°51.32

148°35.05

147°56.95

145°47.34

139°39.32

137° 18.56

136°55.41

126°3.16

112°15 19

107°8.72

102°2.21

 $96^{\circ}9.71$ 

 $95^{\circ}58.05$ 

90°41.68

83°31.93

80°32.80

75°47.25

61°59.61

49°25.60

33°38.61

27°32.71

15°14.40

13°45.16

13°29.82

SHA

358°28.44

230°5.91

278°43.19

SHA

357°50.04

229°37.22

278°29.91

SHA

357°10.69

229°8.40

 $0^{\circ}43.06$ 

Venus: Mars:

278°16.57

Horizontal parallax

0°48.48

 $0^{\circ}53.95$ 

53°5.21

Dec 29°13.63

-42°10.01

56°40.37 -17°50.88

-57°6.41

23°34.83

89°22.24

40°12.21

4°11.27

49°57.03

16°33.58

-8°10.42

 $46^{\circ}1.46$ 

6°22.31

28°37.74

-1°11.21

7°24.67

-52°42.73

-16°45.18

-29°0.56

 $27^{\circ}57.96$ 

-59°35.70

-43°32.35

-69°49.55

-8°46.23

11°50.58

61°37.06

14°25.79

-17°41.12

-63°14.61

-57° 15.53

55°49.41

-11°17.75

49°11.19 -60°29.84

-36°29.82

19°2.93

 $74^{\circ}3.00$ 

-16°8.94

26°37.62

-26°29.34

-69°4.27 -15°45.44

 $-37^{\circ}7.29$ 

 $12^{\circ}32.32$ 

51°28.83

-34°22.30 38°48.13

-26°15.89

8°55 94

-56° 38.99

45°21.90

9°59.30

-46°50.13

-29°29.22

28°12.99

15°20.32

Mer.pass

09:17

17:50

14:35

09:07

09:16

17:48

14:32

09:03

09:14

17:46

14:29

08:59

0.3

0.1

Mer.pass

Mer.pass

-60°56.50

5°9.55

h	Su	+0.030+ 3ec	$\Delta t = t t$	-011 -			
h					Moon		
Sun 0	<b>GHA</b> 180°48.08	<b>Dec</b> N15° 58.66	<b>GHA</b> 91°48.07	u 10.0'	<b>Dec</b> N22° 20.69	d -10.3'	<b>HP</b> 56.9'
1	180 48.08 195°48.14	15° 59.38	91 48.07 106°17.08	10.0	22° 10.38	-10.3 -10.4'	56.9'
2	210°48.20	16°0.11	120° 46.22	10.3	21°59.98	-10.5	56.8'
3	225°48.25	• • 0.83	$135^{\circ}15.49$	10.4'	$21^{\circ}49.48$	-10.6'	56.8'
4	240°48.31	1.55	149° 44.88	10.5'	21°38.88	-10.7'	56.8'
5	255°48.37 270°48.42	2.27 N16°2.99	164° 14.39 178° 44.03	10.6'	21°28.19 N21°17.40	-10.8'	56.7'
6 7	270 48.42 285°48.48	3.71	178 44.03 193°13.78	10.8' 10.9'	N21 17.40 21°6.52	-10.9' -11.0'	56.7' 56.6'
8	300°48.54	4.44	207°43.66	11.0'	20°55.55	-11.1'	56.6'
9	315°48.59	• • 5.16	222° 13.66	11.1'	20°44.49	-11.1'	56.6'
10	330°48.65	5.87	236° 43.77	11.2'	20°33.34	-11.2'	56.5'
11 12	345°48.70 0°48.76	6.59 N16°7.31	251°14.01 265°44.36	11.4' 11.5'	20°22.11 N20°10.79	-11.3' -11.4'	56.5' 56.5'
13	0 48.76 15°48.81	8.03	205 44.30 280°14.83	11.5 11.6'	19°59.39	-11.4 -11.5'	56.4'
14	30°48.87	8.75	294° 45.42	11.7'	19° 47.91	-11.6'	56.4
15	45°48.92	• • 9.47	$309^{\circ}16.12$	11.8'	$19^{\circ}36.35$	-11.6'	56.4'
16	60°48.98	10.18	323°46.93	11.9'	19°24.71	-11.7'	56.3'
17 18	75°49.03 90°49.08	10.90 N16° 11.61	338° 17.86 352° 48.90	12.0' 12.2'	19°12.99 N19°1.20	-11.8' -11.9'	56.3' 56.3'
19	105°49.14	12.33	7°20.05	12.3'	18° 49.33	-11.9'	56.2'
20	120°49.19	13.04	21°51.31	12.4	18° 37.39	-12.0'	56.2'
21	135°49.24	•• 13.76	36°22.68	12.5'	18°25.38	-12.1'	56.2'
22	150°49.30	14.47	50°54.16	12.6'	18° 13.29	-12.2'	56.1'
23	165°49.35	15.19	65°25.74	12.7'	18°1.14	-12.2'	56.1'
	SD = 15.9'	d = 0.7'		SI	D = 15.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	180°49.40	N16° 15.90	79°57.43	12.8'	N17° 48.92	-12.3'	56.1'
1	195°49.45	16.61	94°29.23	12.9'	$17^{\circ}36.64$	-12.4'	56.0'
2	210°49.51	17.32	109°1.13	13.0'	17°24.29	-12.4'	56.0'
3 4	225°49.56 240°49.61	· · 18.03 18.75	123°33.13 138°5.23	13.1' 13.2'	17° 11.88 16° 59.40	-12.5' -12.5'	56.0' 56.0'
5	255°49.66	19.46	150 5.25 152° 37.43	13.2	16° 46.86	-12.5 -12.6'	55.9'
6	270°49.71	N16°20.17	167°9.73	13.4'	N16°34.26	-12.7'	55.9'
7	285°49.76	20.88	$181^{\circ}42.13$	13.5'	$16^{\circ}21.61$	-12.7'	55.9'
8	300°49.81	21.58	196°14.63	13.6'	16°8.90	-12.8'	55.8'
9 10	315°49.86 330°49.91	· · 22.29 23.00	210° 47.22 225° 19.91	13.7' 13.8'	15°56.13 15°43.30	-12.8' -12.9'	55.8' 55.8'
11	345°49.96	23.71	239°52.69	13.9	15 45.30 15°30.42	-12.9'	55.7'
12	0°50.01	N16°24.42	254° 25.56	14.0'	N15° 17.49	-13.0'	55.7'
13	15°50.06	25.12	$268^{\circ}58.52$	14.1'	$15^{\circ}4.51$	-13.0'	55.7'
14	30°50.11	25.83	283°31.57	14.1'	14°51.48	-13.1'	55.7'
15 16	45°50.16 60°50.21	· · 26.54 27.24	298°4.71 312°37.94	14.2' 14.3'	14°38.40 14°25.27	-13.1' -13.2'	55.6' 55.6'
17	75°50.26	27.95	327°11.25	14.4	14° 12.09	-13.2'	55.6'
18	90°50.31	N16°28.65	341°44.65	14.5'	N13°58.87	-13.3'	55.5'
19	105°50.35	29.35	356° 18.13		13°45.60		
20	120°50.40	30.06	10°51.69	14.6'	13°32.29	-13.4'	55.5'
21 22	135°50.45 150°50.50	· · 30.76 31.46	25°25.33 39°59.06	14.7' 14.8'	13° 18.94 13° 5.54	-13.4' -13.4'	55.5' 55.4'
23	165°50.54	32.16	54° 32.86	14.9'	13° 52.11	-13.5'	55.4'
	SD = 15.9'	d = 0.7'			D = 15.3'		
	<u> </u>	<u>u = 0.7</u>					
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°50.59 195°50.64	N16° 32.87 33.57	69°6.74 83°40.69	15.0' 15.0'	N12°38.63 12°25.12	-13.5' -13.6'	55.4' 55.4'
2	210°50.68	33.57 34.27	98° 14.72	15.0 15.1'	12° 25.12 12° 11.57	-13.6'	55.4 55.3'
3	225°50.73	• • 34.97	112°48.83	15.2'	11°57.98	-13.6	55.3'
4	240°50.77	35.67	127° 23.00	15.2'	11°44.36	-13.7'	55.3'
5	255°50.82	36.37	141°57.25	15.3'	11°30.71	-13.7'	55.3'
6 7	270°50.87 285°50.91	N16° 37.06 37.76	156°31.56 171°5.95	15.4' 15.5'	N11°17.02 11°3.29	-13.7' -13.8'	55.2' 55.2'
8	300°50.96	38.46	171 5.95 185° 40.40	15.5'	10°49.54	-13.8'	55.2'
9	315°51.00	39.16	$200^{\circ}14.92$	15.6'	10°35.76	-13.8'	55.2'
10	330°51.04	39.85	214°49.50	15.6'	10°21.94	-13.8'	55.1'
11	345°51.09 0°51.13	40.55 N16°41.25	229°24.14	15.7'	10°8.10 N09°54.23	-13.9'	55.1'
12 13	0°51.13 15°51.18	N16°41.25 41.94	243°58.85 258°33.62	15.8' 15.8'	09° 40.33	-13.9' -13.9'	55.1' 55.1'
14	30°51.22	42.64	273°8.45	15.9'	09° 26.41	-13.9'	55.0'
15	45°51.26	• • 43.33	$287^{\circ}43.33$	15.9'	09° 12.46	-14.0'	55.0'
16	60°51.31	44.02	302° 18.27	16.0'	08° 58.49	-14.0'	55.0'
17	75°51.35 90°51.39	44.72 N16°45.41	316°53.27 331°28.33	16.1' 16.1'	08° 44.49 N08° 30.47	-14.0'	55.0' 54.9'
18 19	90°51.39 105°51.43	N16°45.41 46.10	331°28.33 346°3.43	16.1	08° 16.43	-14.0' -14.1'	54.9'
20	120°51.47	46.79	0°38.59	16.2	08°2.37	-14.1'	54.9'
21	135°51.52	• • 47.49	15° 13.80	16.3'	07°48.29	-14.1'	54.9'
22	150°51.56	48.18	29°49.06	16.3'	07°34.19	-14.1'	54.9'
23	165°51.60	48.87	44°24.37	16.4'	07°20.07	-14.1'	54.8'
	SD = 15.8'	d = 0.7'		SI	D = 15.1'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	44-64%	
04	03:12	03:15	11:57	18:30	06:05		
05	03:18	03:20	11:57	19:15	06:53		
06	03:22	03:25	11:57	19:57	07:37		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	225°5.48	221°35.91 N01°43.09	93°44.92 N19°58.72	143°8.64 N23°0.37	225°43.17 <b>S</b> 02°28.36	
1	240°7.94	236°36.68 43.45	108°46.18 58.36	158°10.55 0.40	240° 45.41 28.27	Alpheratz 357°34.78 29°13.63 Ankaa 353°7.20 -42°10.00
2	$255^{\circ}10.40$	251°37.44 43.80	123°47.43 58.00	173°12.45 0.44	255° 47.65 28.18	Ankaa 353°7.20 -42°10.00 Schedar 349°31.25 56°40.37
3	270°12.87	266°38.21 · · 44.16	138°48.69 · · 57.65	188°14.35 · · 0.47	270°49.89 · · 28.10	Diphda 348°47.31 -17°50.87
4	285° 15.33	281°38.97 44.52 296°39.73 44.88	153° 49.94 57.29 168° 51.20 56.93	203°16.26 0.50	285°52.13 28.01	Achernar 335°20.51 -57°6.39
5 6	300° 17.80 315° 20.26	296°39.73 44.88 311°40.49 N01°45.24	168° 51.20 56.93 183° 52.45 N19° 56.57	218°18.16 0.54 233°20.07 N23°0.57	300°54.37 27.92 315°56.62 \$02°27.83	Hamal 327°51.26 23°34.83
7	330°22.72	326°41.25 45.60	198° 53.70 56.21	248°21.97 0.60	330°58.86 27.74	Polaris 314°24.50 89°22.23
8	345°25.19	341°42.01 45.96	213°54.96 55.85	263°23.87 0.64	346°1.10 27.66	Acamar 315°11.99 -40°12.19
9	0°27.65	356°42.76 · · 46.33	228°56.21 · · 55.49	278°25.78 · · 0.67	1°3.34 · · · 27.57	Menkar 314°6.21 4°11.28 Mirfak 308°28.41 49°57.02
10	15°30.12	11°43.51 46.69	243°57.46 55.13	293°27.68 0.70	16°5.59 27.48	Aldebaran 290°39.65 16°33.58
11	30°32.58	26°44.27 47.06	258° 58.72 54.77	308°29.58 0.74	31°7.83 27.39	Rigel 281°3.91 -8°10.42
12 13	45°35.04 60°37.51	41°45.02 N01°47.42 56°45.77 47.79	273°59.97 N19°54.41 289°1.22 54.05	323°31.48 N23°0.77 338°33.39 0.81	46°10.07 \$02°27.31 61°12.31 27.22	Capella 280°21.93 46°1.46
14	75°39.97	71°46.51 48.16	304°2.47 53.69	353°35.29 0.84	76°14.56 27.13	Bellatrix 278°22.89 6°22.31
15	90°42.44	86°47.26 · · 48.53	319°3.73 · · 53.33	8°37.19 · · 0.87	91°16.80 · · 27.04	Elnath 278°1.87 28°37.74 Alnilam 275°37.74 -1°11.21
16	105° 44.90	101°48.01 48.90	334°4.98 52.97	23°39.09 0.91	106° 19.04 26.96	Alnilam 275°37.74 -1°11.21 Betelgeuse 270°52.07 7°24.67
17	120°47.36	116°48.75 49.27	349°6.23 52.61	38°41.00 0.94	121°21.28 26.87	Canopus 263°52.66 -52°42.72
18	135°49.83	131°49.49 N01°49.65	4°7.48 N19°52.25	53°42.90 N23°0.97	136°23.53	Sirius 258°26.24 -16°45.17
19 20	150° 52.29 165° 54.76	146°50.23 50.02 161°50.97 50.40	19°8.73 51.89 34°9.98 51.52	68°44.80 1.01 83°46.70 1.04	151°25.77 26.69 166°28.01 26.61	Adhara 255°5.89 -29°0.55
21	180° 57.22	176°51.71 · · 50.77	49°11.24 · · 51.16	98°48.61 · · 1.07	181°30.26 · · 26.52	Procyon 244°50.72 5°9.56
22	195° 59.69	191°52.44 51.15	64°12.49 50.80	113°50.51 1.10	196°32.50 26.43	Pollux 243°17.15 27°57.97
23	211°2.15	206°53.18 51.53	79° 13.74 50.44	128°52.41 1.14	211°34.74 26.35	Avior 234°14.82 -59°35.70 Suhail 222°46.17 -43°32.34
Mer.r	pass. 08:58	ν0.8' d0.4' m-4.66	ν1.3' d-0.4' m1.02	ν1.9' d0.0' m-1.97	ν2.2' d-0.1' m1.16	Miaplacidus 221°38.31 -69°49.55
						Alphard 217°47.50 -8°46.23
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.10 11°50.58
0	226° 4.61	<b>GHA Dec</b> 221°53.91 N01°51.91	94°14.99 N19°50.08	143°54.31 N23°1.17	226°36.99 \$02°26.26	Dubhe 193°40.36 61°37.07
1	241°7.08	236°54.64 52.29	109° 16.24 49.71	158°56.21 1.20	241°39.23 26.17	Denebola 182°24.48 14°25.80
2	256°9.54	251°55.37 52.67	124°17.49 49.35	173°58.11 1.24	256° 41.48 26.08	Gienah 175°43.10 -17°41.12 Acrux 172°59.34 -63°14.62
3	$271^{\circ}12.01$	266°56.10 · · 53.05	139°18.74 · · 48.99	189°0.01 · · 1.27	271°43.72 · · 26.00	Gacrux 171°50.95 -57°15.54
4	286° 14.47	281°56.83 53.44	154°19.99 48.62	204°1.92 1.30	286° 45.96 25.91	Alioth 166°12.25 55°49.42
5	301°16.93	296°57.56 53.82	169°21.24 48.26	219° 3.82 1.34	301°48.21 25.82	Spica 158°21.75 -11°17.75
6 7	316° 19.40 331° 21.86	311°58.28 N01°54.21 326°59.00 54.60	184°22.49 N19°47.90 199°23.73 47.53	234° 5.72 N23° 1.37 249° 7.62 1.40	316°50.45 \$02°25.74 331°52.70 25.65	Alkaid 152°51.32 49°11.21
8	346°24.33	341°59.72 54.98	214° 24.98 47.17	264° 9.52 1.43	346°54.94 25.56	Hadar 148°35.05 -60°29.85
9	1°26.79	357°0.44 · · 55.37	229° 26.23 · · 46.81	279°11.42 · · 1.47	1°57.19 · · 25.48	Menkent 147°56.95 -36°29.82 Arcturus 145°47.34 19°2.94
10	$16^{\circ}29.25$	12°1.16 55.76	244°27.48 46.44	294°13.32 1.50	16°59.43 25.39	Rigil Kent. 139°39.32 -60°56.51
11	31°31.72	27°1.88 56.15	259°28.73 46.08	309°15.22 1.53	32°1.68 25.30	Kochab 137°18.56 74°3.02
12	46°34.18	42°2.60 N01°56.55	274°29.98 N19°45.71	324°17.12 N23°1.57	47°3.92 \$02°25.22	Zuben'ubi 136°55.41 -16°8.94
13 14	61°36.65 76°39.11	57°3.31 56.94 72°4.02 57.33	289°31.22 45.35 304°32.47 44.98	339°19.02 1.60 354°20.92 1.63	62°6.17 25.13 77°8.41 25.04	Alphecca 126°3.16 26°37.63
15	91°41.57	87°4.73 · · 57.73	319°33.72 · · 44.62	9°22.82 · · 1.66	92°10.66 · · 24.96	Antares 112°15.18 -26°29.34
16	106° 44.04	102°5.44 58.13	334°34.97 44.25	24°24.72 1.70	107° 12.90 24.87	Atria 107°8.69 -69°4.28 Sabik 102°2.19 -15°45.44
17	121°46.50	117°6.15 58.52	349°36.21 43.89	39°26.62 1.73	122°15.15 24.79	Shaula 96°9.69 -37°7.30
18	136°48.97	132°6.86 N01°58.92	4°37.46 N19°43.52	54°28.52 N23°1.76	137°17.39 S02°24.70	Rasalhague 95°58.04 12°32.32
19	151°51.43 166°53.89	147°7.57 59.32	19° 38.71 43.16 34° 39.95 42.79	69°30.42 1.79	152°19.64 24.61	Eltanin 90°41.66 51°28.84
20 21	181° 56.36	162°8.27 01°59.72 177°8.97 02°0.12	34°39.95 42.79 49°41.20 • 42.42	84°32.32 1.83 99°34.22 · · 1.86	167°21.88 24.53 182°24.13 •• 24.44	Kaus Aust. 83°31.91 -34°22.30
22	196° 58.82	192°9.67 0.52	64° 42.44 42.06	114°36.12 1.89	197°26.37 24.35	Vega 80°32.78 38°48.14
23	212°1.29	207°10.37 0.93	79°43.69 41.69	129°38.02 1.92	212° 28.62 24.27	Nunki 75°47.23 -26°15.89 Altair 61°59.59 8°55.95
Merr	pass. 08:54	ν0.7' d0.4' m-4.65	ν1.3' d-0.4' m1.03	ν1.9' d0.0' m-1.96	ν2.2' d-0.1' m1.16	Peacock 53°5.18 -56°38.99
	33. 00.54		- VI.3 U 0.4 IIII.03			Deneb 49°25.57 45°21.91
<b>-</b> ·	CIIA	CIIA D	CUA D	CIIA D	CIIA D	Enif 33°38.59 9°59.31
Fri 0	<b>GHA</b> 227°3.75	<b>GHA Dec</b> 222°11.07 N02°1.33	<b>GHA Dec</b> 94°44.93 N19°41.32	<b>GHA Dec</b> 144°39.91 N23°1.96	<b>GHA Dec</b> 227°30.87 <b>S</b> 02°24.18	Al Na'ir 27°32.68 -46°50.13
1	242°6.21	237°11.77 1.74	109° 46.18 40.96	159°41.81 1.99	242°33.11 24.10	Fomalhaut 15°14.38 -29°29.21 Scheat 13°45.14 28°12.99
2	257°8.68	252°12.47 2.14	124°47.43 40.59	174°43.71 2.02	257°35.36 24.01	Markab 13°29.81 15°20.33
3	272° 11.14	267°13.16 · · 2.55	139°48.67 · · 40.22	189°45.61 · · 2.05	272°37.60 · · 23.92	
4	287° 13.61	282°13.85 2.96	154°49.92 39.85	204°47.51 2.08	287°39.85 23.84	May 07 Wed SHA Mer.pass
5 6	302° 16.07 317° 18.53	297°14.55 3.37 312°15.24 N02°3.78	169°51.16 39.49 184°52.40 N19°39.12	219°49.41 2.12 234°51.31 N23°2.15	302°42.10 23.75 317°44.34 \$02°23.67	Venus 356°30.43 09:13 Mars 228°39.45 17:44
7	317 18.53 332°21.00	312 15.24 NU2 3.78 327°15.92 4.19	184 52.40 N19 39.12 199°53.65 38.75	249°53.20 2.18	317 44.34 S02 23.67 332°46.59 23.58	Jupiter 278°3.17 14:26
8	347°23.46	342°16.61 4.60	214° 54.89 38.38	264°55.10 2.21	347°48.84 23.50	Saturn 0°37.69 08:56
9	2°25.93	357°17.30 · · 5.02	229°56.14 · · 38.01	279°57.00 · · 2.25	2°51.08 · · 23.41	
10	17°28.39	12°17.98 5.43	244°57.38 37.64	294°58.90 2.28	17°53.33 23.33	May 08 Thu SHA Mer.pass Venus 355°49.30 09:12
11	32°30.86	27° 18.67 5.85	259° 58.62 37.28	310°0.80 2.31	32°55.58 23.24	Mars 228°10.37 17:42
12 13	47°33.32 62°35.78	42°19.35 N02°6.26 57°20.03 6.68	274°59.87 N19°36.91 290°1.11 36.54	325°2.69 N23°2.34 340°4.59 2.37	47°57.83 \$02°23.15 63°0.07 23.07	Jupiter 277°49.70 14:23
14	77° 38.25	72°20.71 7.10	305°2.35 36.17	355°6.49 2.41	78°2.32 22.98	Saturn 0°32.38 08:52
15	92°40.71	87°21.39 · · 7.52	320°3.59 · · 35.80	10°8.39 · · 2.44	93°4.57 · · 22.90	May 09 Fri SHA Mer.pass
16	$107^{\circ}43.18$	102°22.06 7.94	335°4.84 35.43	25°10.28 2.47	108°6.82 22.81	Venus 355°7.32 09:11
17	122° 45.64	117°22.74 8.36	350°6.08 35.06	40°12.18 2.50	123°9.06 22.73	Mars 227°41.18 17:40
18	137° 48.10 152° 50.57	132°23.41 N02°8.78 147°24.08 9.21	5°7.32 N19°34.69 20°8.56 34.32	55°14.08 N23°2.53 70°15.97 2.56	138°11.31	Jupiter 277°36.16 14:20
19 20	167°53.03	147 24.08 9.21 162° 24.75 9.63	35°9.80 33.95	70°15.97 2.56 85°17.87 2.60	153°13.56 22.56 168°15.81 22.47	Saturn 0°27.12 08:49
21	182°55.50	177°25.42 · · 10.06	50°11.05 · · 33.58	100°19.77 · · · 2.63	183°18.05 · · 22.39	Horizontal parallax
22	197°57.96	192°26.09 10.48	65°12.29 33.21	115°21.66 2.66	198° 20.30 22.30	Venus: 0.3
23	213°0.42	207°26.76 10.91	80°13.53 32.84	130°23.56 2.69	213°22.55 22.22	Mars: 0.1
Mer.	pass. 08:50	ν0.7' d0.4' m-4.64	ν1.2' d-0.4' m1.04	ν1.9' d0.0' m-1.96	ν2.2' d-0.1' m1.15	

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.64	N16°49.56	$58^{\circ}59.72$	16.4'	N07°5.94	-14.2'	54.8'
1	195°51.68	50.25	73°35.12	16.4'	06°51.79	-14.2'	54.8'
2	210°51.72 225°51.76	50.93 •• 51.62	88°10.57 102°46.06	16.5' 16.5'	06°37.62 06°23.44	-14.2' -14.2'	54.8' 54.8'
4	240°51.80	52.31	117°21.59	16.6'	06°9.24	-14.2'	54.7'
5	255°51.84	53.00	$131^{\circ}57.16$	16.6'	$05^{\circ}55.03$	-14.2'	54.7'
6	270°51.88	N16°53.68	146°32.77	16.6'	N05°40.81	-14.2'	54.7'
7 8	285°51.92 300°51.96	54.37 55.06	161°8.42 175°44.11	16.7' 16.7'	05°26.58 05°12.33	-14.2' -14.3'	54.7' 54.7'
9	315°52.00	55.74	190°19.83	16.8'	04°58.08	-14.3'	54.7'
10	330°52.04	56.43	204°55.59	16.8'	04°43.81	-14.3'	54.6'
11	345°52.08	57.11	219°31.38	16.8'	04°29.54	-14.3'	54.6'
12 13	0°52.11 15°52.15	N16°57.80 58.48	234°7.20 248°43.06	16.9' 16.9'	N04°15.26 04°0.97	-14.3' -14.3'	54.6' 54.6'
14	30°52.19	59.16	263°18.94	16.9'	03°46.68	-14.3'	54.6'
15	45°52.23	16°59.84	277°54.86	16.9'	03°32.38	-14.3'	54.5'
16	60°52.26 75°52.30	17°0.53	292°30.80 307°6.77	17.0'	03°18.07 03°3.76	-14.3'	54.5'
17 18	75°52.30 90°52.34	1.21 N17°1.89	307°6.77 321°42.76	17.0' 17.0'	N02°49.45	-14.3' -14.3'	54.5' 54.5'
19	105°52.37	2.57	336°18.78	17.0'	02°35.14	-14.3'	54.5'
20	120°52.41	3.25	$350^{\circ}54.82$	17.1'	$02^{\circ}20.82$	-14.3'	54.5'
21	135°52.45	• • 3.93	5°30.89	17.1'	02°6.50	-14.3'	54.5'
22 23	150°52.48 165°52.52	4.61 5.29	20°6.97 34°43.07	17.1' 17.1'	01°52.19 01°37.87	-14.3' -14.3'	54.4' 54.4'
23			- 57 75.07			17.0	J T. T
	SD = 15.8'	d = 0.7'		SI	O = 15.0'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°52.55	N17°5.96	49°19.19	17.1'	N01°23.55	-14.3'	54.4'
1	195°52.59 210°52.62	6.64 7.32	63°55.33 78°31.49	17.2' 17.2'	01°9.24 00°54.93	-14.3' -14.3'	54.4' 54.4'
2	210 52.62 225°52.66	· · 8.00	78°31.49 93°7.66	17.2'	00°54.93	-14.3'	54.4' 54.4'
4	240°52.69	8.67	107°43.84	17.2'	00°26.31	-14.3'	54.3'
5	255°52.73	9.35	122°20.03	17.2'	N00°12.01	-14.3'	54.3'
6	270°52.76 285°52.79	N17°10.02	136°56.24 151°32.46	17.2'	\$00°2.28 00°16.57	14.3'	54.3'
7 8	285°52.79 300°52.83	10.70 11.37	151°32.46 166°8.68	17.2' 17.2'	00°16.57	14.3' 14.3'	54.3' 54.3'
9	315°52.86	. 12.04	180°44.92	17.2'	00°45.13	14.3'	54.3'
10	330°52.89	12.72	$195^{\circ}21.16$	17.2'	$00^{\circ}59.40$	14.3'	54.3'
11	345°52.92	13.39	209°57.41	17.3'	01°13.65	14.2'	54.3'
12 13	0°52.96 15°52.99	N17°14.06 14.73	224°33.66 239°9.91	17.3' 17.3'	\$01°27.90 01°42.14	14.2' 14.2'	54.2' 54.2'
14	30°53.02	15.40	253°46.17	17.3	01°56.37	14.2'	54.2'
15	45°53.05	•• 16.07	268°22.43	17.3'	$02^{\circ}10.58$	14.2'	54.2'
16	60°53.08	16.74	282°58.69	17.3'	02°24.78	14.2'	54.2'
17 18	75°53.12 90°53.15	17.41 N17°18.08	297°34.95 312°11.20	17.3' 17.3'	02°38.97 \$02°53.15	14.2' 14.2'	54.2' 54.2'
19	105°53.18	18.75	326°47.46	17.2'	03°7.31	14.1'	54.2'
20	120°53.21	19.42	341°23.71		03°21.45		54.2'
21	135°53.24	• • 20.09	355°59.95	17.2'	03°35.58 03°49.70	14.1'	54.2'
22 23	150°53.27 165°53.30	20.75 21.42	10°36.19 25°12.42	17.2' 17.2'	03°49.70 04°3.79	14.1' 14.1'	54.1' 54.1'
20	SD = 15.8'	d = 0.7'			0 = 14.8'	11.1	J 1.1
	3D = 15.6	a = 0.7		31	J = 14.6°		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°53.33	N17°22.09	39°48.64	17.2'	S04°17.87	14.1'	54.1'
1 2	195°53.36 210°53.38	22.75 23.42	54°24.85 69°1.05	17.2' 17.2'	04°31.93 04°45.97	14.0' 14.0'	54.1' 54.1'
3	210 53.36 225°53.41	•• 24.08	83°37.24	17.2'	04° 59.98	14.0'	54.1
4	240°53.44	24.74	98°13.42	17.2'	05°13.98	14.0'	54.1'
5	255°53.47	25.41	112°49.58	17.1'	05°27.96 \$05°41.91	14.0'	54.1'
6 7	270°53.50 285°53.53	N17°26.07 26.73	127°25.73 142°1.86	17.1' 17.1'	\$05°41.91 05°55.84	13.9' 13.9'	54.1' 54.1'
8	300°53.55	27.40	156°37.98	17.1	06°9.75	13.9'	54.1
9	315°53.58	• • 28.06	171°14.08	17.1'	06°23.63	13.9'	54.0'
10	330°53.61	28.72	185°50.16	17.1'	06°37.49	13.8'	54.0'
11 12	345°53.63 0°53.66	29.38 N17°30.04	200°26.21 215°2.25	17.0' 17.0'	06°51.32 \$07°5.12	13.8' 13.8'	54.0' 54.0'
13	15°53.69	30.70	219°38.27	17.0'	07°18.90	13.7'	54.0'
14	30°53.71	31.36	244°14.26	17.0'	07°32.65	13.7'	54.0'
15	45°53.74	• • 32.01	258°50.23	16.9'	07°46.37	13.7'	54.0'
16 17	60°53.76 75°53.79	32.67 33.33	273°26.17 288°2.09	16.9' 16.9'	08°0.06 08°13.71	13.7' 13.6'	54.0' 54.0'
18	90°53.82	33.33 N17°33.99	302°37.98	16.9'	08 13.71 \$08°27.34	13.6'	54.0'
19	105°53.84	34.64	317°13.85	16.8'	08°40.94	13.6'	54.0'
20	120°53.86	35.30	331°49.68	16.8'	08°54.50	13.5'	54.0'
21 22	135°53.89 150°53.91	· · 35.95 36.61	346°25.48 1°1.26	16.8' 16.7'	09°8.03 09°21.53	13.5' 13.5'	54.0' 54.0'
23	165°53.94	37.26	1 1.20 15°37.00	16.7'	09 21.53 09°34.99	13.5	54.0'
-	SD = 15.8'	d = 0.7'			O = 14.8'		
		<u> </u>		JI	17.0		

·	Twi	light	١		Twi	ilight
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
N 72°	////	////	00:17	////	////	////
N 70°	////	////	01:45	22:15	////	////
68°	////	////	02:23	21:34	////	////
66°	////	01:01	02:49	21:07	23:01	////
64°	////	01:49	03:09	20:46	22:08	////
62°	////	02:19	03:25	20:29	21:37	////
60°	00:54	02:41	03:39	20:16	21:14	23:07
N 58°	01:38	02:59	03:51	20:04	20:56	22:19
56°	02:05	03:14	04:01	19:54	20:41	21:50
54°	02:26	03:26	04:09	19:45	20:28	21:29
52°	02:43	03:37	04:17	19:37	20:17	21:12
50°	02:57	03:46	04:24	19:30	20:08	20:58
45°	03:24	04:06	04:39	19:14	19:48	20:30
N 40°	03:45	04:22	04:52	19:02	19:32	20:09
35°	04:01	04:35	05:02	18:51	19:19	19:52
30°	04:15	04:46	05:11	18:42	19:08	19:39
20°	04:36	05:04	05:27	18:26	18:50	19:17
N 10°	04:53	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	06:05	17:47	18:09	18:35
20°	05:29	05:56	06:19	17:34	17:57	18:24
30°	05:40	06:08	06:34	17:19	17:44	18:13
35°	05:45	06:15	06:42	17:10	17:37	18:07
40°	05:51	06:23	06:52	17:01	17:29	18:02
45°	05:57	06:32	07:03	16:49	17:20	17:56
<b>S</b> 50°	06:03	06:42	07:17	16:35	17:10	17:49
52°	06:06	06:47	07:24	16:29	17:05	17:46
54°	06:09	06:52	07:31	16:22	17:00	17:43
56°	06:12	06:57	07:39	16:14	16:55	17:40
58°	06:16	07:04	07:48	16:05	16:49	17:36
<b>S</b> 60°	06:19	07:10	07:58	15:54	16:42	17:33
	1					

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	73-88%	
07	03:27	03:28	11:57	20:37	08:18		
08	03:30	03:32	11:56	21:16	08:57		
09	03:33	03:35	11:56	21:56	09:36		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	228°2.89	222°27.43 N02°11.34	95°14.77 N19°32.46	145°25.46 N23°2.72	228°24.80 \$02°22.13	
1	243°5.35	237°28.09 11.77	110°16.01 32.09	160°27.35 2.75	243°27.05 22.05	Alpheratz 357°34.76 29°13.63
2	258°7.82	252°28.75 12.20	125° 17.25 31.72	175°29.25 2.79	258°29.30 21.96	Ankaa 353°7.18 -42°9.99 Schedar 349°31.22 56°40.36
3	273° 10.28	267° 29.41 · · 12.63	140°18.49 · · 31.35	190°31.15 · · 2.82	273°31.54 · · 21.88	Diphda 348°47.29 -17°50.86
4	288° 12.74	282°30.07 13.06	155°19.73 30.98	205°33.04 2.85	288° 33.79 21.79	Achernar 335°20.50 -57°6.37
5	303° 15.21	297°30.73 13.50	170°20.97 30.61	220°34.94 2.88	303°36.04 21.71	Hamal 327°51.25 23°34.82
6	318° 17.67	312°31.39 N02°13.93	185°22.21 N19°30.23	235°36.83 N23°2.91	318°38.29	Polaris 314°24.26 89°22.21
7 8	333°20.14 348°22.60	327°32.05 14.36 342°32.70 14.80	200° 23.45 29.86 215° 24.69 29.49	250°38.73 2.94 265°40.62 2.97	333°40.54 21.54 348°42.79 21.46	Acamar 315°11.99 -40°12.18
9	3°25.06	357°33.35 · · 15.24	230°25.93 · · 29.12	265°40.62 2.97 280°42.52 · · 3.01	348° 42.79 21.46 3° 45.04 · · 21.37	Menkar 314°6.21 4°11.28
10	18° 27.53	12°34.01 15.68	245°27.17 28.74	295°44.41 3.04	18° 47.29 21.29	Mirfak 308°28.41 49°57.01
11	33°29.99	27°34.66 16.12	260°28.41 28.37	310°46.31 3.07	33°49.54 21.20	Aldebaran 290°39.66 16°33.58
12	48°32.46	42°35.31 N02°16.56	275°29.64 N19°28.00	325°48.21 N23°3.10	48°51.79 <b>S</b> 02°21.12	Rigel 281°3.92 -8°10.41
13	63°34.92	57°35.96 17.00	290°30.88 27.62	340°50.10 3.13	63°54.04 21.03	Capella 280°21.94 46°1.45 Bellatrix 278°22.90 6°22.32
14	78°37.39	72°36.60 17.44	305°32.12 27.25	355°52.00 3.16	78° 56.29 20.95	Bellatrix 278°22.90 6°22.32 Elnath 278°1.87 28°37.74
15	93°39.85	87°37.25 · · 17.88	320°33.36 · · 26.87	10°53.89 · · 3.19	93°58.53 · · 20.87	Alnilam 275°37.75 -1°11.20
16	108° 42.31	102°37.89 18.32	335°34.60 26.50	25°55.78 3.22	109°0.78 20.78	Betelgeuse 270°52.08 7°24.67
17	123° 44.78	117°38.53 18.77	350°35.83 26.13	40°57.68 3.26	124°3.03 20.70	Canopus 263°52.68 -52°42.71
18	138° 47.24	132°39.18 N02°19.21	5°37.07 N19°25.75	55°59.57 N23°3.29	139°5.28 S02°20.61	Sirius 258°26.25 -16°45.17
19 20	153° 49.71 168° 52.17	147°39.82 19.66 162°40.46 20.11	20°38.31 25.38 35°39.55 25.00	71°1.47 3.32 86°3.36 3.35	154°7.53 20.53 169°9.79 20.44	Adhara 255°5.90 -29°0.54
21	183°54.63	162°40.46 20.11 177°41.09 · · 20.56	35°39.55 25.00 50°40.78 •• 24.63	86°3.36 3.35 101°5.26 · · 3.38	169°9.79 20.44 184°12.04 · · 20.36	Procyon 244°50.73 5°9.56
22	198° 57.10	192°41.73 21.01	65° 42.02 24.25	116° 7.15 3.41	199°14.29 20.28	Pollux 243°17.16 27°57.97
23	213°59.56	207°42.36 21.46	80°43.26 23.88	131°9.05 3.44	214°16.54 20.19	Avior 234°14.85 -59°35.69
						Suhail 222°46.19 -43°32.34
Mer.p	pass. 08:46	ν0.7' d0.4' m-4.63	ν1.2' d-0.4' m1.05	ν1.9' d0.0' m-1.96	$\nu 2.2' \ d$ -0.1' m1.15	Miaplacidus 221°38.35 -69°49.55
						Alphard 217°47.52 -8°46.23 Regulus 207°34.12 11°50.59
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.39 61°37.08
0	229°2.03	222°43.00 N02°21.91	95°44.49 N19°23.50	146°10.94 N23°3.47	229°18.79 <b>S</b> 02°20.11	Denebola 182°24.50 14°25.80
1	244°4.49	237°43.63 22.36	110°45.73 23.12	161°12.83 3.50	244°21.04 20.03	Gienah 175°43.11 -17°41.12
2	259°6.95	252°44.26 22.81	125°46.97 22.75	176°14.73 3.53	259°23.29 19.94	Acrux 172°59.36 -63°14.63
3	274°9.42	267° 44.89 · · 23.27	140°48.20 · · 22.37	191°16.62 · · 3.56	274°25.54 · · 19.86	Gacrux 171°50.97 -57°15.55
4 5	289°11.88 304°14.35	282°45.52 23.72 297°46.15 24.18	155° 49.44 22.00 170° 50.67 21.62	206°18.51 3.59 221°20.41 3.63	289°27.79 19.77 304°30.04 19.69	Alioth 166°12.26 55°49.44
6	319° 16.81	312°46.77 N02°24.64	170°50.67 21.62 185°51.91 N19°21.24	236°22.30 N23°3.66	304°30.04 19.69 319°32.29 \$02°19.61	Spica 158°21.75 -11°17.75
7	334° 19.27	327°47.40 25.10	200°53.14 20.87	251°24.19 3.69	334°34.54 19.52	Alkaid 152°51.33 49°11.22
8	349°21.74	342°48.02 25.55	215°54.38 20.49	266°26.09 3.72	349°36.80 19.44	Hadar 148°35.06 -60°29.86
9	4°24.20	357°48.64 · · 26.01	230°55.61 · · 20.11	281°27.98 · · 3.75	4°39.05 · · 19.36	Menkent 147°56.95 -36°29.83 Arcturus 145°47.35 19°2.95
10	19°26.67	12°49.26 26.47	245°56.85 19.73	296°29.87 3.78	19°41.30 19.27	Arcturus 145°47.35 19°2.95 Rigil Kent. 139°39.32 -60°56.52
11	$34^{\circ}29.13$	27°49.88 26.94	260°58.08 19.36	311°31.77 3.81	34°43.55 19.19	Kochab 137°18.57 74°3.03
12	49°31.60	42°50.50 N02°27.40	275°59.32 N19°18.98	326°33.66 N23°3.84	49°45.80 <b>S</b> 02°19.11	Zuben'ubi 136°55.40 -16°8.94
13	64°34.06	57°51.12 27.86	291°0.55 18.60	341°35.55 3.87	64°48.05 19.02	Alphecca 126°3.15 26°37.64
14	79°36.52	72°51.74 28.33	306°1.78 18.22	356°37.44 3.90	79°50.31 18.94	Antares 112°15.17 -26°29.34
15	94°38.99	87°52.35 · · 28.79	321°3.02 · · 17.84	11°39.34 · · 3.93	94°52.56 · · 18.86	Atria 107°8.67 -69°4.29
16 17	109° 41.45 124° 43.92	102°52.96 29.26 117°53.57 29.73	336°4.25 17.46 351°5.48 17.09	26°41.23 3.96 41°43.12 3.99	109°54.81 18.78 124°57.06 18.69	Sabik 102°2.18 -15°45.44
18	139° 46.38	132°54.19 N02°30.19	6°6.72 N19°16.71	56°45.01 N23°4.02	139°59.32 \$02°18.61	Shaula 96°9.67 -37°7.30
19	154° 48.84	147°54.79 30.66	21°7.95 16.33	71°46.90 4.05	155°1.57 18.53	Rasalhague 95°58.02 12°32.33
20	169°51.31	162°55.40 31.13	36°9.18 15.95	86°48.80 4.08	170°3.82 18.44	Eltanin 90°41.64 51°28.85
21	184°53.77	177°56.01 · · 31.60	51°10.41 · · 15.57	101°50.69 · · 4.11	185°6.07 · · 18.36	Kaus Aust. 83°31.89 -34°22.30 Vega 80°32.76 38°48.15
22	199°56.24	192°56.62 32.08	66°11.65 15.19	116°52.58 4.14	200°8.33 18.28	Nunki 75°47.21 -26°15.88
23	$214^{\circ}58.70$	207° 57.22 32.55	81°12.88 14.81	131°54.47 4.17	215° 10.58 18.20	Altair 61°59.57 8°55.96
Merr	pass. 08:42	$\nu$ 0.6' d0.5' m-4.62	ν1.2' d-0.4' m1.07	ν1.9' d0.0' m-1.96	ν2.3' d-0.1' m1.15	Peacock 53°5.15 -56°38.99
	Ja33. 00.42		——————————————————————————————————————			Deneb 49°25.55 45°21.92
						Enif 33°38.57 9°59.32
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.66 -46°50.12
0	230°1.16 245°3.63	222°57.82 N02°33.02 237°58.42 33.50	96°14.11 N19°14.43 111°15.34 14.05	146°56.36 N23°4.20 161°58.25 4.23	230°12.83 S02°18.11 245°15.09 18.03	Fomalhaut 15°14.37 -29°29.20
1 2	245 3.63 260°6.09	252°59.02 33.97	111°15.34 14.05 126°16.57 13.67	161°58.25 4.23 177°0.15 4.26	260°17.34 17.95	Scheat 13°45.12 28°12.99
3	275°8.56	267°59.62 · · 34.45	141°17.81 · · 13.29	192°2.04 · · 4.29	275°19.59 · · 17.87	Markab 13°29.79 15°20.33
4	290°11.02	283°0.22 34.93	156°19.04 12.91	207° 3.93 4.32	290°21.84 17.78	May 10 Sat SHA Mer.pass
5	305° 13.49	298°0.82 35.40	171°20.27 12.53	222° 5.82 4.35	305°24.10 17.70	Venus 354°24.54 09:10
6	320° 15.95	313°1.41 N02°35.88	186°21.50 N19°12.15	237°7.71 N23°4.38	320°26.35 <b>S</b> 02°17.62	Mars 227°11.88 17:38
7	$335^{\circ}18.41$	328°2.01 36.36	201°22.73 11.76	252°9.60 4.41	335°28.61 17.54	Jupiter 277°22.57 14:16
8	350° 20.88	343°2.60 36.84	216°23.96 11.38	267°11.49 4.44	350° 30.86 17.45	Saturn 0°21.91 08:45
9	5°23.34	358°3.19 · · 37.33	231°25.19 · · 11.00	282°13.38 · · 4.47	5°33.11 · · 17.37	May 11 Sun SHA Mer.pass
10	20°25.81	13°3.78 37.81	246°26.42 10.62	297°15.27 4.50	20°35.37 17.29	Venus 353°40.97 09:09
11	35°28.27	28°4.37 38.29	261°27.65 10.24	312°17.16 4.53	35° 37.62 17.21	Mars 226°42.47 17:36
12 13	50°30.73	43°4.96 N02°38.78	276°28.88 N19°9.86	327°19.05 N23°4.56	50°39.88	Jupiter 277°8.91 14:13
13 14	65° 33.20 80° 35.66	58°5.55 39.26 73°6.13 39.75	291°30.11 9.47 306°31.34 9.09	342°20.94 4.59 357°22.83 4.62	65°42.13 17.04 80°44.38 16.96	Saturn 0°16.76 08:41
15	95°38.13	88°6.72 · · 40.23	321°32.57 · · 8.71	12°24.72 · · 4.65	95°46.64 · · 16.88	May 12 Mon SHA Mer.pass
16	110° 40.59	103°7.30 40.72	336°33.80 8.32	27°26.61 4.68	110°48.89 16.80	May 12 Mon SHA Mer.pass Venus 352°56.66 09:08
17	125° 43.05	118°7.88 41.21	351°35.03 7.94	42°28.50 4.71	125°51.15 16.72	Mars 226°12.95 17:34
18	140° 45.52	133°8.47 N02°41.70	6°36.26 N19°7.56	57°30.39 N23°4.74	140°53.40 S02°16.63	Jupiter 276°55.20 14:10
19	155° 47.98	148°9.04 42.19	21°37.49 7.17	72°32.28 4.77	155°55.66 16.55	Saturn 0°11.67 08:38
20	170° 50.45	163°9.62 42.68	36°38.71 6.79	87°34.17 4.80	170° 57.91 16.47	
21	185°52.91	178°10.20 · · 43.18	51°39.94 · · 6.41	102°36.06 · · 4.83	186°0.17 · · 16.39	Horizontal parallax
22	200°55.38	193°10.78 43.67	66°41.17 6.02	117°37.95 4.86	201°2.42 16.31	Venus: 0.3 Mars: 0.1
23	215° 57.84	208°11.35 44.16	81°42.40 5.64	132°39.84 4.89	216°4.68 16.22	iviars: U.1
Mer.p	pass. 08:39	ν0.6' d0.5' m-4.61	$\nu 1.2' \ d ext{-}0.4' \ m1.08$	$\nu 1.9'~d0.0'~{\rm m} ext{-}1.95$	$\nu 2.3' \ d\text{-}0.1' \ \text{m}1.14$	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.96	N17°37.92	30° 12.70	16.7'	S09°48.41	13.4	54.0'
1	195°53.98	38.57	44°48.38	16.6'	10°1.80	13.4'	54.0'
2	210°54.01	39.22	59°24.02	16.6'	$10^{\circ}15.15$	13.3'	54.0'
3	225°54.03	• • 39.87	73°59.62	16.6'	$10^{\circ}28.46$	13.3'	53.9'
4	240°54.05	40.53	88°35.19	16.5'	10°41.74	13.2'	53.9'
5	255°54.07	41.18	103°10.72	16.5'	10°54.97	13.2'	53.9'
6	270°54.10 285°54.12	N17°41.83 42.48	117°46.21 132°21.66	16.5' 16.4'	\$11°8.17 11°21.32	13.2'	53.9'
7 8	300°54.12	42.48	132 21.00 146° 57.07	16.4	11 21.32 11°34.43	13.1' 13.1'	53.9' 53.9'
9	315°54.16	• • 43.78	161°32.44	16.3'	11°47.50	13.0'	53.9'
10	330°54.18	44.43	176°7.77	16.3'	12°0.53	13.0'	53.9'
11	345°54.20	45.07	190°43.06	16.2'	$12^{\circ}13.51$	12.9'	53.9'
12	0°54.22	N17°45.72	205°18.30	16.2'	S12°26.44	12.9'	53.9'
13	15°54.24	46.37	219°53.49	16.2'	$12^{\circ}39.33$	12.8'	53.9'
14	30°54.26	47.01	234°28.64	16.1'	12°52.17	12.8'	53.9'
15	45°54.28 60°54.30	· · 47.66 48.31	249°3.75 263°38.80	16.1' 16.0'	13° 4.97 13° 17.71	12.7'	53.9'
16 17	75°54.32	48.95	203 38.80 278°13.81	16.0'	13 17.71 13°30.41	12.7' 12.6'	53.9' 53.9'
18	90°54.34	N17° 49.60	292°48.77	15.9'	\$13°43.06	12.6'	53.9'
19	105°54.36	50.24	307°23.68	15.9'	13°55.66	12.5'	53.9'
20	120°54.38	50.88	321°58.54	15.8'	14°8.20	12.5'	53.9'
21	135°54.40	• • 51.53	336°33.35	15.8'	14°20.69	12.4'	53.9'
22	150°54.42	52.17	351°8.10	15.7'	14°33.13	12.4'	53.9'
23	165°54.44	52.81	5° 42.80	15.6'	14°45.52	12.3'	53.9'
	SD = 15.8'	d = 0.7'		SD	0 = 14.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0 0	180°54.45	N17° 53.45	20° 17.45	ν 15.6'	S14°57.84	12.3'	53.9'
1	195°54.47	54.09	34°52.04	15.5'	15° 10.12	12.2'	53.9'
2	210°54.49	54.73	49°26.58	15.5'	15°22.33	12.2'	53.9'
3	225°54.50	• • 55.37	64°1.06	15.4'	$15^{\circ}34.49$	12.1'	53.9'
4	240°54.52	56.01	78°35.49	15.4'	15°46.59	12.0'	53.9'
5	255°54.54	56.65	93°9.85	15.3'	15°58.63	12.0'	53.9'
6	270°54.55 285°54.57	N17°57.29 57.93	107°44.16 122°18.41	15.2' 15.2'	\$16° 10.61 16° 22.53	11.9' 11.9'	53.9' 53.9'
7 8	285 54.57 300°54.59	57.93 58.56	122 18.41 136°52.60	15.2 15.1'	16 22.53 16°34.39	11.9	53.9'
9	315°54.60	• • 59.20	151° 26.73	15.1'	16°46.18	11.7	53.9'
10	330°54.62	17°59.84	166°0.80	15.0'	16°57.91	11.7'	53.9'
11	345°54.63	18°0.47	180°34.80	14.9'	17°9.58	11.6'	53.9'
12	0°54.65	N18°1.11	195°8.75	14.9'	S17°21.18	11.5'	53.9'
13	15°54.66	1.74	209° 42.63	14.8'	17°32.71	11.5'	53.9'
14	30°54.67	2.37	224° 16.44	14.8'	17°44.17	11.4'	53.9'
15	45°54.69 60°54.70	· · 3.01	238° 50.19 253° 23.88	14.7' 14.6'	17°55.57 18°6.90	11.3'	53.9'
16 17	75°54.72	3.64 4.27	253 23.88 267°57.50	14.6'	18 6.90 18°18.16	11.3' 11.2'	53.9' 53.9'
18	90°54.73	N18°4.90	282°31.05	14.5'	S18°29.34	11.1'	53.9'
19	105°54.74	5.54	297°4.54	14.4'	18° 40.45	11.0'	53.9'
20	120°54.76	6.17	311°37.96	14.4'	18°51.50	11.0'	53.9'
21	135°54.77	• • 6.80	$326^{\circ}11.31$	14.3'	$19^{\circ}2.46$	10.9'	53.9'
22	150°54.78	7.43	340°44.60	14.2'	19° 13.35	10.8'	53.9'
23	165°54.79	8.06	355° 17.81	14.1'	19°24.17	10.7'	53.9'
	SD = 15.8'	d = 0.6'		SD	0 = 14.7'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°54.80	N18°8.69	9°50.96	14.1'	S19°34.91	10.7'	54.0'
1	195°54.82	9.31	24°24.04	14.0'	19°45.57	10.6'	54.0'
2	210°54.83 225°54.84	9.94	38°57.04	13.9'	19°56.15	10.5'	54.0'
3 4	225°54.84 240°54.85	· · 10.57 11.19	53°29.98 68°2.84	13.9' 13.8'	20° 6.65 20° 17.08	10.4' 10.3'	54.0' 54.0'
5	255°54.86	11.19	82°35.63	13.7'	20 17.06 20°27.42	10.3	54.0'
6	270°54.87	N18° 12.45	97°8.35	13.6'	S20°37.68	10.3	54.0'
7	285°54.88	13.07	111°41.00	13.6'	20°47.85	10.1	54.0'
8	300°54.89	13.70	$126^{\circ}13.58$	13.5'	20°57.94	10.0'	54.0'
9	315°54.90	• • 14.32	140°46.08	13.4'	21°7.94	9.9'	54.0'
10	330°54.91	14.94	155° 18.51	13.4'	21°17.86	9.8'	54.0'
11 12	345°54.92 0°54.93	15.57 N18° 16.19	169° 50.86 184° 23.15	13.3' 13.2'	21°27.69 <b>S</b> 21°37.44	9.7' 9.7'	54.0' 54.0'
13	0 54.93 15°54.93	16.81	184 23.15 198°55.35	13.1'	21°47.09	9.7 9.6'	54.0'
14	30°54.94	17.43	213°27.49	13.1	21°56.65	9.5	54.0'
15	45°54.95	• 18.05	227° 59.55	13.0'	22°6.12	9.4'	54.0'
16	60°54.96	18.67	242°31.53	12.9'	$22^{\circ}15.50$	9.3'	54.0'
17	75°54.97	19.29	257°3.44	12.8'	$22^{\circ}24.79$	9.2'	54.0'
18	90°54.97	N18° 19.91	271°35.27	12.8'	S22°33.98	9.1'	54.0'
19	105°54.98	20.53	286°7.03	12.7'	22°43.08	9.0'	54.1'
20 21	120°54.99 135°54.99	21.15 •• 21.77	300°38.72 315°10.33	12.6' 12.5'	22°52.08 23°0.98	8.9' 8.8'	54.1' 54.1'
21	135°54.99 150°55.00	22.38	315°10.33 329°41.86	12.5'	23°0.98 23°9.79	8.8'	54.1' 54.1'
23	165°55.01	23.00	344° 13.32	12.4'	23° 18.49	8.6'	54.1'
	SD = 15.8'	d = 0.6'			0 = 14.7'		
					± 1.1		

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

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

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-99%
10	03:36	03:37	11:56	22:36	10:16	
11	03:38	03:39	11:56	23:19	10:58	
12	03:39	03:40	11:56	-:-	11:42	

h	Aries	Ve	nus	,	ars	Jup	iter	Sat	urn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Doo
Tue 0	231°0.30	223°11.92	N02°44.66	96° 43.63	N19° 5.25	147°41.73	N23°4.92	231°6.93	S02°16.14			Dec
1	246°2.77	238°12.50	45.15	90° 43.03 111° 44.85	4.87	162°43.62	4.95	246° 9.19	16.06	Alpheratz	357°34.74	29°13.63
2	261°5.23	253° 13.07	45.65	126°46.08	4.48	177°45.51	4.97	261°11.45	15.98	Ankaa	353°7.16	-42°9.97
3	276°7.70	268° 13.64	46.15	141°47.31	• • 4.10	192°47.40	5.00	276° 13.70	. 15.90	Schedar	349°31.19	56° 40.35
4	291°10.16	283°14.21	46.65	156°48.54	3.71	207°49.28	5.03	291°15.96	15.82	Diphda	348°47.28	-17°50.84
5	$306^{\circ}12.62$	298°14.77	47.15	171°49.76	3.33	222°51.17	5.06	$306^{\circ}18.21$	15.74	Achernar	335°20.49	-57°6.36
6	321°15.09	313° 15.34	N02°47.65	186°50.99	N19°2.94	237°53.06	N23°5.09	321°20.47	S02°15.66	Hamal Polaris	327°51.24 314°23.74	23°34.82 89°22.20
7	$336^{\circ}17.55$	$328^{\circ}15.91$	48.15	201°52.22	2.56	252°54.95	5.12	336° 22.72	15.57	Acamar	314 23.74 315°11.99	-40° 12.17
8	351°20.02	343°16.47	48.65	216°53.44	2.17	267°56.84	5.15	351°24.98	15.49	Menkar	314°6.20	4° 11.29
9	6°22.48	358° 17.03	• • 49.15	231°54.67	• • 1.79	282°58.73	• • 5.18	6°27.24	• • 15.41	Mirfak	308°28.40	49°57.00
10	21°24.95	13° 17.59	49.66	246°55.89	1.40	298° 0.61	5.21	21°29.49	15.33	Aldebaran	290°39.65	16°33.57
11	36° 27.41 51° 29.87	28° 18.15 43° 18.71	50.16 N02°50.66	261°57.12 276°58.35	1.01 N19° 0.63	313°2.50 328°4.39	5.24 N23°5.27	36°31.75 51°34.01	15.25 \$02°15.17	Rigel	281°3.92	-8° 10.41
12 13	66° 32.34	43 16.71 58°19.27	51.17	270 56.55 291°59.57	19° 0.03	343° 6.28	5.29	66° 36.26	15.09	Capella	280°21.94	46°1.44
14	81°34.80	73° 19.83	51.68	307°0.80	18°59.85	358°8.17	5.32	81°38.52	15.09	Bellatrix	278°22.90	$6^{\circ}22.32$
15	96° 37.27	88°20.38	52.19	322°2.02	• • 59.47	13°10.05	5.35	96° 40.78	• • 14.93	Elnath	278°1.88	28°37.73
16	111°39.73	103°20.94	52.69	337°3.25	59.08	28°11.94	5.38	111°43.03	14.85	Alnilam	275°37.75	-1°11.20
17	$126^{\circ}42.19$	118°21.49	53.20	352°4.47	58.69	43°13.83	5.41	126° 45.29	14.76	Betelgeuse	270°52.08	7°24.67
18	141°44.66	133°22.04	N02°53.71	7°5.70	N18°58.30	58°15.72	N23°5.44	141°47.55	S02°14.68	Canopus Sirius	263°52.70 258°26.26	-52° 42.70 -16° 45.16
19	$156^{\circ}47.12$	148°22.59	54.23	22°6.92	57.92	73°17.60	5.47	156° 49.81	14.60	Adhara	255°5.91	-10 45.10 -29°0.54
20	171°49.59	163°23.14	54.74	37°8.15	57.53	88°19.49	5.50	171°52.06	14.52	Procyon	244°50.74	5°9.56
21	186°52.05	178°23.69	• • 55.25	52°9.37	• • 57.14	103°21.38	• • 5.53	186°54.32	• • 14.44	Pollux	243°17.17	27°57.96
22	201°54.52	193°24.24	55.77	67° 10.59	56.75	118°23.26	5.55	201°56.58	14.36	Avior	234°14.88	-59°35.69
23	216°56.98	208°24.79	56.28	82°11.82	56.36	133°25.15	5.58	216°58.84	14.28	Suhail	222°46.20	-43°32.34
Mer.p	pass. 08:35	$\nu$ 0.6′ d0.	.5′ m-4.60	$\nu$ 1.2 $^{\prime}$ d-0	0.4′ m1.09	$\nu 1.9' \ d0.$	0′ m-1.95	$\nu 2.3' \ d-0$	.1' m $1.14$	Miaplacidus	221°38.39	-69°49.55
		-		-				-		Alphard	217°47.52	-8°46.22
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.12	11°50.59
0	231°59.44	223°25.33	N02°56.80	97°13.04	N18°55.97	148°27.04	N23°5.61	232°1.09	502°14.20	Dubhe Denebola	193°40.42 182°24.50	61°37.09 14°25.81
1	$247^{\circ}1.91$	238°25.87	57.31	$112^{\circ}14.27$	55.58	163°28.93	5.64	247°3.35	14.12	Gienah	175°43.11	
2	262°4.37	253°26.42	57.83	$127^{\circ}15.49$	55.20	178°30.81	5.67	262°5.61	14.04	Acrux	172°59.37	-63° 14.64
3	277°6.84	268°26.96	• • 58.35	142° 16.71	• • 54.81	193°32.70	• • 5.70	277°7.87	• • 13.96	Gacrux	171°50.98	-57° 15.56
4	292°9.30	283°27.50	58.87	157° 17.94	54.42	208°34.58	5.72	292°10.13	13.88	Alioth	166°12.28	55° 49.45
5 6	307° 11.76 322° 14.23	298°28.04 313°28.58	59.39 N02°59.91	172°19.16 187°20.38	54.03 N18°53.64	223°36.47 238°38.36	5.75 N23°5.78	307° 12.39 322° 14.64	13.80 \$02°13.72	Spica	158°21.75	-11° 17.75
7	337° 16.69	328°29.11	03°0.43	202°21.60	53.25	253°40.24	5.81	337° 16.90	13.64	Alkaid	152°51.34	49° 11.24
8	352° 19.16	343°29.65	0.95	217°22.83	52.86	268°42.13	5.84	352° 19.16	13.56	Hadar	148°35.05	-60°29.87
9	7°21.62	358°30.18	1.47	232°24.05	• • 52.47	283°44.02	5.87	7°21.42	• • 13.48	Menkent	147°56.95	-36°29.83
10	22°24.09	13°30.72	2.00	247°25.27	52.08	298°45.90	5.89	22°23.68	13.40	Arcturus Rigil Kent.	145°47.35 139°39.32	19°2.96 -60°56.53
11	$37^{\circ}26.55$	28°31.25	2.52	262°26.49	51.69	313°47.79	5.92	37°25.94	13.32	Kochab	139 39.32 137°18.59	74°3.05
12	52°29.01	43°31.78	N03°3.05	277°27.71	N18°51.29	328°49.67	N23°5.95	52°28.20	502°13.24	Zuben'ubi	136°55.40	-16°8.94
13	67°31.48	58°32.31	3.57	292°28.94	50.90	343°51.56	5.98	67°30.46	13.16	Alphecca	126°3.15	26° 37.65
14	82°33.94	73°32.84	4.10	307°30.16	50.51	358°53.44	6.01	82°32.72	13.08	Antares	112°15.16	-26°29.34
15 16	97°36.41 112°38.87	88°33.37 103°33.89	· · 4.63 5.16	322°31.38 337°32.60	· · 50.12 49.73	13°55.33 28°57.21	• • 6.04 6.06	97°34.97 112°37.23	· · 13.00 12.92	Atria	107°8.63	-69°4.30
17	127°41.33	118°34.42	5.69	352°33.82	49.73	43°59.10	6.09	127°39.49	12.84	Sabik	102°2.17	-15°45.43
18	142°43.80	133°34.94	N03° 6.22	7°35.04	N18°48.94	59°0.99	N23°6.12	142°41.75	S02°12.76	Shaula Rasalhague	96°9.65 95°58.01	-37°7.30 12°32.35
19	$157^{\circ}46.26$	148°35.47	6.75	22°36.26	48.55	74°2.87	6.15	157°44.01	12.68	Eltanin	90°41.62	51° 28.87
20	172°48.73	163°35.99	7.28	37°37.48	48.16	89°4.76	6.18	172°46.27	12.60	Kaus Aust.	83°31.86	-34° 22.30
21	$187^{\circ}51.19$	178°36.51	• • 7.81	52°38.70	• • 47.77	104°6.64	• • 6.20	187°48.53	• • 12.52	Vega	80°32.74	38° 48.17
22	202°53.66	193°37.03	8.35	67°39.92	47.37	119°8.52	6.23	202°50.79	12.45	Nunki	75°47.19	-26° 15.88
23	217°56.12	208°37.55	8.88	82°41.14	46.98	134°10.41	6.26	217°53.05	12.37	Altair	61°59.55	8°55.97
Mer.p	pass. 08:31	$\nu$ 0.5′ d0.	.5′ m-4.59	$\nu$ 1.2 $^{\prime}$ d-0	0.4′ m1.10	$\nu 1.9' \ d0.$	0′ m-1.95	$\nu 2.3' \ d-0$	.1' m1.14	Peacock		-56° 38.98
										Deneb	49°25.52	45°21.93
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.55	9°59.32
0	232°58.58	223°38.07	N03° 9.42	97°42.36	N18°46.59	149°12.29	N23°6.29		S02°12.29	Al Na'ir	27°32.63	
1	248°1.05	238°38.58	9.95	112°43.58	46.19	164°14.18	6.31	247° 57.57	12.21	Fomalhaut Scheat	15°14.34	-29°29.19 28°13.00
2	263°3.51	253°39.10	10.49	127°44.80	45.80	179°16.06	6.34	262°59.83	12.13	Markab	13°45.09 13°29.77	15°20.34
3	278°5.98	268°39.61	• • 11.03	142°46.02	• • 45.41	194°17.95	• • 6.37	278°2.10	• • 12.05	IVIAIRAD	15 29.11	15 20.54
4	293°8.44	283°40.12	11.56	157°47.24	45.01	$209^{\circ}19.83$	6.40	293°4.36	11.97	May 13 Tue	SHA	Mer.pass
5	308° 10.91	298°40.64	12.10	172°48.46	44.62	224°21.72	6.43	308°6.62	11.89	Venus	352°11.62	09:07
6	323° 13.37	313°41.15	N03°12.64	187°49.68	N18°44.23	239°23.60	N23°6.45	323°8.88	S02°11.81	Mars	225°43.32	17:32
7	338° 15.83	328°41.66	13.18	202°50.90	43.83	254°25.48	6.48	338° 11.14	11.73	Jupiter	276°41.42	14:07
8 9	353° 18.30 8° 20.76	343°42.17 358°42.67	13.73 •• 14.27	217°52.11 232°53.33	43.44 •• 43.04	269°27.37 284°29.25	6.51 •• 6.54	353°13.40	11.65 •• 11.58	Saturn	0°6.63	08:34
10	23°23.23	13°43.18	14.27	232 53.33 247° 54.55	42.65	299°31.13	6.56	8° 15.66 23° 17.92	11.50	May 14 Wed	SHA	Mer.pass
11	38°25.69	28°43.68	15.36	262°55.77	42.25	314°33.02	6.59	38° 20.18	11.42	Venus	351°25.89	09:06
12	53°28.15	43°44.19	N03°15.90	277° 56.99	N18°41.86	329°34.90	N23°6.62	53°22.45	S02°11.34	Mars	225°13.60	17:30
13	68°30.62	58°44.69	16.45	292°58.20	41.46	344°36.78	6.65	68°24.71	11.26	Jupiter Saturn	276°27.59 0°1.65	14:04 08:31
14	83° 33.08	73°45.19	16.99	307°59.42	41.07	359°38.67	6.67	83° 26.97	11.18	Saturn	0 1.03	00:31
15	98° 35.55	88°45.69	17.54	323°0.64	• • 40.67	14°40.55	• • 6.70	98° 29.23	• • 11.10	May 15 Thu	SHA	Mer.pass
16	113° 38.01	103°46.19	18.09	338°1.86	40.27	29°42.43	6.73	113°31.49	11.03		350°39.48	09:05
17	128° 40.48 143° 42.94	118°46.69 133°47.19	18.64 N03°19.19	353°3.07 8°4.29	39.88 N18°39.48	44°44.32 59°46.20	6.75 N23°6.78	128° 33.76 143° 36.02	10.95 \$02°10.87	Mars	224°43.78	17:28
18 19	143 42.94 158°45.40	133 47.19 148°47.69	19.74	8 4.29 23°5.51	39.48	74°48.08	N23 6.78 6.81	143 30.02 158° 38.28	10.79	Jupiter Saturn	276°13.71 359°56.73	14:01 08:27
20	173° 47.87	163°48.18	20.29	38° 6.72	38.69	89°49.97	6.84	173° 40.54	10.79	Saturn	JUN 20.13	υδ:27
21	188° 50.33	178°48.68	• • 20.84	53°7.94	• • 38.29	104°51.85	• • 6.86	188° 42.80	• • 10.63	Horizo	ntal parallax	
22	203°52.80	193°49.17	21.39	68°9.15	37.89	119°53.73	6.89	203°45.07	10.56		Venus:	0.3
23	218°55.26	208°49.66	21.94	83°10.37	37.50	134°55.61	6.92	218°47.33	10.48		Mars:	0.1
Mer.	pass. 08:27	$\nu$ 0.5' d0.	.5′ m-4.58	$\nu$ 1.2' d-0	.4′ m1.11	$\nu 1.9' \ d0.$	0′ m-1.95	$\nu 2.3' \ d-0$	.1′ m1.14			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.01	N18°23.62	358°44.70	12.3'	S23°27.10	8.5'	54.1'
1	195°55.02	24.23	13°16.01	12.2'	23°35.61	8.4'	54.1'
2	210°55.02	24.85	27°47.24	12.2'	23°44.01	8.3'	54.1'
3	225°55.03	• • 25.46	42°18.40	12.1'	23°52.31	8.2'	54.1'
4 5	240°55.03 255°55.04	26.07 26.69	56°49.48 71°20.49	12.0' 11.9'	24°0.51 24°8.60	8.1' 8.0'	54.1' 54.1'
6	270°55.04	N18°27.30	85°51.42	11.9'	\$24°16.58	7.9	54.1
7	285°55.05	27.91	100°22.27	11.8'	24°24.46	7.8'	54.1'
8	300°55.05	28.52	114°53.06	11.7'	24°32.23	7.7'	54.1'
9	315°55.05	•• 29.13	129°23.76	11.6'	24°39.90	7.6'	54.2'
10	330°55.06	29.74	143°54.40	11.6'	24°47.45	7.4'	54.2'
11 12	345°55.06 0°55.06	30.35 N18°30.96	158°24.96 172°55.45	11.5' 11.4'	24°54.89 \$25°2.22	7.3' 7.2'	54.2' 54.2'
13	15°55.07	31.57	187°25.86	11.3'	25°9.44	7.1	54.2'
14	30°55.07	32.18	201°56.20	11.3'	25°16.55	7.0'	54.2'
15	45°55.07	• • 32.79	216°26.47	11.2'	$25^{\circ}23.54$	6.9'	54.2'
16	60°55.07	33.40	230°56.66	11.1'	25°30.41	6.8'	54.2'
17 18	75°55.07 90°55.07	34.00 N18°34.61	245°26.79 259°56.84	11.1' 11.0'	25°37.17 \$25°43.82	6.6' 6.5'	54.2' 54.2'
18	90 55.07 105°55.08	35.22	259 56.84 274°26.83	10.9	25°50.34	6.4'	54.2'
20	120°55.08	35.82	288°56.74	10.9	25°56.75	6.3	54.3'
21	135°55.08	• • 36.43	303°26.58	10.8'	26°3.03	6.2'	54.3'
22	150°55.08	37.03	317°56.35	10.7'	$26^{\circ}9.20$	6.0'	54.3'
23	165°55.08	37.63	332°26.06	10.6'	26°15.24	5.9'	54.3'
	SD = 15.8'	d = 0.6'		SD	0 = 14.8'		
Wed 0	<b>GHA</b> 180°55.08	<b>Dec</b> N18°38.24	<b>GHA</b> 346°55.70	u 10.6'	Dec 526°21.16	<i>d</i> 5.8'	<b>HP</b> 54.3'
1	180°55.08 195°55.08	38.84	1°25.27	10.5	26°26.96	5.8° 5.7'	54.3'
2	210°55.08	39.44	15°54.77	10.4	26°32.63	5.5'	54.3'
3	225°55.08	• • 40.04	30°24.21	10.4'	26°38.18	5.4'	54.3'
4	240°55.07	40.64	44°53.58	10.3'	$26^{\circ}43.61$	5.3'	54.3'
5	255°55.07	41.24	59°22.89	10.2'	26°48.90	5.2'	54.4'
6 7	270°55.07 285°55.07	N18°41.84 42.44	73°52.14 88°21.32	10.2' 10.1'	\$26°54.07 26°59.12	5.0' 4.9'	54.4' 54.4'
8	300°55.07	42.44	102°50.44	10.1	20 59.12 27°4.03	4.9 4.8'	54.4'
9	315°55.07	• • 43.64	117°19.50	10.0'	27°8.81	4.7'	54.4'
10	330°55.06	44.24	131°48.50	9.9'	$27^{\circ}13.46$	4.5'	54.4'
11	345°55.06	44.83	146°17.44	9.9'	27°17.98	4.4'	54.4'
12	0°55.06	N18°45.43	160°46.32	9.8'	\$27°22.37	4.3'	54.4'
13 14	15°55.05 30°55.05	46.02 46.62	175°15.15 189°43.92	9.8' 9.7'	27°26.63 27°30.75	4.1' 4.0'	54.5' 54.5'
15	45°55.05	47.21	204°12.63	9.7' 9.7'	27°34.74	4.0 3.9'	54.5'
16	60°55.04	47.81	218°41.29	9.6'	27°38.59	3.7'	54.5'
17	75°55.04	48.40	233°9.89	9.6'	$27^{\circ}42.31$	3.6'	54.5'
18	90°55.03	N18°49.00	247°38.45	9.5'	S27°45.89	3.4'	54.5'
19	105°55.03	49.59	262°6.95 276°35.40	9.5'	27°49.33	3.3'	54.5'
20 21	120°55.02 135°55.02	50.18 •• 50.77	276°35.40 291°3.80	9.4' 9.4'	27°52.64 27°55.81	3.2' 3.0'	54.5' 54.6'
22	150°55.01	51.36	305°32.16	9.4	27°58.84	2.9'	54.6'
23	165°55.01	51.95	320°0.47	9.3'	28°1.73	2.8'	54.6'
	SD = 15.8'	d = 0.6'		SD	0 = 14.8'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°55.00 195°54.99	N18°52.54 53.13	334°28.73 348°56.95	9.2' 9.2'	\$28°4.48 28°7.09	2.6' 2.5'	54.6' 54.6'
2	210°54.99	53.13	3°25.13	9.2 9.1'	28° 9.56	2.3	54.6'
3	225°54.98	• • 54.31	17°53.27	9.1'	28°11.88	2.2'	54.6'
4	240°54.97	54.90	$32^{\circ}21.36$	9.1'	$28^{\circ}14.07$	2.0'	54.7'
5	255°54.97	55.48	46°49.42	9.0'	28°16.11	1.9'	54.7'
6 7	270°54.96 285°54.95	N18°56.07 56.66	61°17.44 75°45.42	9.0' 8.9'	\$28°18.01 28°19.76	1.8' 1.6'	54.7' 54.7'
8	285 54.95 300 54.94	50.00 57.24	75°45.42 90°13.37	8.9'	28° 19.76 28° 21.37	1.5	54.7' 54.7'
9	315°54.93	57.83	104°41.28	8.9'	28°22.84	1.3'	54.7'
10	330°54.93	58.41	119°9.16	8.9'	28°24.16	1.2'	54.8'
11	345°54.92	58.99	133°37.01	8.8'	28°25.34	1.0'	54.8'
12	0°54.91	N18°59.58	148° 4.84	8.8'	\$28°26.37	0.9'	54.8'
13 14	15°54.90 30°54.89	19°0.16 0.74	162°32.63 177°0.40	8.8' 8.7'	28°27.25 28°27.99	0.7' 0.6'	54.8' 54.8'
15	45°54.88	. 1.32	177 0.40 191°28.14	8.7'	28°28.58	0.6	54.8'
16	60°54.87	1.91	205°55.85	8.7'	28°29.02	0.3	54.8'
17	75°54.86	2.49	220°23.55	8.7'	28°29.32	0.1'	54.9'
18	90°54.85	N19°3.07	234°51.22	8.7'	\$28°29.47	0.0'	54.9'
19 20	105°54.84 120°54.83	3.64 4.22	249°18.88 263°46.51	8.6' 8.6'	28°29.47 28°29.32	-0.1' -0.3'	54.9' 54.9'
20	120°54.83 135°54.81	4.22 • • 4.80	263°46.51 278°14.13	8.6'	28°29.32 28°29.02	-0.3' -0.4'	54.9'
22	150°54.80	5.38	276 14.13 292°41.74	8.6'	28°28.58	-0.4 -0.6'	54.9'
23	165°54.79	5.96	307°9.33	8.6'	28°27.98	-0.7'	55.0'
	SD = 15.8'	d = 0.6'		SD	0 = 14.9'		

Lat.	Twi	light	Sunrise	Sunset	Twi	ilight
Lat.	Naut.	Civil	Surrise	Sunset	Civil	Naut.
N 72°						
<b>N</b> 70°	////	////	00:51	23:15	////	////
68°	////	////	01:51	22:06	////	////
66°	////	////	02:25	21:31	////	////
64°	////	01:14	02:50	21:05	22:45	////
62°	////	01:55	03:09	20:46	22:02	////
60°	////	02:22	03:24	20:30	21:34	////
<b>N</b> 58°	01:06	02:42	03:37	20:17	21:12	22:52
56°	01:43	02:59	03:49	20:05	20:55	22:13
54°	02:09	03:13	03:59	19:55	20:41	21:46
52°	02:28	03:25	04:07	19:46	20:28	21:26
50°	02:44	03:36	04:15	19:38	20:18	21:10
45°	03:15	03:58	04:32	19:21	19:56	20:39
<b>N</b> 40°	03:37	04:15	04:46	19:08	19:38	20:16
35°	03:55	04:29	04:57	18:56	19:24	19:58
30°	04:10	04:41	05:07	18:46	19:12	19:43
20°	04:33	05:01	05:24	18:29	18:52	19:20
N $10^{\circ}$	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
<b>S</b> 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:58	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:15	17:40	18:09
$35^{\circ}$	05:49	06:20	06:47	17:06	17:33	18:03
40°	05:56	06:29	06:58	16:55	17:24	17:57
45°	06:03	06:38	07:10	16:42	17:14	17:49
<b>S</b> 50°	06:11	06:50	07:26	16:27	17:02	17:42
52°	06:14	06:55	07:33	16:19	16:57	17:38
54°	06:18	07:01	07:41	16:11	16:51	17:34
56°	06:21	07:07	07:50	16:02	16:45	17:31
58°	06:26	07:14	08:00	15:52	16:38	17:26
<b>S</b> 60°	06:30	07:22	08:12	15:40	16:30	17:22
Lat		Moonris	se		Moonse	t
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						

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

		Sun		Moon			
Day	Eqn.o	f Time	Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-95%	
13	03:40	03:40	11:56	00:05	12:29		
14	03:40	03:40	11:56	00:54	13:20		
15	02:40	03.40	11.56	01.46	14.12		

h _	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	233°57.72		N03°22.50	98°11.59	N18°37.10	149°57.50	N23°6.94	233°49.59	S02°10.40	Alpheratz	357°34.71	29°13.64
1	249°0.19	238°50.64	23.05	113° 12.80	36.70	164°59.38	6.97	248°51.86	10.32	Ankaa	353°7.14	-42°9.95
2	264°2.65	253°51.13	23.61	128° 14.02	36.30	180° 1.26	7.00	263°54.12	10.24	Schedar	349°31.16	56°40.35
3	279°5.12	268°51.62	• • 24.17	143°15.23	• • 35.90	195°3.14	• • 7.03	278° 56.38	• • 10.17	Diphda	348°47.25	-17°50.83
4	294°7.58	283°52.11	24.72	158° 16.45	35.51	210° 5.02	7.05	293°58.65	10.09	Achernar	335°20.47	-57°6.34
5	309° 10.05	298°52.59	25.28	173°17.66	35.11	225°6.91	7.08	309°0.91	10.01	Hamal	327°51.22	23°34.83
6 7	324° 12.51 339° 14.97	313°53.08 328°53.56	N03°25.84 26.40	188° 18.88 203° 20.09	N18°34.71 34.31	240° 8.79 255° 10.67	N23°7.11 7.13	324°3.17 339°5.44	\$02° 9.93 9.86	Polaris	314°23.15	89°22.18
8	354° 17.44	343°54.04	26.40	203 20.09 218° 21.31	33.91	270°12.55	7.13	354°7.70	9.80	Acamar	315°11.98	-40°12.15
9	9° 19.90	358° 54.52	• • 27.52	233° 22.52	33.51	285°14.43	7.19	9°9.96	• • 9.70	Menkar	$314^{\circ}6.19$	4°11.29
10	24°22.37	13°55.00	28.08	248° 23.74	33.11	300°16.31	7.21	24° 12.23	9.62	Mirfak	308°28.38	49°57.00
11	39° 24.83	28°55.48	28.64	263°24.95	32.71	315°18.20	7.24	39° 14.49	9.55	Aldebaran	290°39.65	16°33.58
12	54° 27.30	43°55.96	N03°29.21	278°26.17	N18°32.31	330°20.08	N23°7.27	54° 16.75	502° 9.47	Rigel	281°3.92	-8°10.40
13	69° 29.76	58°56.44	29.77	293°27.38	31.91	345°21.96	7.29	69° 19.02	9.39	Capella	280°21.93	46°1.44 6°22.32
14	84°32.22	73°56.91	30.34	308°28.59	31.51	0°23.84	7.32	$84^{\circ}21.28$	9.31	Bellatrix Elnath	278°22.89 278°1.87	0 22.32 28°37.73
15	99° 34.69	88°57.39	• • 30.90	323°29.81	• • 31.11	15°25.72	• • 7.35	99°23.55	• • 9.24	Alnilam	276 1.67 275°37.75	-1°11.19
16	114° 37.15	103°57.86	31.47	338°31.02	30.71	30°27.60	7.37	114° 25.81	9.16	Betelgeuse	270°52.08	7°24.67
17	129°39.62	118°58.34	32.03	353°32.23	30.31	45°29.48	7.40	129°28.08	9.08	Canopus	263°52.71	-52°42.69
18	144°42.08	133°58.81	N03°32.60	8°33.45	N18°29.91	60°31.36	N23°7.43	144°30.34	502° 9.00	Sirius	258°26.26	-16°45.16
19	159° 44.54	148°59.28	33.17	23°34.66	29.51	75°33.24	7.45	159° 32.61	8.93	Adhara	255° 5.92	-29°0.53
20	174°47.01	163°59.75	33.74	38° 35.87	29.11	90°35.12	7.48	174°34.87	8.85	Procyon	244°50.74	5°9.56
21	189°49.47	179°0.22	• • 34.31	53°37.08	• • 28.71	105°37.01	· · 7.50	189°37.14	• • 8.77	Pollux	243°17.17	27°57.96
22	204°51.94	194°0.68	34.88	68°38.30	28.31	120°38.89	7.53	204°39.40	8.70	Avior	234°14.90	-59°35.69
23	219°54.40	209°1.15	35.45	83°39.51	27.91	135°40.77	7.56	219°41.67	8.62	Suhail	222°46.22	-43°32.34
Mer.p	pass. 08:23	$\nu$ 0.5′ d0.6	6′ m-4.57	$\nu 1.2' \ d$ -0	.4' m1.12	$\nu 1.9' \ d0.$	0′ m-1.94	$\nu 2.3' \ d-0$	.1' m $1.13$	Miaplacidus	221°38.43	-69°49.55
										Alphard	217°47.53	-8°46.22
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.13	11°50.59
0	234° 56.87		N03°36.02	98° 40.72	N18°27.50	150° 42.65	N23°7.58	234°43.93	S02°8.54	Dubhe	193°40.44	61°37.09
1	249°59.33	239°2.08	36.60	113°41.93	27.10	165°44.53	7.61	249°46.20	8.47	Denebola	182°24.50	14°25.81
2	265°1.79	254°2.54	37.17	128° 43.15	26.70	180°46.41	7.64	264°48.46	8.39	Gienah	175°43.11	-17°41.13
3	280°4.26	269°3.01	37.74	143°44.36	26.30	195°48.29	7.66	279°50.73	• • 8.31	Acrux	172°59.38	-63°14.65
4	295°6.72	284°3.47	38.32	158° 45.57	25.90	210°50.17	7.69	294°53.00	8.24	Gacrux	171°50.98 166°12.29	-57°15.57 55°49.46
5	310°9.19	299°3.93	38.89	173°46.78	25.49	225°52.05	7.71	309°55.26	8.16	Alioth Spica	158°21.75	-11°17.75
6	325°11.65	314°4.39	N03°39.47	188°47.99	N18°25.09	240°53.93	N23°7.74	324°57.53	S02°8.08	Alkaid	150° 21.75 152° 51.34	49°11.25
7	$340^{\circ}14.11$	329°4.84	40.05	203°49.20	24.69	255°55.81	7.77	339°59.79	8.01	Hadar	148°35.05	-60°29.89
8	355° 16.58	344°5.30	40.63	218°50.41	24.28	270°57.69	7.79	355°2.06	7.93	Menkent	147°56.94	-36°29.84
9	10° 19.04	359°5.76	• • 41.21	233°51.62	• • 23.88	285°59.56	• • 7.82	10°4.33	• • 7.85	Arcturus	145°47.34	19°2.96
10	25°21.51	14°6.21	41.78	248°52.83	23.48	301°1.44	7.84	25°6.59	7.78	Rigil Kent.	139°39.31	-60°56.55
11	40°23.97	29°6.67	42.36	263°54.05	23.07	316° 3.32	7.87	40°8.86	7.70	Kochab	137°18.60	74°3.06
12	55° 26.44	44°7.12	N03°42.95	278°55.26	N18°22.67	331°5.20	N23°7.90	55°11.13	\$02°7.62	Zuben'ubi	136°55.39	-16°8.94
13 14	70°28.90 85°31.36	59°7.57 74°8.02	43.53 44.11	293°56.47 308°57.68	22.26 21.86	346°7.08 1°8.96	7.92 7.95	70° 13.39 85° 15.66	7.55 7.47	Alphecca	126°3.14	26°37.66
15	100°33.83	89°8.47	• • 44.69	323° 58.89	. 21.46	16°10.84	· · 7.97	100° 17.93	• • 7.40	Antares	112°15.14	-26°29.35
16	115° 36.29	104°8.92	45.28	339°0.10	21.40	31°12.72	8.00	115° 20.19	7.32	Atria	107°8.59	-69°4.31
17	130°38.76	119°9.37	45.86	354°1.30	20.65	46°14.60	8.02	130°22.46	7.24	Sabik	102°2.15	-15°45.43
18	145°41.22		N03°46.45		N18°20.24	61°16.48	N23°8.05	145°24.73	S02°7.17	Shaula	96°9.62	-37°7.30
19	160°43.69	149°10.26	47.03	24°3.72	19.84	76°18.35	8.08	$160^{\circ}26.99$	7.09	Rasalhague Eltanin	95°57.99 90°41.60	12°32.35 51°28.88
20	175°46.15	$164^{\circ}10.71$	47.62	39°4.93	19.43	91°20.23	8.10	$175^{\circ}29.26$	7.02	Kaus Aust.	83°31.84	-34°22.30
21	190°48.61	$179^{\circ}11.15$	• • 48.21	54°6.14	• • 19.02	106°22.11	• • 8.13	190°31.53	• • 6.94	Vega	80°32.72	38°48.18
22	205°51.08	194° 11.59	48.79	69°7.35	18.62	121°23.99	8.15	205°33.80	6.87	Nunki	75°47.16	-26°15.88
23	220°53.54	209°12.03	49.38	84°8.56	18.21	136°25.87	8.18	220°36.07	6.79	Altair	61°59.52	8°55.98
Mer.	pass. 08:19	$\nu$ 0.5′ d0.6	6′ m-4.55	$\nu 1.2' \ d-0$	.4' m1.14	$\nu 1.9' \ d0.$	0′ m-1.94	$\nu 2.3' \ d-0$	.1′ m1.13	Peacock	53°5.06	-56°38.98
										Deneb	49°25.49	45°21.94
_	6114	6114		6114	5	6114	_	6114	_	Enif	33°38.52	9°59.33
Sun	<b>GHA</b> 235°56.01	<b>GHA</b> 224°12.47	Dec	<b>GHA</b> 99°9.77	<b>Dec</b> N18° 17.81	<b>GHA</b> 151°27.75	Dec	<b>GHA</b> 235°38.33	Dec 502°6.71	Al Na'ir	27°32.59	-46°50.10
0 1	250°58.47	224 12.47 239°12.91	50.56	99 9.77 114° 10.98	17.40	151 27.75 166°29.62	N23°8.20 8.23	250°40.60	\$02°6.71 6.64	Fomalhaut	15°14.31	-29°29.18
2	266° 0.93	259 12.91 254°13.35	51.15	114 10.96 129°12.18	16.99	100 29.02 181°31.50	8.25	265° 42.87	6.56	Scheat	13°45.06	28°13.01
3	281°3.40	269°13.79	• • 51.74	144° 13.39	. 16.59	196°33.38	• 8.28	280° 45.14	• • 6.49	Markab	13°29.74	15°20.35
4	296°5.86	284° 14.23	52.34	159° 14.60	16.18	211°35.26	8.30	295°47.41	6.41	May 16 Fri	SHA	Mer.pass
5	311°8.33	299°14.66	52.93	174° 15.81	15.77	226°37.14	8.33	310°49.68	6.34	Venus	349°52.43	09:04
6	326° 10.79	314° 15.10	N03°53.52		N18°15.37	241°39.01	N23°8.35	325°51.94	S02°6.26	Mars		17:26
7	341°13.26	329° 15.53	54.12	204°18.22	14.96	256°40.89	8.38	340°54.21	6.19	Jupiter	$275^{\circ}59.77$	13:58
8	$356^{\circ}15.72$	$344^{\circ}15.96$	54.71	219°19.43	14.55	271°42.77	8.40	355°56.48	6.11	Saturn	$359^{\circ}51.87$	08:23
9	11°18.18	$359^{\circ}16.40$	•• 55.31	234°20.64	• • 14.14	286°44.65	• • 8.43	10°58.75	• • 6.04	May 17 Sat	SHA	Mor poss
10	26° 20.65	14° 16.83	55.90	249°21.84	13.74	301°46.52	8.45	26°1.02	5.96	Venus	349° 4.75	Mer.pass 09:04
11	41°23.11	29°17.26	56.50	264°23.05	13.33	316°48.40	8.48	41°3.29	5.89	Mars		17:24
12	56°25.58	44°17.68	N03°57.10	279°24.26	N18°12.92	331°50.28	N23°8.50	56°5.56	S02°5.81	Jupiter	275°45.78	13:55
13	71°28.04	59°18.11	57.70	294°25.46	12.51	346°52.15	8.53	71°7.83	5.74	Saturn	359°47.07	08:20
14	86°30.50	74°18.54	58.29	309°26.67	12.10	1°54.03	8.55	86° 10.10	5.66			
15 16	101°32.97	89°18.96	· · 58.89	324°27.88	11.69	16°55.91	· · 8.58	101°12.37	· · 5.59	May 18 Sun	SHA	Mer.pass
16	116° 35.43	104°19.39	03°59.49	339°29.08	11.28	31°57.79	8.60	116° 14.64	5.51	Venus		09:03
17	131°37.90	119° 19.81	04°0.10	354°30.29	10.87	46°59.66	8.63	131°16.91	5.44 502° 5.26	Mars		17:22
18 19	146° 40.36 161° 42.83	134°20.23 149°20.66	N04°0.70 1.30	9°31.50 24°32.70	N18°10.47 10.06	62° 1.54 77° 3.42	N23°8.65	146° 19.18 161° 21.45	\$02°5.36	Jupiter		13:52
20	101 42.83 176° 45.29	149 20.00 164°21.08	1.30	39° 33.91	9.65	92° 5.29	8.68 8.70	101 21.45 176°23.72	5.29 5.21	Saturn	359°42.33	08:16
21	176 45.29 191° 47.75	104 21.08 179°21.50	. 2.51	59 33.91 54°35.11	• • 9.24	92 5.29 107° 7.17	8.70 •• 8.73	176 23.72 191°25.99	5.21	Horizoi	ntal parallax	
22	206° 50.22	194°21.92	3.11	69°36.32	8.83	122° 9.04	8.75	206°28.26	5.06		Venus:	0.2
23	221°52.68	209°22.33	3.72	84°37.52	8.42	137°10.92	8.78	221°30.53	4.99		Mars:	0.1
	pass. 08:15	$\nu$ 0.4' d0.6			0.4' m1.15		0′ m-1.94		.1′ m1.13		-	
1/1~												

h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.78	N19°6.53	321°36.91	8.6'	<b>S</b> 28°27.24	-0.9'	55.0'
1	195°54.77	7.11	336°4.47	8.6'	28°26.35	-1.0'	55.0'
2	210°54.75 225°54.74	7.68 •• 8.26	350°32.03 4°59.58	8.6' 8.5'	28°25.31 28°24.12	-1.2' -1.3'	55.0' 55.0'
4	240°54.73	8.83	19° 27.13	8.5	28°22.78	-1.5'	55.1'
5	255° 54.72	9.41	33°54.67	8.5'	28°21.29	-1.6'	55.1'
6	270°54.70	N19° 9.98	48°22.20	8.5'	\$28°19.65	-1.8'	55.1'
7	285°54.69	10.55 11.12	62°49.73	8.5'	28°17.86	-1.9'	55.1'
8 9	300°54.67 315°54.66	11.12	77°17.27 91°44.80	8.5' 8.5'	28°15.92 28°13.84	-2.1' -2.2'	55.1' 55.2'
10	330°54.64	12.27	106° 12.34	8.5	28°11.60	-2.2 -2.4'	55.2'
11	345°54.63	12.84	120°39.87	8.5'	$28^{\circ}9.21$	-2.5'	55.2'
12	0°54.62	N19°13.41	135°7.42	8.6'	\$28°6.68	-2.7'	55.2'
13 14	15°54.60 30°54.58	13.98 14.54	149°34.97 164°2.53	8.6' 8.6'	28°3.99 28°1.16	-2.8' -3.0'	55.2' 55.2'
15	30 54.58 45°54.57	14.54	104 2.53 178° 30.09	8.6'	28 1.10 27°58.17	-3.0 -3.1'	55.2' 55.3'
16	60° 54.55	15.68	192°57.67	8.6'	27°55.04	-3.3	55.3'
17	75° 54.54	16.25	207°25.26	8.6'	$27^{\circ}51.76$	-3.4'	55.3'
18	90°54.52	N19°16.81	221°52.86	8.6'	\$27°48.33	-3.6'	55.3'
19 20	105°54.50 120°54.49	17.38 17.94	236°20.48 250°48.11	8.6' 8.6'	27°44.75 27°41.02	-3.7' -3.9'	55.4' 55.4'
21	135°54.47	. 18.51	265° 15.76	8.7'	27°37.15	-3.9 -4.0'	55.4'
22	150° 54.45	19.07	279°43.43	8.7'	27°33.12	-4.2'	55.4'
23	165°54.43	19.64	294°11.11	8.7'	27°28.95	-4.3'	55.4'
	SD = 15.8'	d = 0.6'		SI	O = 15.0'		
C-+	GHA	Daa	CHA		Dec	L.	НР
Sat 0	GHA 180°54.42	<b>Dec</b> N19°20.20	<b>GHA</b> 308° 38.82	ν 8.7'	Dec \$27°24.64	d -4.5'	HP 55.5'
1	195°54.40	20.76	323°6.55	8.8'	27°20.17	-4.6'	55.5'
2	210°54.38	21.32	337°34.30	8.8'	27°15.56	-4.8'	55.5'
3	225°54.36	• • 21.89	352°2.08	8.8'	27°10.81	-4.9'	55.5'
4 5	240°54.34 255°54.32	22.45 23.01	6°29.88 20°57.71	8.8' 8.9'	27°5.90 27°0.86	-5.0' -5.2'	55.5' 55.6'
6	270°54.30	N19°23.57	35°25.56	8.9'	\$26°55.66	-5.2 -5.3	55.6'
7	285°54.28	24.12	49°53.44	8.9'	26°50.33	-5.5'	55.6'
8	300°54.26	24.68	64°21.36	8.9'	26°44.84	-5.6'	55.6'
9	315°54.24	• • 25.24	78°49.30 93°17.28	9.0'	26°39.22	-5.8'	55.7'
10 11	330°54.22 345°54.20	25.80 26.36	93 17.28 107°45.28	9.0' 9.0'	26°33.45 26°27.54	-5.9' -6.1'	55.7' 55.7'
12	0°54.18	N19°26.91	122° 13.33	9.1'	S26°21.48	-6.2	55.7'
13	15°54.16	27.47	136°41.40	9.1'	26°15.29	-6.3	55.8'
14 15	30°54.14 45°54.11	28.02 •• 28.58	151°9.51 165°37.66	9.1' 9.2'	26°8.95 26°2.47	-6.5' -6.6'	55.8' 55.8'
16	60°54.09	29.13	180°5.84	9.2' 9.2'	25°55.85	-6.8'	55.8'
17	75° 54.07	29.68	194°34.07	9.3'	25°49.09	-6.9'	55.8'
18	90°54.05	N19°30.24	209°2.33	9.3'	S25°42.20	-7.0'	55.9'
19	105°54.03 120°54.00	30.79 31.34	223°30.63 237°58.97	9.3'	25°35.16 25°27.98	-7.2' -7.3'	55.9'
20 21	120°54.00 135°53.98	31.34	252° 27.35	9.4' 9.4'	25°27.98 25°20.67	-7.3° -7.4'	55.9' 55.9'
22	150°53.96	32.44	266°55.77	9.5'	25°13.22	-7.6'	56.0'
23	165°53.93	32.99	281°24.23	9.5'	$25^{\circ}5.64$	-7.7'	56.0'
	SD = 15.8'	d = 0.6'		SI	O = 15.1'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	180°53.91	N19°33.54	295°52.74	9.5'	\$24°57.92	-7.9'	56.0'
1	195°53.88	34.09	310°21.29	9.6'	24°50.06	-8.0'	56.0'
2	210°53.86	34.64	324°49.88	9.6'	24°42.07	-8.1'	56.1'
3 4	225°53.83 240°53.81	· · 35.18 35.73	339° 18.52 353° 47.20	9.7' 9.7'	24°33.95 24°25.69	-8.3' -8.4'	56.1' 56.1'
5	255° 53.78	36.28	8° 15.93	9.8'	24° 17.30	-8.5	56.2'
6	270°53.76	N19°36.82	22°44.70	9.8'	S24°8.78	-8.7'	56.2'
7	285°53.73	37.37	37° 13.52	9.9'	24°0.13	-8.8'	56.2'
8 9	300°53.71 315°53.68	37.91 •• 38.46	51°42.38 66°11.29	9.9' 10.0'	23°51.35 23°42.44	-8.9' -9.0'	56.2' 56.3'
10	330° 53.65	39.00	80° 40.25	10.0'	23°33.40	-9.0 -9.2'	56.3
11	345°53.63	39.54	95°9.26	10.1'	23°24.24	-9.3'	56.3'
12	0°53.60	N19°40.09	109°38.31	10.1'	\$23°14.94	-9.4'	56.3'
13 14	15°53.57 30°53.55	40.63 41.17	124°7.41 138°36.56	10.1' 10.2'	23°5.52 22°55.98	-9.5' -9.7'	56.4' 56.4'
15	45° 53.52	• • 41.71	150 50.50 153°5.76	10.2'	22°46.31	-9.7 -9.8'	56.4'
16	60°53.49	42.25	167° 35.00	10.3'	22°36.51	-9.9'	56.5'
17	75°53.46	42.79	182°4.30	10.3'	22°26.60	-10.0'	56.5'
18 19	90°53.43 105°53.41	N19°43.33 43.87	196°33.64 211°3.03	10.4' 10.4'	\$22°16.56 22°6.40	-10.2' -10.3'	56.5' 56.5'
19 20	105°53.41 120°53.38	43.8 <i>7</i> 44.40	211°3.03 225°32.47	10.4	22°6.40 21°56.11	-10.3° -10.4'	56.6'
21	135°53.35	• • 44.94	240°1.96	10.5'	21°45.71	-10.5	56.6'
22	150°53.32	45.48	254°31.49	10.6'	21°35.19	-10.6'	56.6'
23	165°53.29	46.01	269°1.08	10.6'	21°24.55	-10.8'	56.7'
	SD = 15.8'	d = 0.5'		SI	D = 15.3'		

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

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	236°55.15	224°22.75 N04°4.32	99°38.73 N18°8.01	152°12.80 N23°8.80	236°32.80	
1	251°57.61	239°23.17 4.93	114°39.93 7.59	167°14.67 8.83	251°35.07 4.84	Alpheratz 357°34.69 29°13.64
2	267°0.07	254°23.58 5.54	129°41.14 7.18	182°16.55 8.85	266°37.34 4.77	Ankaa 353°7.11 -42°9.94 Schedar 349°31.13 56°40.35
3	282°2.54	269°23.99 · · 6.14	144°42.34 · · 6.77	197°18.42 • • 8.88	281°39.61 · · 4.69	Diphda 348°47.23 -17°50.82
4	297°5.00	284°24.41 6.75	159°43.55 6.36	212°20.30 8.90	296°41.88 4.62	Achernar 335°20.44 -57°6.32
5	312°7.47	299°24.82 7.36	174° 44.75 5.95	227°22.18 8.92	311°44.15 4.54	Hamal 327°51.20 23°34.83
6	327°9.93	314°25.23 N04°7.97	189°45.95 N18°5.54	242°24.05 N23°8.95	326°46.42 \$02°4.47	Polaris 314°22.71 89°22.17
7 8	342°12.40 357°14.86	329°25.64 8.58 344°26.05 9.19	204° 47.16 5.13 219° 48.36 4.72	257°25.93 8.97 272°27.80 9.00	341°48.69 4.40 356°50.97 4.32	Acamar 315°11.96 -40°12.13
9	12° 17.32	359°26.46 · · 9.80	234°49.57 · · 4.30	287°29.68 · · 9.02	11°53.24 · · 4.25	Menkar 314° 6.18 4° 11.30
10	27° 19.79	14° 26.86 10.42	249°50.77 3.89	302°31.55 9.05	26°55.51 4.17	Mirfak 308°28.37 49°56.99
11	42°22.25	29°27.27 11.03	264°51.97 3.48	317°33.43 9.07	41°57.78 4.10	Aldebaran 290°39.64 16°33.58
12	57°24.72	44°27.67 N04°11.64	279°53.18 N18°3.07	332°35.30 N23°9.09	57°0.05 S02°4.03	Rigel 281°3.92 -8°10.39 Capella 280°21.93 46°1.43
13	$72^{\circ}27.18$	59°28.08 12.26	294°54.38 2.65	347°37.18 9.12	72°2.32 3.95	Bellatrix 278°22.89 6°22.33
14	87°29.64	74°28.48 12.87	309°55.58 2.24	2°39.05 9.14	87°4.60 3.88	Elnath 278°1.87 28°37.73
15	102°32.11	89°28.88 · · 13.49	324°56.78 · · 1.83	17°40.93 · · 9.17	102°6.87 · · 3.81	Alnilam 275°37.75 -1°11.19
16 17	117°34.57 132°37.04	104°29.29 14.10 119°29.69 14.72	339° 57.99 1.41 354° 59.19 1.00	32°42.80 9.19 47°44.68 9.21	117°9.14 3.73 132°11.41 3.66	Betelgeuse 270°52.08 7°24.68
18	132 37.04 147°39.50	134°30.08 N04°15.34	10°0.39 N18°0.59	62°46.55 N23°9.24	132°11.41 3.66 147°13.69 \$02°3.59	Canopus 263°52.72 -52°42.67
19	162°41.96	149°30.48 15.96	25°1.59 18°0.17	77°48.43 9.26	162°15.96 3.51	Sirius 258°26.26 -16°45.15
20	177° 44.43	164°30.88 16.57	40°2.80 17°59.76	92°50.30 9.29	177°18.23 3.44	Adhara 255°5.92 -29°0.52
21	192°46.89	179°31.28 · · 17.19	55°4.00 · · 59.34	107°52.18 · · 9.31	192°20.50 · · 3.37	Procyon 244°50.74 5°9.57
22	207°49.36	194°31.67 17.81	70°5.20 58.93	122°54.05 9.33	207°22.78 3.29	Pollux 243°17.18 27°57.96
23	222°51.82	209°32.07 18.44	85°6.40 58.51	137°55.92 9.36	222°25.05 3.22	Avior 234°14.93 -59°35.68 Suhail 222°46.23 -43°32.34
Merr	pass. 08:11	ν0.4' d0.6' m-4.53	$\nu$ 1.2' d-0.4' m1.16	$\nu 1.9' \ d0.0' \ \text{m-}1.94$	ν2.3' d-0.1' m1.12	Miaplacidus 221°38.48 -69°49.55
- IVICI.	Dass. 00.11	νο.4 ασ.σ III-4.33	ν1.2 α-0.4 III1.10	ν1.9 d0.0 III-1.94	ν2.3 d-0.1 III1.12	Alphard 217°47.54 -8°46.22
_						Regulus 207°34.14 11°50.59
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.45 61°37.09
0	237°54.29	224°32.46 N04°19.06 239°32.85 19.68	100°7.60 N17°58.10	152°57.80 N23°9.38	237°27.32	Denebola 182°24.51 14°25.81
1 2	252° 56.75 267° 59.21	239°32.85 19.68 254°33.25 20.30	115°8.80 57.69 130°10.01 57.27	167°59.67 9.41 183°1.55 9.43	252°29.60 3.07 267°31.87 3.00	Gienah 175°43.12 -17°41.13
3	283°1.68	269°33.64 · · 20.92	145°11.21 · · 56.85	198° 3.42 · · 9.45	282°34.14 · · 2.93	Acrux 172°59.40 -63°14.66
4	298°4.14	284°34.03 21.55	160°12.41 56.44	213° 5.30 9.48	297°36.42 2.85	Gacrux 171°51.00 -57°15.59
5	313°6.61	299°34.41 22.17	175°13.61 56.02	228°7.17 9.50	312°38.69 2.78	Alioth 166°12.30 55°49.47
6	328°9.07	314°34.80 N04°22.80	190°14.81 N17°55.61	243°9.04 N23°9.52	327°40.97 <b>S</b> 02°2.71	Spica 158°21.75 -11°17.75 Alkaid 152°51.34 49°11.26
7	$343^{\circ}11.53$	329°35.19 23.42	205°16.01 55.19	258°10.92 9.55	342°43.24 2.64	Hadar 148°35.05 -60°29.90
8	358° 14.00	344°35.58 24.05	220° 17.21 54.78	273°12.79 9.57	357°45.51 2.56	Menkent 147°56.94 -36°29.85
9	13° 16.46	359°35.96 · · 24.68	235°18.41 · · 54.36	288°14.66 · · 9.59	12°47.79 · · 2.49	Arcturus 145°47.34 19°2.97
10	28° 18.93	14°36.34 25.30	250°19.61 53.94	303°16.54 9.62	27°50.06 2.42	Rigil Kent. 139°39.30 -60°56.56
11 12	43°21.39 58°23.85	29°36.73 25.93 44°37.11 N04°26.56	265°20.81 53.53 280°22.01 N17°53.11	318°18.41 9.64 333°20.28 N23°9.66	42°52.34 2.35 57°54.61 S02°2.27	Kochab 137°18.61 74°3.08
13	73°26.32	59°37.49 27.19	295°23.21 52.69	348°22.16 9.69	72°56.89 2.20	Zuben'ubi 136°55.38 -16°8.95
14	88° 28.78	74°37.87 27.82	310° 24.41 52.27	3°24.03 9.71	87°59.16 2.13	Alphecca 126°3.13 26°37.67
15	103°31.25	89°38.25 · · 28.45	325°25.61 · · 51.86	18°25.90 · · 9.73	103°1.44 · · 2.06	Antares 112°15.12 -26°29.35 Atria 107°8.56 -69°4.33
16	118°33.71	104°38.63 29.08	340°26.81 51.44	33°27.77 9.76	118°3.71 1.98	Atria 107°8.56 -69°4.33   Sabik 102°2.13 -15°45.43
17	133°36.18	119°39.01 29.72	355°28.01 51.02	48°29.65 9.78	133°5.99 1.91	Shaula 96°9.60 -37°7.31
18	148°38.64	134°39.38 N04°30.35	10°29.21 N17°50.60	63°31.52 N23°9.80	148°8.26 \$02°1.84	Rasalhague 95°57.97 12°32.36
19	163°41.10	149°39.76 30.98	25°30.40 50.19	78°33.39 9.83	163°10.54 1.77	Eltanin 90°41.58 51°28.90
20	178° 43.57	164°40.13 31.61	40°31.60 49.77	93°35.27 9.85	178°12.81 1.70	Kaus Aust. 83°31.81 -34°22.30
21 22	193° 46.03 208° 48.50	179°40.51 · · 32.25 194°40.88 32.88	55° 32.80 · · 49.35 70° 34.00 48.93	108°37.14 · · 9.87 123°39.01 9.89	193°15.09 · · 1.62 208°17.36 1.55	Vega 80°32.70 38°48.19
23	208 48.50 223°50.96	209°41.25 33.52	85°35.20 48.51	138°40.88 9.92	200 17.50 1.55 223°19.64 1.48	Nunki 75°47.14 -26°15.88
		-				Altair 61°59.50 8°55.98
Mer.p	pass. 08:07	$\nu$ 0.4′ $d$ 0.6′ m-4.52	$\nu 1.2' \ d$ -0.4' m1.17	$\nu 1.9' \ d0.0' \ \text{m-}1.94$	$\nu 2.3' \ d$ -0.1' m1.12	Peacock 53°5.02 -56°38.98 Deneb 49°25.46 45°21.94
						Deneb 49°25.46 45°21.94 Enif 33°38.49 9°59.34
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.55 -46°50.09
0	238° 53.42	224°41.63 N04°34.16	100°36.40 N17°48.09	153°42.76 N23°9.94	238°21.92 <b>S</b> 02°1.41	Fomalhaut 15°14.28 -29°29.17
1	253° 55.89	239°42.00 34.79	115° 37.59 47.67	168°44.63 9.96	253°24.19 1.34	Scheat 13°45.04 28°13.01
2	268° 58.35	254°42.36 35.43	130°38.79 47.25 145°39.99 • 46.83	183°46.50 9.99	268°26.47 1.26	Markab 13°29.71 15°20.36
3 4	284°0.82 299°3.28	269°42.73 · · 36.07 284°43.10 36.71	145°39.99 · · 46.83 160°41.19 46.41	198°48.37 ·· 10.01 213°50.24 10.03	283°28.74 · · 1.19 298°31.02 1.12	May 19 Mon SHA Mer.pass
5	299 3.20 314°5.74	299° 43.47 37.35	175° 42.39 45.99	213 50.24 10.05 228°52.12 10.05	313°33.30 1.05	Venus 347°27.60 09:02
6	329°8.21	314°43.83 N04°37.98	190°43.58 N17°45.57	243°53.99 N23°10.08	328°35.57 S02°0.98	Mars 222°43.58 17:20
7	344° 10.67	329°44.20 38.63	205° 44.78 45.15	258°55.86 10.10	343°37.85 0.91	Jupiter 275°17.65 13:49
8	359° 13.14	344°44.56 39.27	220°45.98 44.73	273°57.73 10.12	358°40.13 0.83	Saturn 359°37.65 08:13
9	$14^{\circ}15.60$	359°44.92 · · 39.91	235°47.17 · · 44.31	288°59.60 · · 10.14	13°42.40 · · 0.76	May 20 Tue SHA Mer.pass
10	29° 18.06	14°45.29 40.55	250°48.37 43.89	304°1.47 10.17	28°44.68 0.69	Venus 346°38.18 09:02
11	44°20.53	29°45.65 41.19	265°49.57 43.47	319°3.34 10.19	43°46.96 0.62	Mars 222°13.32 17:18
12	59°22.99	44°46.01 N04°41.84	280°50.76 N17°43.05	334°5.22 N23°10.21	58°49.24 \$02°0.55	Jupiter 275° 3.51 13:46
13 14	74°25.46 89°27.92	59°46.37 42.48 74°46.73 43.12	295°51.96 42.63 310°53.16 42.21	349°7.09 10.23 4°8.96 10.26	73°51.51 0.48 88°53.79 0.41	Saturn 359°33.04 08:09
15	104°30.38	89°47.08 · · 43.77	325°54.35 · · 41.78	19°10.83 · · 10.28	103°56.07 · · 0.34	May 21 Wed SHA Mer.pass
16	119° 32.85	104°47.44 44.41	340°55.55 41.36	34°12.70 10.30	118°58.35 0.27	May 21 Wed SHA Mer.pass Venus 345°48.20 09:01
17	134°35.31	119°47.80 45.06	355°56.74 40.94	49°14.57 10.32	134°0.62 0.19	Mars 221°42.97 17:16
18	149°37.78	134°48.15 N04°45.71	10°57.94 N17°40.52	64°16.44 N23°10.35	149°2.90 \$02°0.12	Jupiter 274°49.33 13:43
19	$164^{\circ}40.24$	149°48.50 46.35	25°59.13 40.09	79°18.31 10.37	164°5.18 0.05	Saturn 359°28.49 08:05
20	179° 42.71	164°48.86 47.00	41°0.33 39.67	94°20.18 10.39	179°7.46 01°59.98	Havisantal navallen
21	194° 45.17	179°49.21 · · 47.65	56°1.53 · · 39.25	109°22.05 · · 10.41	194°9.74 01°59.91	Horizontal parallax Venus: 0.2
22	209°47.63	194°49.56 48.30	71°2.72 38.83	124°23.93 10.43	209°12.01 59.84	Venus: 0.2 Mars: 0.1
23	224°50.10	209°49.91 48.95	86°3.92 38.40	139°25.80 10.46	224°14.29 59.77	IVIGIS. U.1
Mer.p	bass. 08:03	$\nu$ 0.4′ $d$ 0.6′ m-4.51	$\nu 1.2' \ d$ -0.4' m1.18	$\nu 1.9^{\prime}~d0.0^{\prime}~\text{m-}1.93$	$ u 2.3' \ d$ -0.1' m1.12	

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.26	N19° 46.55	283°30.71	10.7'	S21° 13.80	-10.9'	56.7'
1	195°53.23	47.08	298°0.39	10.7	21°2.93	-10.9	56.7
2	210°53.20	47.62	312°30.12	10.7	20°51.94	-11.1'	56.7'
3	225°53.17	• • 48.15	326°59.89	10.8	20° 40.84	-11.1	56.8'
4	240°53.14	48.69	341°29 71	10.9	20° 29 62	-11.3	56.8'
5	255°53.11	49.22	355° 59.59	10.9	20° 18.29	-11.4	56.8'
6	270°53.07	N19°49.75	10° 29.50	11.0'	\$20°6.85	-11.6'	56.9'
7	285°53.04	50.28	24°59.47	11.0'	19°55.30	-11.7'	56.9'
8	300°53.01	50.81	39°29.48	11.1'	19° 43.64	-11.8'	56.9'
9	315°52.98	51.34	53°59.54	11.1'	19° 31.86	-11.9'	56.9'
10	330°52.95	51.87	68° 29.64	11.1'	19° 19.98	-12.0'	57.0'
11	345°52.91	52.40	82°59.79	11.2'	19°8.00	-12.1'	57.0'
12	0°52.88	N19°52.93	97°29.98	11.2'	\$18°55.90	-12.2'	57.0'
13	15°52.85	53.46	112°0.22	11.3'	18° 43.70	-12.3'	57.1'
14	30°52.81	53.98	126°30.50	11.3'	18° 31.40	-12.4	57.1'
15	45°52.78	• • 54.51	141°0.82	11.4'	18° 18.99	-12.5'	57.1'
16	60°52.75	55.04	155°31.19	11.4'	18°6.48	-12.6'	57.2'
17	75°52.71	55.56	170°1.60	11.5'	17°53.87	-12.7'	57.2'
18	90°52.68	N19°56.09	184°32.06	11.5'	\$17°41.16	-12.8'	57.2'
19	105°52.64	56.61	199°2.55	11.5'	17°28.34	-12.9'	57.3'
20	120°52.61	57.13	213°33.09	11.6'	17° 15.43	-13.0'	57.3'
21	135°52.57	• • 57.66	228°3.66	11.6'	17°2.42	-13.1'	57.3'
22	150°52.54	58.18	242°34.28	11.7'	16°49.31	-13.2'	57.4'
23	165°52.50	58.70	257°4.93	11.7'	16°36.11	-13.3'	57.4'
	CD 15.01						
	SD = 15.8'	d = 0.5'		SI	D = 15.5'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°52.47	N19°59.22	271°35.63	11.7'	S16°22.81	-13.4'	57.4'
1	195°52.43	19°59.74	$286^{\circ}6.36$	11.8'	$16^{\circ}9.42$	-13.5'	57.4'
2	210°52.40	20°0.26	$300^{\circ}37.12$	11.8'	$15^{\circ}55.93$	-13.6'	57.5'
3	225°52.36	• • 0.78	315°7.93	11.8'	$15^{\circ}42.36$	-13.7'	57.5'
4	240°52.32	1.30	329°38.76	11.9'	$15^{\circ}28.69$	-13.8'	57.5'
5	255°52.29	1.82	344°9.64	11.9'	15° 14.93	-13.8'	57.6'
6	270°52.25	N20°2.34	358° 40.54	11.9'	S15°1.08	-13.9'	57.6'
7	285°52.21	2.86	13°11.48	12.0'	14°47.15	-14.0'	57.6'
8	300°52.17	3.37	27°42.46	12.0'	14°33.12	-14.1'	57.7'
9	315°52.14	• • 3.89	42° 13.46	12.0'	$14^{\circ}19.02$	-14.2'	57.7'
10	330°52.10	4.40	56° 44.49	12.1'	14°4.82	-14.3'	57.7'
11	345°52.06	4.92	71° 15.56	12.1'	13°50.54	-14.4'	57.8'
12	0°52.02	N20°5.43	85°46.65	12.1'	<b>S</b> 13°36.18	-14.4'	57.8'
13	15°51.98	5.95	100° 17.77	12.1'	13°21.74	-14.5'	57.8'
14	30°51.94	6.46	114°48.92	12.2'	13°7.22	-14.6'	57.9'
15	45°51.90	• • 6.97	129°20.09	12.2'	12°52.62	-14.7'	57.9'
16	60°51.86	7.48	143°51.29	12.2'	12° 37.93	-14.8'	57.9'
17	75°51.82	7.99	158° 22.51	12.2'	12°23.18	-14.8'	58.0'
18	90°51.78	N20°8.51	172°53.75	12.3'	\$12°8.34	-14.9'	58.0'
19	105°51.74	9.02	187°25.02	12.3'	11°53.43	-15.0'	58.0'
20	120°51.70	9.52	201°56.31	12.3'	11°38.44	-15.1'	58.1'
21	135°51.66	• • 10.03	216°27.61	12.3'	11°23.39	-15.1'	58.1'
22	150°51.62	10.54	230°58.94	12.3'	11°8.25	-15.2'	58.1'
23	165°51.58	11.05	245°30.28	12.4'	10°53.05	-15.3'	58.2'
	SD = 15.8'	d = 0.5'		SI	O = 15.7'		
\A/e -1	GHA	Des	CH*		Das		HP
Wed	GHA 180°51.54	<b>Dec</b> N20°11.56	<b>GHA</b> 260°1.64	u 12.4'	<b>Dec</b> \$10° 37.78	d -15.3'	<b>нР</b> 58.2'
0 1	180°51.54 195°51.50	12.06	260°1.64 274°33.02	12.4	10° 22.44	-15.3 -15.4'	58.2' 58.2'
2	210°51.45	12.06 12.57	274 33.02 289°4.41	12.4	10 22.44 10°7.03	-15.4 -15.5'	58.3'
3	210 51.45 225°51.41	• • 13.07	303°35.81	12.4	09°51.56	-15.5'	58.3'
3 4	240°51.37	13.58	318°7.23	12.4	09° 36.02	-15.5' -15.6'	58.3'
5	255°51.33	14.08	332°38.66	12.4	09°30.02	-15.0 -15.7'	58.4'
6	255 51.33 270°51.28	N20° 14.59	332 38.00 347°10.09	12.4	509°4.74	-15.7'	58.4
7	285°51.24	15.09	1°41.54	12.4	08°49.01	-15. <i>1</i> '	58.4'
8	300°51.20	15.59	1 41.54 16°12.99	12.5'	08°33.22	-15.6 -15.9'	58.5'
9	315°51.15	. 16.09	30°44.45	12.5'	06 33.22 08°17.37	-15.9'	58.5'
10	330°51.11	16.59	45° 15.92	12.5'	08°1.46	-15.9 -16.0'	58.5'
11	345°51.06	17.09	59° 47.39	12.5'	06 1.40 07°45.50	-16.0'	58.6'
12	0°51.02	N20° 17.59	74° 18.86	12.5'	507°29.47	-16.1	58.6
13	15°50.98	18.09	88° 50.33	12.5'	07° 13.40	-16.1	58.6
14	30°50.93	18.59	00 50.55 103°21.80	12.5'	07 13.40 06°57.26	-16.1 -16.2'	58.7'
15	45°50.89	. 19.09	103 21.80 117°53.28	12.5'	06°41.08	-16.2'	58.7'
16	60°50.84	19.59	117 55.26 132°24.75	12.5'	06°24.85	-16.2 -16.3'	58.7'
17	75°50.79	20.08	132 24.75 146°56.21	12.5'	06°8.56	-10.3 -16.3'	58.8'
18	90°50.75	N20°20.58	140 50.21 161°27.68	12.5'	S05°52.23	-16.4	58.8'
18	90 50.75 105°50.70	21.08	101 27.08 175°59.13	12.5	05° 35.84	-16.4'	58.8'
20	120°50.66	21.57	175 39.13 190°30.58	12.4	05° 19.42	-16.4 -16.5'	58.9'
21	135°50.61	22.07	205°2.02	12.4	05 19.42 05°2.94	-10.5'	58.9'
22	150°50.56	22.56	219° 33.45	12.4	05 2.94 04°46.43	-16.6'	58.9'
23	165°50.52	23.05	219 33.43 234°4.87	12.4	04° 40.43	-16.6'	59.0'
	SD = 15.8'	d = 0.5'			D = 15.9'	_0.0	

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

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

		Sun			Moon			
	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
l	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-45%	
	19	03:33	03:32	11:56	05:17	17:41		
	20	03:30	03:28	11:57	06:05	18:29		
	21	03:26	03:24	11:57	06:53	19:17		

h	Aries	Venus	Mars	Jupiter	Saturn	
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	239° 52.56	224°50.26 N04°49.60	101°5.11 N17°37.98	154°27.67 N23°10.48	239°16.57 S01°59.70	
1	254° 55.03	239°50.61 50.25	116°6.30 37.56	169°29.54 10.50	254°18.85 59.63	A
2	269° 57.49	254°50.96 50.90	131°7.50 37.13	184°31.41 10.52	269°21.13 59.56	
3	284° 59.95	269°51.30 · · 51.55	146°8.69 · · 36.71	199°33.28 · · 10.54	284°23.41 · · 59.49	
4	300°2.42	284°51.65 52.21	161°9.89 36.28	214°35.15 10.57	299°25.69 59.42	
5	315°4.88	299°51.99 52.86	176°11.08 35.86	229°37.02 10.59	314°27.97 59.35	Α Α
6	330°7.35	314°52.34 N04°53.51	191°12.28 N17°35.43	244°38.89 N23°10.61	329°30.25 S01°59.28	
7	345°9.81	329°52.68 54.17	206° 13.47 35.43	259°40.76 10.63	344°32.53 59.21	
8	0° 12.27	344°53.02 54.82	221°14.66 34.59	274°42.63 10.65	359°34.80 59.14	
9	15° 14.74	359°53.37 · · 55.48	236°15.86 · · 34.16	289°44.50 · · 10.67	14°37.08 · · 59.07	
10	30° 17.20	14°53.71 56.13	251°17.05 33.73	304°46.37 10.70	29°39.36 59.00	
11	45° 19.67	29°54.05 56.79	266° 18.24 33.31	319°48.24 10.72	44°41.64 58.93	Al
12	60°22.13	44°54.38 N04°57.45	281°19.44 N17°32.88	334°50.10 N23°10.74	59°43.92 S01°58.86	
13	75° 24.59	59°54.72 58.10	296°20.63 32.46	349°51.97 10.76	74°46.20 58.79	
14	90° 27.06	74°55.06 58.76	311°21.82 32.03	4°53.84 10.78	89°48.48 58.72	1
15	105° 29.52	89°55.40 04°59.42	326°23.02 · · 31.61	19°55.71 ·· 10.80	104°50.77 · · 58.65	
16	120° 31.99	104°55.73 05°0.08	341°24.21 31.18	34°57.58 10.83	119°53.05 58.58	
17	135°34.45	119°56.07 0.74	356°25.40 30.75	49°59.45 10.85	134°55.33 58.51	Be <sup>-</sup>
18	150°36.91	134°56.40 N05°1.40	11°26.59 N17°30.33	65°1.32 N23°10.87	149°57.61 S01°58.44	
19	165°39.38	149°56.73 2.06	26°27.79 29.90	80°3.19 10.89	164°59.89 58.37	
20	180°41.84	164°57.06 2.72	41°28.98 29.47	95° 5.06 10.91	180°2.17 58.30	
21	195°44.31	179°57.40 · · 3.38	56°30.17 · · 29.05	110°6.93 · · 10.93	195°4.45 · · 58.23	'
22	210°46.77	194°57.73 4.04	71°31.36 28.62	125° 8.80 10.95	210°6.73 58.16	
23	225°49.24	209°58.05 4.71	86°32.55 28.19	140°10.66 10.97	225°9.01 58.09	
	07.50	0.0/ 10.7/ 4.50	10/10/110	1.0/ 10.0/ 1.00		
Wer.	pass. 07:59	ν0.3' d0.7' m-4.50	ν1.2' d-0.4' m1.19	ν1.9' d0.0' m-1.93	ν2.3' d-0.1' m1.11	Mia
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	240°51.70	224°58.38 N05°5.37	101°33.75 N17°27.76	155°12.53 N23°11.00	240°11.29 <b>S</b> 01°58.02	D
1	255°54.16	239°58.71 6.03	116°34.94 27.34	170°14.40 11.02	255°13.58 57.95	"
2	270°56.63	254°59.04 6.70	131°36.13 26.91	185°16.27 11.04	270°15.86 57.89	
3	285°59.09	269°59.36 · · 7.36	146°37.32 · · 26.48	200°18.14 · · 11.06	285°18.14 · · 57.82	
4	301°1.56	284°59.69 8.03	161°38.51 26.05	215°20.01 11.08	300°20.42 57.75	
5	316°4.02	300°0.01 8.69	176°39.70 25.62	230°21.87 11.10	315°22.70 57.68	
6	331°6.48	315°0.34 N05°9.36	191°40.89 N17°25.19	245°23.74 N23°11.12	330°24.98 S01°57.61	
7	346°8.95	330°0.66 10.03	206° 42.08 24.76	260°25.61 11.14	345°27.27 57.54	
8	$1^{\circ}11.41$	345°0.98 10.70	221°43.27 24.33	275°27.48 11.16	0°29.55 57.47	_ N
9	$16^{\circ}13.88$	0°1.30 · · 11.36	236°44.46 · · 23.91	290°29.35 · · 11.18	15°31.83 · · 57.40	
10	$31^{\circ}16.34$	15°1.62 12.03	251°45.65 23.48	305°31.21 11.20	30°34.11 57.33	Rig
11	$46^{\circ}18.80$	30°1.94 12.70	266° 46.84 23.05	320°33.08 11.22	45°36.40 57.27	IVIE
12	61°21.27	45°2.26 N05°13.37	281°48.03 N17°22.62	335°34.95 N23°11.25	60°38.68 S01°57.20	Zι
13	$76^{\circ}23.73$	60°2.57 14.04	296° 49.22 22.19	350°36.82 11.27	75°40.96 57.13	A
14	$91^{\circ}26.20$	75°2.89 14.71	311°50.41 21.76	5°38.69 11.29	90°43.25 57.06	~
15	$106^{\circ}28.66$	90°3.21 · · 15.38	326°51.60 · · 21.33	20°40.55 · · 11.31	105°45.53 · · 56.99	
16	121°31.12	105°3.52 16.06	341°52.79 20.89	35°42.42 11.33	120°47.81 56.92	
17	136°33.59	120°3.84 16.73	356°53.98 20.46	50°44.29 11.35	135°50.10 56.85	
18	151°36.05	135°4.15 N05°17.40	11°55.17 N17°20.03	65°46.15 N23°11.37	150°52.38 <b>S</b> 01°56.79	Ras
19	166°38.52	150°4.46 18.07	26°56.36 19.60	80°48.02 11.39	165°54.66 56.72	
20	181°40.98	165°4.77 18.75	41°57.55 19.17	95°49.89 11.41	180°56.95 56.65	Kaı
21	196°43.44	180°5.08 · · 19.42	56°58.74 · · 18.74	110°51.76 · · 11.43	195°59.23 · · 56.58	
22	211°45.91	195°5.39 20.10	71°59.93 18.31	125°53.62 11.45	211°1.51 56.51	
23	226°48.37	210°5.70 20.77	87°1.12 17.88	140°55.49 11.47	226°3.80 56.45	
Mer	pass. 07:55	ν0.3' d0.7' m-4.49	ν1.2' d-0.4' m1.20	$\nu$ 1.9' d0.0' m-1.93	ν2.3' d-0.1' m1.11	1
_	_					
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
0	241°50.84	225°6.01 N05°21.45	102°2.30 N17°17.44	155°57.36 N23°11.49	241°6.08 S01°56.38	Foi
1	256° 53.30	240°6.32 22.12	117°3.49 17.01	170°59.22 11.51	256°8.37 56.31	
2	271°55.77	255°6.62 22.80	132°4.68 16.58	186°1.09 11.53	271°10.65 56.24	
3	286° 58.23	270°6.93 · · 23.48	147°5.87 · · 16.15	201°2.96 · · 11.55	286°12.94 · · 56.17	
4	302°0.69	285°7.23 24.16	162°7.06 15.71	216° 4.82 11.57	301°15.22 56.11	May
5	317°3.16	300°7.54 24.83	177°8.24 15.28	231°6.69 11.59	316°17.51 56.04	
6	332°5.62	315°7.84 N05°25.51	192°9.43 N17°14.85	246°8.56 N23°11.61	331°19.79 S01°55.97	
7	347°8.09	330°8.14 26.19	207°10.62 14.41	261°10.42 11.63	346°22.08 55.90	
8	2°10.55	345°8.44 26.87	222°11.81 13.98	276°12.29 11.65	1°24.36 55.84	
9	17°13.01	0°8.74 · · 27.55	237°12.99 · · 13.55	291°14.16 · · 11.67	16°26.65 · · 55.77	Ma
10	32° 15.48 47° 17.94	15°9.04 28.23 30°9.34 28.91	252°14.18 13.11 267°15.37 12.68	306°16.02 11.69	31°28.93 55.70 46°31.22 55.63	
11	47°17.94 62°20.41	30°9.34 28.91 45°9.64 N05°29.60	267°15.37 12.68 282°16.56 N17°12.24	321°17.89 11.71 336°19.75 N23°11.73	46°31.22 55.63 61°33.50 S01°55.57	
12 13	62°20.41 77°22.87	45°9.64 N05°29.60 60°9.94 30.28	282°16.56 N17°12.24 297°17.74 11.81	336°19.75 N23°11.73 351°21.62 11.75	61°33.50 S01°55.57 76°35.79 55.50	
	92°25.33	75°10.23 30.28	312°18.93 11.38	6°23.49 11.77	91°38.07 55.43	
14 15	92°25.33 107°27.80		312°18.93 11.38 327°20.12 · · 10.94	21°25.35 · · 11.79	91°38.07 55.43 106°40.36 · · 55.37	
15 16	107° 27.80 122° 30.26	90°10.53 · · 31.64 105°10.83 32.33	342°21.30 10.51	36°27.22 11.81		May
16 17	122° 30.26 137° 32.73	105°10.83 32.33 120°11.12 33.01	342°21.30 10.51 357°22.49 10.07	51°29.08 11.83	121°42.65 55.30 136°44.93 55.23	
18	152° 35.19	135°11.41 N05°33.70	12°23.67 N17°9.64	66°30.95 N23°11.85	130°44.93 55.23 151°47.22 \$01°55.16	
19	167° 37.65	150°11.70 34.38	27°24.86 9.20	81°32.81 11.87	166°49.51 55.10	
20	182° 40.12	165°12.00 35.07	42°26.05 8.76	96°34.68 11.89	181°51.79 55.03	
21	197° 42.58	180°12.29 · · 35.75	57°27.23 · · 8.33	111°36.54 · · 11.91	196°54.08 · · 54.96	
22	212° 45.05	195°12.58 36.44	72°28.42 7.89	126°38.41 11.93	211°56.37 54.90	
23	227° 47.51	210°12.87 37.13	87°29.60 7.46	141°40.27 11.94	226°58.65 54.83	
Mer.	pass. 07:51	$\nu$ 0.3′ $d$ 0.7′ m-4.48	$\nu 1.2' \ d$ -0.4' m1.21	$\nu 1.9' \ d0.0' \ \text{m-}1.93$	ν2.3′ d-0.1′ m1.11	

	Stars	
	SHA	Dec
Alpheratz	357°34.67 353°7.09	29°13.64 -42°9.93
Ankaa Schedar	353 7.09 349°31.10	-42 9.93 56°40.34
Diphda	348°47.22	-17°50.81
Achernar Hamal	335°20.42 327°51.19	-57°6.30 23°34.83
Polaris	314°22.32	89°22.16
Acamar	315°11.96	-40°12.11
Menkar Mirfak	314°6.17 308°28.36	4°11.31 49°56.99
Aldebaran	290°39.64	16°33.58
Rigel	281°3.92	-8°10.38 46°1.43
Capella Bellatrix	280°21.93 278°22.89	6°22.33
Elnath	$278^{\circ}1.87$	28° 37.73
Alnilam	275°37.75 270°52.08	-1°11.18 7°24.68
Betelgeuse Canopus	263°52.74	-52°42.66
Sirius	$258^{\circ}26.27$	-16°45.14
Adhara	255°5.93 244°50.75	-29°0.51 5°9.57
Procyon Pollux	244 50.75 243°17.19	27° 57.96
Avior	234°14.96	-59° 35.68
Suhail Miaplacidus	222°46.25 221°38.53	-43°32.33 -69°49.55
Alphard	221 30.53 217°47.55	-8°46.22
Regulus	$207^{\circ}34.15$	11°50.60
Dubhe Denebola	193°40.48 182°24.52	61°37.10 14°25.82
Gienah	175°43.13	-17°41.13
Acrux	$172^{\circ}59.42$	-63°14.67
Gacrux Alioth	171°51.01 166°12.31	-57°15.59 55°49.48
Spica	158°21.75	-11° 17.75
Alkaid	152°51.35	49°11.27
Hadar Menkent	148°35.06 147°56.94	-60°29.91 -36°29.86
Arcturus	147 50.94 145°47.34	19°2.98
Rigil Kent.	139°39.31	-60°56.57
Kochab	137° 18.63 136° 55.38	74°3.09 -16°8.95
Zuben'ubi Alphecca	126°3.13	26°37.68
Antares	112° 15.12	-26° 29.35
Atria Sabik	107°8.54 102°2.12	-69°4.34 -15°45.43
Shaula	96°9.59	-37°7.31
Rasalhague	95°57.96	12°32.37
Eltanin Kaus Aust.	90°41.56 83°31.79	51°28.91 -34°22.30
Vega	80°32.68	38° 48.20
Nunki	75°47.12	-26° 15.88
Altair Peacock	61°59.48 53°4.99	8°55.99 -56°38.98
Deneb	49°25.43	45° 21.95
Enif	33°38.48	9°59.35
Al Na'ir Fomalhaut	27°32.53 15°14.26	-46°50.08 -29°29.16
Scheat	13°45.02	28° 13.02
Markab	13°29.69	15°20.36
May 22 Thu	SHA	Mer.pass
Venus Mars	344°57.70 221°12.55	09:00 17:14
Jupiter	274°35.10	13:40
Saturn	359°24.01	08:02
May 23 Fri	SHA	Mer.pass
Venus Mars	344°6.68 220°42.05	09:00 17:12
Jupiter	274°20.83	13:37
Saturn	359° 19.59	07:58
May 24 Sat	SHA	Mer.pass
Venus Mars	343° 15.17 220° 11.47	08:59 17:10
Jupiter	$274^{\circ}6.52$	13:34
Saturn	359° 15.25	07:54
Horizon	tal parallax	
	Venus: Mars:	0.2 0.1
	ividi 5.	0.1

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.47	$N20^{\circ}23.55$	248° 36.27	12.4'	S04°13.27	-16.6'	59.0'
1 2	195°50.42 210°50.37	24.04 24.53	263°7.66 277°39.04	12.4' 12.4'	03°56.63 03°39.95	-16.7' -16.7'	59.0' 59.1'
3	210 50.37 225°50.33	25.02	292° 10.40	12.4	03°23.24	-10.7 -16.8'	59.1'
4	240°50.28	25.51	306°41.74	12.3'	03°6.48	-16.8'	59.1'
5	255°50.23	26.00	321°13.06	12.3'	02°49.70	-16.8'	59.2'
6	270°50.18 285°50.13	N20°26.49 26.98	335°44.36 350°15.64	12.3' 12.3'	\$02°32.88 02°16.03	-16.9' -16.9'	59.2' 59.2'
7 8	285 50.13 300°50.08	20.98 27.46	4°46.90	12.3	02 16.03 01°59.15	-16.9'	59.2 59.3'
9	315°50.03	• • 27.95	19° 18.13	12.2'	01°42.24	-16.9'	59.3'
10	330°49.98	28.44	33°49.33	12.2'	01°25.30	-17.0'	59.3'
11	345°49.93 0°49.88	28.92 N20° 29.41	48° 20.51 62° 51.66	12.1' 12.1'	01°8.34 \$00°51.35	-17.0' -17.0'	59.4' 59.4'
12 13	15°49.88	N20° 29.41 29.89	77°22.77	12.1	00°34.34	-17.0' -17.0'	59.4' 59.4'
14	30°49.78	30.38	91°53.86	12.1'	00°17.31	-17.1'	59.5'
15	45°49.73	• • 30.86	106°24.91	12.0'	S00°0.25	-17.1'	59.5'
16	60°49.68	31.34	120°55.92	12.0'	N00°16.82	17.1'	59.5'
17 18	75°49.63 90°49.58	31.83 N20° 32.31	135°26.90 149°57.84	11.9' 11.9'	00°33.91 N00°51.01	17.1' 17.1'	59.6' 59.6'
19	105°49.53	32.79	164°28.75	11.9'	01°8.13	17.1	59.6'
20	120°49.47	33.27	$178^{\circ}59.61$	11.8'	$01^{\circ}25.26$	17.1'	59.6'
21	135°49.42	• • 33.75	193°30.43	11.8'	01°42.41	17.2'	59.7'
22 23	150°49.37 165°49.32	34.23 34.71	208°1.21 222°31.94	11.7' 11.7'	01°59.56 02°16.72	17.2' 17.2'	59.7' 59.7'
23						11.4	33.1
	SD = 15.8'	d = 0.5'		SI	D = 16.1'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°49.26	N20°35.19	237°2.62	11.6'	N02°33.89	17.2'	59.8'
1 2	195°49.21 210°49.16	35.66 36.14	251°33.26 266°3.85	11.6' 11.5'	02°51.06 03°8.23	17.2' 17.2'	59.8' 59.8'
3	210°49.16 225°49.10	36.14	200° 3.85 280° 34.39	11.5'	03°8.23 03°25.41	17.2' 17.2'	59.8° 59.9'
4	240°49.05	37.09	295°4.87	11.4'	03°42.58	17.2	59.9'
5	255°49.00	37.57	309°35.31	11.4'	03°59.76	17.2'	59.9'
6	270°48.94 285°48.89	N20°38.04	324°5.68 338°36.00	11.3'	N04°16.93 04°34.09	17.2'	59.9'
7 8	285°48.89 300°48.83	38.51 38.99	338° 36.00 353° 6.27	11.3' 11.2'	04° 34.09 04° 51.25	17.2' 17.1'	60.0' 60.0'
9	315°48.78	• • 39.46	7°36.47	11.1'	05°8.40	17.1	60.0'
10	330°48.72	39.93	22°6.61	11.1'	$05^{\circ}25.54$	17.1'	60.0'
11	345°48.67	40.40	36°36.69	11.0'	05°42.66	17.1'	60.1'
12 13	0°48.61 15°48.55	N20° 40.87 41.34	51°6.71 65°36.66	11.0' 10.9'	N05°59.77 06°16.87	17.1' 17.1'	60.1' 60.1'
14	30°48.50	41.81	80°6.55	10.8	06°33.95	17.1	60.2
15	45°48.44	• • 42.28	94°36.36	10.7'	$06^{\circ}51.01$	17.0'	60.2'
16	60°48.39	42.75	109°6.11	10.7'	07°8.05	17.0'	60.2'
17 18	75°48.33 90°48.27	43.22 N20° 43.68	123°35.79 138°5.40	10.6' 10.5'	07°25.06 N07°42.05	17.0' 17.0'	60.2' 60.3'
19	105°48.21	44.15	152°34.93	10.5	07°59.01	16.9'	60.3'
20	120°48.16	44.62	167°4.39		$08^{\circ}15.95$	16.9'	60.3'
21	135°48.10	• • 45.08	181°33.77	10.3'	08°32.85 08°49.72	16.9'	60.3'
22 23	150°48.04 165°47.98	45.54 46.01	196°3.07 210°32.30	10.2' 10.1'	08°49.72 09°6.56	16.8' 16.8'	60.4' 60.4'
2.5	SD = 15.8'	d = 0.5'			D = 16.3'	10.0	
	$\frac{3D = 15.6}{}$	u = 0.5		- 31	D = 10.5		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°47.92	N20°46.47	225°1.44	10.1'	N09°23.36	16.8'	60.4
1 2	195°47.87 210°47.81	46.93 47.40	239°30.50 253°59.49	10.0' 9.9'	09°40.12 09°56.84	16.7' 16.7'	60.4' 60.4'
3	210 47.81 225°47.75	• • 47.86	268° 28.38	9.9 9.8'	10° 13.52	16.6'	60.5
4	240°47.69	48.32	282°57.19	9.7'	10°30.15	16.6'	60.5'
5	255°47.63	48.78	297°25.92	9.6'	10°46.74	16.5	60.5'
6 7	270°47.57 285°47.51	N20°49.24 49.70	311°54.55 326°23.10	9.5' 9.5'	N11°3.28 11°19.76	16.5' 16.4'	60.5' 60.5'
8	300°47.45	50.15	340°51.56	9.5 9.4'	11 19.70 11°36.20	16.4	60.6
9	315°47.39	50.61	355° 19.93	9.3'	11°52.58	16.3	60.6'
10	330°47.33	51.07	9°48.20	9.2'	12°8.90	16.3'	60.6'
11 12	345°47.27 0°47.21	51.53 N20°51.98	24°16.38 38°44.46	9.1' 9.0'	12°25.16 N12°41.37	16.2' 16.1'	60.6'
13	15°47.21	N20 51.98 52.44	38° 44.46 53° 12.45	9.0° 8.9°	12° 57.51	16.1	60.6' 60.7'
14	30°47.08	52.89	67°40.34	8.8'	13°13.58	16.0'	60.7'
15	45°47.02	• • 53.34	82°8.14	8.7'	13°29.58	15.9'	60.7'
16 17	60°46.96 75°46.90	53.80 54.25	96°35.83 111°3.43	8.6' 8.5'	13°45.52 14°1.38	15.9' 15.8'	60.7' 60.7'
18	75°46.90 90°46.83	54.25 N20°54.70	111° 3.43 125° 30.92	8.4	N14°17.17	15.8	60.7'
19	105°46.77	55.15	139°58.31	8.3	14°32.89	15.6'	60.8'
20	120°46.71	55.60	154°25.60	8.2'	14°48.52	15.6'	60.8'
21 22	135°46.65 150°46.58	• • 56.05 56.50	168°52.78 183°19.86	8.1' 8.0'	15°4.07 15°19.54	15.5' 15.4'	60.8' 60.8'
22	150°46.58 165°46.52	56.50 56.95	183° 19.86 197° 46.83	8.0° 7.9°	15° 19.54 15° 34.93	15.4	60.8
	SD = 15.8'	d = 0.5'			D = 16.5'		
		<u>u = 0.5</u>		J1	_ 10.5		

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

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

	Sun			Moon		
Day	Eqn.o	f Time	Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	34-14%
22	03:22	03:20	11:57	07:40	20:04	
23	03:17	03:14	11:57	08:29	20:54	
24	03:12	03:09	11:57	09:19	21:46	

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	242°49.98	225°13.15 N05°37.81	102°30.79 N17°7.02	156°42.14 N23°11.96	242°0.94 \$01°54.76
1	257°52.44	240°13.44 38.50	117°31.97 6.58	171°44.00 11.98	257°3.23 54.70
2	272°54.90	255°13.73 39.19	132°33.16 6.15	186°45.87 12.00	272°5.52 54.63
3	287° 57.37	270°14.01 · · 39.88	147°34.34 · · 5.71	201°47.73 · · 12.02	287°7.80 · · 54.56
4	302°59.83	285°14.30 40.57	162°35.53 5.27	216°49.60 12.04	302°10.09 54.50
5	318°2.30	300°14.58 41.26	177°36.71 4.84	231°51.46 12.06	317°12.38 54.43
6	333° 4.76	315°14.87 N05°41.95	192°37.90 N17°4.40	246°53.33 N23°12.08	332°14.67 S01°54.37
	333 4.70 348°7.22	330°15.15 42.64	207°39.08 3.96	261°55.19 12.10	347°16.95 54.30
7					
8	3°9.69	345°15.43 43.33	222°40.27 3.52	276°57.06 12.12	2°19.24 54.23
9	18° 12.15	0°15.71 · · 44.02	237°41.45 · · 3.08	291°58.92 · · 12.14	17°21.53 · · 54.17
10	33° 14.62	15°15.99 44.72	252° 42.64 2.65	307° 0.79 12.15	32°23.82 54.10
11	48° 17.08	$30^{\circ}16.27$ 45.41	267° 43.82 2.21	322°2.65 12.17	47°26.11 54.04
12	63° 19.54	45°16.55 N05°46.10	282°45.00 N17°1.77	337°4.52 N23°12.19	62°28.40 <b>S</b> 01°53.97
13	78°22.01	60°16.83 46.79	297°46.19 1.33	352° 6.38 12.21	77°30.68 53.90
14	93°24.47	75°17.10 47.49	312°47.37 0.89	7°8.24 12.23	92°32.97 53.84
15	108° 26.94	90°17.38 · · 48.18	327°48.55 •• 0.45	22°10.11 · · 12.25	107°35.26 · · 53.77
16	123°29.40	105°17.66 48.88	342°49.74 17°0.01	37°11.97 12.27	122°37.55 53.71
17	138° 31.87	120°17.93 49.57	357°50.92 16°59.57	52°13.84 12.29	137°39.84 53.64
18	153°34.33	135°18.20 N05°50.27	12°52.10 N16°59.13	67°15.70 N23°12.30	152°42.13 <b>S</b> 01°53.57
19	168°36.79	150°18.48 50.97	27°53.29 58.70	82°17.56 12.32	167°44.42 53.51
20	183°39.26	165°18.75 51.66	42°54.47 58.26	97°19.43 12.34	182°46.71 53.44
21	198° 41.72	180°19.02 · · 52.36	57°55.65 · · 57.82	112°21.29 · · 12.36	197°49.00 · · 53.38
22	198 41.72 213°44.19				
23	228° 46.65	210°19.56 53.75	87°58.02 56.93	142°25.02 12.40	227°53.58 53.25
Mer.p	pass. 07:47	ν0.3′ d0.7′ m-4.47	ν1.2' d-0.4' m1.22	$\nu 1.9' \ d0.0' \ \text{m-}1.93$	$\nu 2.3' \ d$ -0.1' m1.11
NA =	CHV	CHA D	CHA D	CHA D	CHA D
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	243°49.11	225°19.83 N05°54.45	102°59.20 N16°56.49	157°26.88 N23°12.42	242°55.87 S01°53.18
1	258° 51.58	240°20.10 55.15	118°0.38 56.05	172°28.75 12.43	257°58.16 53.12
2	273°54.04	255°20.37 55.85	133°1.56 55.61	187°30.61 12.45	273°0.45 53.05
3	288°56.51	270°20.63 · · 56.55	148°2.75 · · 55.17	202°32.47 · · 12.47	288°2.74 · · 52.99
4	303°58.97	285°20.90 57.25	163°3.93 54.73	217°34.34 12.49	303°5.03 52.92
5	319°1.44	300°21.16 57.95	178°5.11 54.29	232°36.20 12.51	318°7.32 52.86
6	334°3.90	315°21.43 N05°58.65	193°6.29 N16°53.85	247°38.06 N23°12.52	333°9.61 <b>S</b> 01°52.79
7	349°6.36	330°21.69 05°59.35	208°7.47 53.40	262°39.93 12.54	348°11.90 52.73
8	4°8.83	345°21.95 06°0.06	223°8.65 52.96	277°41.79 12.56	3°14.19 52.66
9	19° 11.29	0°22.22 · · 0.76	238°9.84 · · 52.52	292°43.65 · · 12.58	18°16.48 · · 52.60
10	34° 13.76	15°22.48 1.46	253°11.02 52.08	307°45.51 12.60	33°18.77 52.53
11	49° 16.22	30°22.74 2.16	268°12.20 51.63	322°47.38 12.61	48°21.06 52.47
12	64° 18.69	45°23.00 N06°2.87	283°13.38 N16°51.19	337°49.24 N23°12.63	63°23.36 S01°52.40
	79°21.15				
13				352°51.10 12.65	78°25.65 52.34 93°27.94 52.27
14	94°23.61		313°15.74 50.31	7°52.97 12.67	
15	109°26.08	90°23.77 · · 4.98	328°16.92 · · 49.86	22°54.83 · · 12.69	108°30.23 · · 52.21
16	124°28.54	105°24.03 5.69	343° 18.10 49.42	37°56.69 12.70	123°32.52 52.15
17	139°31.01	120°24.28 6.39	358° 19.28 48.98	52°58.55 12.72	138°34.82 52.08
18	154° 33.47	135°24.54 N06°7.10	13°20.46 N16°48.53	68°0.42 N23°12.74	153°37.11 <b>S</b> 01°52.02
19	169°35.93	150°24.79 7.81	28°21.64 48.09	83°2.28 12.76	168°39.40 51.95
20	184°38.40	165°25.05 8.51	43°22.82 47.64	98°4.14 12.77	183°41.69 51.89
21	199° 40.86	180°25.30 · · 9.22	58°24.00 · · 47.20	113°6.00 · · 12.79	198°43.98 · · 51.82
22	214°43.33	195°25.55 9.93	73°25.18 46.75	128° 7.86 12.81	213°46.28 51.76
23	229° 45.79	210°25.80 10.64	88°26.36 46.31	143° 9.73 12.83	228°48.57 51.70
Mer.p	pass. 07:43	ν0.3′ d0.7′ m-4.45	ν1.2' d-0.4' m1.23	ν1.9' d0.0' m-1.92	ν2.3' d-0.1' m1.10
_	6114	au.	GU4 B	G114 B	G114 B
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	244° 48.26	225°26.05 N06°11.34	103°27.54 N16°45.86	158°11.59 N23°12.85	243°50.86 S01°51.63
1	259° 50.72	240°26.30 12.05	118°28.72 45.42	173°13.45 12.86	258°53.16 51.57
2	274°53.18	255°26.55 12.76	133°29.90 44.97	188° 15.31 12.88	273°55.45 51.50
3	289°55.65	270°26.80 · · 13.47	148°31.08 · · 44.53	203°17.17 · · 12.90	288°57.74 · · 51.44
4	304°58.11	285°27.05 14.18	163°32.26 44.08	218°19.04 12.91	304°0.04 51.38
5	$320^{\circ}0.58$	300°27.29 14.89	178°33.44 43.64	233°20.90 12.93	319°2.33 51.31
6	335°3.04	315°27.54 N06°15.60	193°34.61 N16°43.19	248°22.76 N23°12.95	334°4.62 <b>S</b> 01°51.25
7	$350^{\circ}5.51$	330°27.78 16.32	208°35.79 42.75	263°24.62 12.97	349°6.92 51.19
8	5°7.97	345°28.03 17.03	223°36.97 42.30	278°26.48 12.98	4°9.21 51.12
9	20° 10.43	0°28.27 · · 17.74	238°38.15 · · 41.85	293°28.34 · · 13.00	19°11.50 · · 51.06
10	35° 12.90	15°28.51 18.45	253°39.33 41.41	308°30.20 13.02	34°13.80 51.00
11	50° 15.36	30°28.76 19.17	268° 40.51 40.96	323°32.07 13.03	49°16.09 50.93
12	65° 17.83	45°29.00 N06°19.88	283°41.69 N16°40.51	338°33.93 N23°13.05	64°18.39 S01°50.87
13	80° 20.29	60°29.24 20.59	298° 42.86 40.06	353°35.79 13.07	79°20.68 50.81
14	95°22.75	75°29.48 21.31	313° 44.04 39.62	8°37.65 13.09	94°22.98 50.74
15	110°25.22	90°29.72 · · 22.02	328° 45.22 · · 39.17	23°39.51 · · 13.10	109°25.27 · · 50.68
16	125°27.68	105°29.95 22.74	343°46.40 38.72	38°41.37 13.12	124°27.57 50.62
17	140°30.15	120°30.19 23.45	358° 47.57 38.27	53°43.23 13.14	139°29.86 50.55
18	155°32.61	135°30.43 N06°24.17	13°48.75 N16°37.83	68°45.09 N23°13.15	154°32.16 S01°50.49
19	170°35.08	150°30.66 24.88	28°49.93 37.38	83°46.95 13.17	169°34.45 50.43
20	185°37.54	165°30.90 25.60	43°51.11 36.93	98°48.81 13.19	184°36.75 50.37
21	200°40.00	180°31.13 · · 26.32	58°52.28 · · 36.48	113°50.68 · · 13.20	199°39.04 · · 50.30
22	$215^{\circ}42.47$	195°31.37 27.04	73°53.46 36.03	128°52.54 13.22	214°41.34 50.24
23	230°44.93	210°31.60 27.75	88°54.64 35.58	143°54.40 13.24	229°43.63 50.18
		-			
ıvıer.p	pass. 07:40	ν0.2' d0.7' m-4.44	ν1.2' d-0.4' m1.24	ν1.9' d0.0' m-1.92	ν2.3' d-0.1' m1.10

	Jiais	-
	SHA	Dec
Alpheratz	357°34.65	29° 13.65
Ankaa	353°7.07	-42°9.91
Schedar	349°31.07	56° 40.34
Diphda	348°47.20	-17°50.80
Achernar Hamal	335°20.40 327°51.17	-57°6.29 23°34.83
Polaris	314°21.55	25 34.63 89°22.14
Acamar	315°11.95	-40° 12.10
Menkar	314°6.16	4°11.31
Mirfak	308°28.35	49°56.98
Aldebaran	290°39.63	16°33.58
Rigel	281°3.92	-8°10.37
Capella	280°21.93	46°1.42
Bellatrix	278°22.89	6°22.33
Elnath	278°1.87	28° 37.72 -1° 11.18
Alnilam	275°37.75 270°52.08	-1 11.18 7°24.69
Betelgeuse Canopus	263°52.75	-52° 42.65
Sirius	258° 26.28	-16° 45.13
Adhara	255°5.94	-29°0.50
Procyon	244°50.76	5°9.57
Pollux	243°17.20	27°57.96
Avior	234°14.98	-59°35.67
Suhail	222°46.27	-43°32.33
Miaplacidus	221°38.57	-69°49.55
Alphard	217°47.56 207°34.16	-8°46.21 11°50.60
Regulus	207° 34.16 193° 40.51	61°37.10
Dubhe Denebola	193° 40.51 182° 24.53	14°25.82
Gienah	175°43.13	-17°41.13
Acrux	172°59.44	-63°14.68
Gacrux	$171^{\circ}51.03$	-57° 15.60
Alioth	$166^{\circ}12.33$	55° 49.49
Spica	$158^{\circ}21.76$	-11° 17.75
Alkaid	152°51.37	49°11.28
Hadar	148°35.06	-60°29.92
Menkent	147°56.94	-36°29.86
Arcturus Rigil Kent.	145°47.35 139°39.31	19°2.99 -60°56.58
Kigii Kent. Kochab	139° 39.31 137° 18.65	-60° 56.58 74° 3.11
Zuben'ubi	136°55.38	-16°8.94
Alphecca	126°3.13	26° 37.70
Antares	112° 15.11	-26°29.35
Atria	$107^{\circ}8.52$	-69°4.35
Sabik	102°2.11	-15° 45.43
Shaula	96°9.57	-37°7.31
Rasalhague	95°57.95	12°32.38
Eltanin Kaus Aust.	90°41.55 83°31.77	51°28.93 -34°22.30
Vega	83 31.77 80°32.67	-34 22.30 38°48.22
Nunki	75°47.10	-26° 15.87
Altair	61°59.46	8° 56.00
Peacock	53°4.95	-56° 38.98
Deneb	$49^{\circ}25.41$	45°21.97
Enif	33°38.45	9°59.36
Al Na'ir	27°32.50	-46°50.07
Fomalhaut	15° 14.24	-29°29.15
Scheat Markab	13°44.99 13°29.67	28° 13.02 15° 20.37
iviarkab	13 29.07	10 20.37
May 25 Sun	SHA	Mer.pass
Venus	342°23.18	08:59
Mars	219°40.81	17:09
Jupiter Saturn	273°52.16 359°10.97	13:32 07:51
May 26 Mon	SHA	Mer.pass
Venus	341°30.72	08:59
Mars	219°10.09 273°37.77	17:07
Jupiter Saturn	2/3°3/.// 359°6.75	13:29 07:47
May 27 Tue	SHA	Mer.pass
Venus	340°37.80	08:58
Mars Jupiter	218°39.28 273°23.33	17:05 13:26
Saturn	359°2.61	07:43
		51.15
Horizon	ital parallax	0.0
	Venus: Mars:	0.2 0.1
	iviais.	0.1

Stars

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 46.45	N20°57.40	212°13.70	7.8'	N15°50.22	15.2'	60.8
1 2	195°46.39 210°46.33	57.85 58.29	226°40.46 241°7.11	7.7' 7.5'	16°5.43 16°20.54	15.1' 15.0'	60.8' 60.9'
3	225° 46.26	• • 58.74	255°33.66	7.4'	16°35.56	14.9'	60.9
4	240°46.20	59.19	270°0.09	7.3'	16°50.48	14.8'	60.9'
5 6	255°46.13 270°46.07	20°59.63 N21°0.08	284°26.42 298°52.63	7.2' 7.1'	17°5.31 N17°20.03	14.7' 14.6'	60.9' 60.9'
7	285° 46.00	0.52	313° 18.74	7.1 7.0'	17°34.65	14.5	60.9
8	300°45.94	0.96	327°44.73	6.9'	17°49.16	14.4'	60.9'
9	315° 45.87	• • 1.41	342°10.61	6.8'	18°3.56	14.3'	60.9'
10 11	330° 45.80 345° 45.74	1.85 2.29	356°36.38 11°2.03	6.7' 6.5'	18°17.86 18°32.04	14.2' 14.1'	60.9' 60.9'
12	0°45.67	N21°2.73	25°27.58	6.4	N18°46.10	13.9'	61.0'
13	15° 45.61	3.17	39°53.01	6.3'	19°0.05	13.8'	61.0'
14 15	30° 45.54 45° 45.47	3.61 • • 4.05	54°18.33 68°43.53	6.2' 6.1'	19°13.88 19°27.58	13.7' 13.6'	61.0' 61.0'
16	60° 45.40	4.49	83°8.62	6.0'	19°41.16	13.5'	61.0'
17	75° 45.34	4.92	97°33.60	5.9'	19°54.62	13.3'	61.0'
18 19	90°45.27 105°45.20	N21°5.36 5.80	111°58.46 126°23.22	5.8' 5.6'	N20°7.94 20°21.13	13.2' 13.1'	61.0' 61.0'
20	120° 45.13	6.23	140°47.85	5.5'	20°34.19	12.9'	61.0'
21	135°45.06	• • 6.67	155°12.38	5.4'	$20^{\circ}47.12$	12.8'	61.0'
22	150° 45.00	7.10	169°36.79	5.3'	20°59.90	12.6'	61.0'
23	165°44.93	7.53	184°1.10	5.2'	21°12.55	12.5'	61.0'
	SD = 15.8'	d = 0.4'		SI	D = 16.6'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°44.86	N21°7.97	198°25.28	5.1'	N21°25.05	12.4'	61.0'
1 2	195° 44.79 210° 44.72	8.40 8.83	212°49.36 227°13.33	5.0' 4.9'	21°37.41 21°49.62	12.2' 12.1'	61.0' 61.0'
3	225° 44.65	• • 9.26	241°37.19	4.7'	22°1.68	11.9'	61.0'
4	240° 44.58	9.69	256°0.94	4.6'	22°13.59	11.8'	61.0'
5 6	255° 44.51 270° 44.44	10.12 N21°10.55	270°24.58 284°48.11	4.5' 4.4'	22°25.35 N22°36.95	11.6' 11.4'	61.0' 61.0'
7	285° 44.37	10.98	299°11.53	4.3'	22°48.39	11.3'	61.0'
8	300°44.30	11.41	313°34.85	4.2'	22°59.67	11.1'	61.0'
9 10	315°44.23 330°44.16	· · 11.84 12.26	327°58.06 342°21.17	4.1' 4.0'	23°10.79 23°21.75	11.0' 10.8'	61.0' 61.0'
11	345° 44.09	12.69	356°44.18	3.9'	23°32.54	10.6'	61.0'
12	0°44.01	N21°13.12	11°7.08	3.8'	N23°43.16	10.5'	61.0'
13 14	15°43.94 30°43.87	13.54 13.96	25°29.89 39°52.59	3.7' 3.6'	23°53.61 24°3.89	10.3' 10.1'	61.0' 61.0'
15	45° 43.80	• • 14.39	54°15.20	3.5'	24°14.00	9.9'	61.0'
16	60°43.73	14.81	68°37.71	3.4'	24°23.92	9.8'	60.9'
17 18	75°43.65 90°43.58	15.23 N21°15.65	83°0.13 97°22.45	3.3'	24°33.68 N24°43.25	9.6' 9.4'	60.9' 60.9'
19	105° 43.51	16.08	111°44.68	3.1'	24°52.64	9.4	60.9
20	120° 43.43	16.50	126°6.83	3.1'	25°1.85	9.0'	60.9'
21 22	135° 43.36 150° 43.29	· · 16.92 17.33	140°28.88 154°50.85	3.0' 2.9'	25°10.87 25°19.70	8.8' 8.6'	60.9' 60.9'
23	165° 43.21	17.75	169° 12.74	2.8'	25° 28.35	8.5'	60.9
	SD = 15.8'	d = 0.4'		SI	D = 16.6'		
-						,	
Tue 0	<b>GHA</b> 180° 43.14	<b>Dec</b> N21°18.17	<b>GHA</b> 183°34.55	u 2.7'	<b>Dec</b> N25°36.81	d 8.3'	<b>HP</b> 60.9'
1	195°43.06	18.59	197°56.27	2.6'	25°45.07	8.1'	60.9'
2	210° 42.99	19.00	212°17.92	2.6'	25°53.15	7.9'	60.8'
3 4	225° 42.92 240° 42.84	· · 19.42 19.84	226°39.50 241°1.00	2.5' 2.4'	26°1.03 26°8.71	7.7' 7.5'	60.8' 60.8'
5	255° 42.77	20.25	255°22.43	2.4'	26°16.19	7.3	60.8
6	270°42.69	N21°20.66	269°43.80	2.3'	N26°23.48	7.1'	60.8'
7 8	285° 42.62 300° 42.54	21.08 21.49	284°5.10 298°26.34	2.2' 2.2'	26°30.57 26°37.45	6.9' 6.7'	60.8' 60.8'
9	315° 42.46	• • 21.90	312°47.52	2.1'	26°44.13	6.5	60.7
10	330°42.39	22.31	327°8.64	2.1'	26°50.61	6.3'	60.7'
11 12	345° 42.31 0° 42.24	22.72 N21°23.13	341°29.70 355°50.72	2.0' 2.0'	26°56.89 N27°2.96	6.1' 5.9'	60.7' 60.7'
13	15°42.16	23.54	10°11.69	1.9'	27°8.82	5.7'	60.7'
14	30°42.08	23.95	24°32.61	1.9'	27°14.48	5.4'	60.6
15 16	45° 42.00 60° 41.93	· · 24.36 24.77	38°53.49 53°14.33	1.8' 1.8'	27°19.92 27°25.16	5.2' 5.0'	60.6' 60.6'
17	75°41.85	25.17	67°35.13	1.8'	27°30.19	4.8'	60.6
18	90°41.77	N21°25.58	81°55.90	1.7'	N27°35.00	4.6'	60.6'
19 20	105°41.69 120°41.62	25.99 26.39	96°16.64 110°37.35	1.7' 1.7'	27°39.61 27°44.00	4.4' 4.2'	60.5' 60.5'
21	135°41.54	. 26.80	124°58.04	1.7'	27°48.18	4.0'	60.5
22	150°41.46	27.20	139°18.70	1.6'	27°52.15	3.8'	60.5
23	165°41.38	27.60	153°39.35	1.6'	27°55.90	3.5'	60.5'
	SD = 15.8'	d = 0.4'		SI	D = 16.6'		

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

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

				1		
		Sun			Moon	
Day	Eqn.of	Time Mer. Mer.Pass.		Age		
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper Lower		28-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	7-0%
25	03:06	03:03	11:57	10:14	22:43	
26	02:59	02:56	11:57	11:14	23:45	
27	02:53	02:49	11:57	12:17	-:-	

h	Aries	Venus	Mars	Jupiter	Saturn
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	245°47.40	225°31.83 N06°28.47	103°55.81 N16°35.13	158°56.26 N23°13.25	244°45.93 <b>S</b> 01°50.11
1	260°49.86	240°32.06 29.19	118°56.99 34.68	173°58.12 13.27	259°48.23 50.05
2	275°52.33	255°32.29 29.91	133°58.17 34.24	188°59.98 13.29	274°50.52 49.99
3	290°54.79	270°32.52 · · 30.63	148°59.34 · · 33.79	204°1.84 · · 13.30	289°52.82 · · 49.93
4	305°57.25	285°32.75 31.35	164°0.52 33.34	219°3.70 13.32	304°55.11 49.87
5	320°59.72	300°32.98 32.07	179°1.69 32.89	234° 5.56 13.34	319°57.41 49.80
6	336°2.18	315°33.21 N06°32.79	194°2.87 N16°32.44	249°7.42 N23°13.35	334°59.71 S01°49.74
7	351°4.65	330°33.43 33.51	209°4.05 31.99	264° 9.28 13.37	350°2.00 49.68
8	6°7.11 21°9.58	345°33.66 34.23 0°33.89 · · 34.95	224°5.22 31.53 239°6.40 · · 31.08	279°11.14 13.38 294°13.00 · · 13.40	5°4.30 49.62 20°6.60 · · 49.55
9 10	21 9.56 36° 12.04	15°34.11 35.67	254°7.57 30.63	309°14.86 13.42	35°8.90 49.49
11	51° 14.50	30°34.33 36.39	269°8.75 30.18	324°16.72 13.43	50°11.19 49.43
12	66° 16.97	45°34.56 N06°37.12	284°9.92 N16°29.73	339°18.58 N23°13.45	65°13.49 S01°49.37
13	81° 19.43	60°34.78 37.84	299° 11.10 29.28	354°20.44 13.47	80°15.79 49.31
14	$96^{\circ}21.90$	75°35.00 38.56	314° 12.27 28.83	9°22.30 13.48	95°18.09 49.24
15	111°24.36	90°35.22 · · 39.29	329°13.45 · · 28.38	24°24.16 · · 13.50	110°20.38 · · 49.18
16	$126^{\circ}26.83$	105°35.44 40.01	344°14.62 27.92	39°26.02 13.51	125°22.68 49.12
17	141°29.29	120°35.66 40.74	359° 15.80 27.47	54°27.88 13.53	140°24.98 49.06
18	156°31.75	135°35.88 N06°41.46	14°16.97 N16°27.02	69°29.74 N23°13.54	155°27.28 S01°49.00
19	171°34.22	150°36.10 42.19	29° 18.15 26.57	84°31.59 13.56	170°29.58 48.94
20 21	186° 36.68 201° 39.15	165°36.32 42.91 180°36.53 · · 43.64	44°19.32 26.11 59°20.50 · · 25.66	99°33.45 13.58 114°35.31 · · 13.59	185°31.87 48.88 200°34.17 · · 48.81
22	201 39.13 216°41.61	195°36.75 44.36	74°21.67 25.21	129°37.17 13.61	215°36.47 48.75
23	231°44.08	210°36.96 45.09	89°22.84 24.76	144°39.03 13.62	230°38.77 48.69
Mer.p	pass. 07:36	ν0.2′ d0.7′ m-4.43	ν1.2' d-0.4' m1.25	$\nu 1.9' \ d0.0' \ \text{m-}1.92$	ν2.3' d-0.1' m1.10
					_
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	246°46.54 261°49.00	225°37.18 N06°45.82	104°24.02 N16°24.30	159°40.89 N23°13.64	245°41.07 S01°48.63
1 2	261 49.00 276°51.47	240°37.39 46.54 255°37.60 47.27	119°25.19 23.85 134°26.37 23.40	174°42.75 13.66 189°44.61 13.67	260° 43.37 48.57 275° 45.67 48.51
3	291°53.93	270°37.82 · · 48.00	149°27.54 · · 22.94	204°46.47 · · 13.69	290°47.97 · · 48.45
4	306° 56.40	285°38.03 48.73	164°28.71 22.49	219°48.33 13.70	305°50.27 48.39
5	321°58.86	300°38.24 49.46	179°29.89 22.03	234°50.19 13.72	320°52.56 48.33
6	337°1.32	315°38.45 N06°50.18	194°31.06 N16°21.58	249°52.04 N23°13.73	335°54.86 S01°48.26
7	$352^{\circ}3.79$	330°38.66 50.91	209°32.23 21.12	264°53.90 13.75	350°57.16 48.20
8	7°6.25	345°38.86 51.64	224°33.41 20.67	279°55.76 13.76	5°59.46 48.14
9	22°8.72	0°39.07 · · 52.37	239°34.58 · · 20.22	294°57.62 · · 13.78	21°1.76 · · 48.08
10 11	37° 11.18 52° 13.65	15°39.28 53.10 30°39.49 53.83	254°35.75 19.76 269°36.93 19.30	309°59.48 13.79 325°1.34 13.81	36°4.06 48.02 51°6.36 47.96
12	67°16.11	45°39.69 N06°54.57	284°38.10 N16°18.85	340°3.20 N23°13.82	66°8.66 S01°47.90
13	82° 18.57	60°39.90 55.30	299°39.27 18.39	355° 5.05 13.84	81°10.97 47.84
14	97°21.04	75°40.10 56.03	314°40.44 17.94	10° 6.91 13.85	96°13.27 47.78
15	112°23.50	90°40.30 · · 56.76	329°41.62 · · 17.48	25°8.77 · · 13.87	111°15.57 · · 47.72
16	127°25.97	105°40.51 57.49	344°42.79 17.03	40°10.63 13.88	126°17.87 47.66
17	142°28.43	120°40.71 58.23	359°43.96 16.57	55°12.49 13.90	141°20.17 47.60
18 19	157°30.90 172°33.36	135°40.91 N06°58.96 150°41.11 06°59.69	14°45.13 N16°16.11 29°46.30 15.66	70°14.34 N23°13.91 85°16.20 13.93	156°22.47
20	172 33.30 187° 35.82	165°41.31 07°0.43	44° 47.48 15.20	100°18.06 13.94	186°27.07 47.42
21	202°38.29	180°41.51 · · 1.16	59°48.65 · · 14.74	115°19.92 · · 13.96	201°29.37 · · 47.36
22	217°40.75	195°41.71 1.89	74°49.82 14.29	130°21.78 13.97	216°31.68 47.30
23	232°43.22	210°41.90 2.63	89°50.99 13.83	145°23.63 13.99	231°33.98 47.24
Merr	pass. 07:32	ν0.2' d0.7' m-4.42	ν1.2' d-0.5' m1.26	$\nu$ 1.9' $d$ 0.0' m-1.92	ν2.3' d-0.1' m1.09
			- VI.L U 0.5 IIII.20	ν 1.5 do.0 iii 1.52	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	247°45.68	225°42.10 N07°3.36	104°52.16 N16°13.37	160°25.49 N23°14.00	246°36.28 S01°47.18
1	262°48.15	240°42.30 4.10	119°53.33 12.91	175°27.35 14.02	261°38.58 47.12
2	$277^{\circ}50.61$	255°42.49 4.83	134°54.50 12.46	190°29.21 14.03	276°40.88 47.06
3	292°53.07	270°42.69 · · 5.57	149°55.68 · · 12.00	205°31.07 · · 14.05	291°43.19 · · 47.00
4	307°55.54	285°42.88 6.31	164°56.85 11.54	220°32.92 14.06	306°45.49 46.94
5	322°58.00	300°43.07 7.04	179°58.02 11.08	235°34.78 14.08	321°47.79 46.88
6	338°0.47	315°43.26 N07°7.78	194°59.19 N16°10.62	250°36.64 N23°14.09	336°50.09 S01°46.82
7 8	353°2.93 8°5.39	330° 43.46 8.52 345° 43.65 9.25	210°0.36 10.16 225°1.53 9.71	265°38.50 14.11 280°40.35 14.12	351°52.40 46.76 6°54.70 46.70
9	8 5.39 23°7.86	0°43.84 · · 9.99	240°2.70 · · 9.25	280 40.35 14.12 295°42.21 · · 14.13	21°57.00 · · 46.64
10	38° 10.32	15°44.03 10.73	255°3.87 8.79	310°44.07 14.15	36°59.31 46.59
11	53° 12.79	30°44.22 11.47	270°5.04 8.33	325°45.92 14.16	52°1.61 46.53
12	68° 15.25	45°44.40 N07°12.21	285°6.21 N16°7.87	340°47.78 N23°14.18	67°3.91 S01°46.47
13	$83^{\circ}17.72$	60°44.59 12.95	300°7.38 7.41	355°49.64 14.19	82°6.22 46.41
14	98°20.18	75°44.78 13.69	315°8.55 6.95	10°51.50 14.21	97°8.52 46.35 _
15	113°22.64	90°44.96 · · 14.42	330°9.72 · · 6.49	25°53.35 · · 14.22	112°10.82 · · 46.29
16	128° 25.11 143° 27.57	105° 45.15 15.16 120° 45.33 15.90	345°10.89 6.03 0°12.06 5.57	40°55.21 14.23	127°13.13 46.23 142°15.43 46.17
17 18	143°27.57 158°30.04	120°45.33 15.90 135°45.52 N07°16.65	0°12.06 5.57 15°13.23 N16°5.11	55°57.07 14.25 70°58.92 N23°14.26	142°15.43 46.17 157°17.74 S01°46.11
19	173° 32.50	150°45.70 17.39	30°14.40 4.65	86° 0.78 14.28	172°20.04 46.06
20	188°34.97	165°45.88 18.13	45° 15.57 4.19	101°2.64 14.29	187°22.34 46.00
21	203°37.43	180°46.07 · · 18.87	60°16.74 · · 3.73	116°4.49 · · 14.30	202°24.65 · · 45.94
22	218° 39.89	195°46.25 19.61	75°17.91 3.26	131° 6.35 14.32	217°26.95 45.88
23	233° 42.36	210°46.43 20.35	90°19.07 2.80	146° 8.21 14.33	232°29.26 45.82
Mer.p	pass. 07:28	$ u 0.2' \ d0.7' \ \text{m-4.41}$	$\nu 1.2' \ d$ -0.5' m1.27	$\nu 1.9' \ d0.0' \ \text{m-}1.92$	ν2.3' d-0.1' m1.09

	SHA	Dec					
Alpheratz	357°34.61	29°13.66					
Ankaa	353°7.04	-42°9.90					
Schedar Diphda	349°31.03 348°47.17	56°40.34 -17°50.78					
Achernar	335°20.38	-57°6.27					
Hamal	$327^{\circ}51.15$	23°34.84					
Polaris	$314^{\circ}20.51$	89°22.13					
Acamar	315°11.93	-40°12.08					
Menkar Mirfak	314°6.14 308°28.32	4°11.32 49°56.97					
Aldebaran	290°39.62	49 50.97 16°33.58					
Rigel	281°3.91	-8°10.37					
Capella	$280^{\circ}21.92$	$46^{\circ}1.41$					
Bellatrix	278°22.88	6°22.34					
Elnath Alnilam	278°1.86 275°37.74	28°37.72 -1°11.17					
Betelgeuse	270°52.07	-1 11.17 7°24.69					
Canopus	263°52.76	-52°42.64					
Sirius	$258^{\circ}26.27$	$-16^{\circ}45.13$					
Adhara	255° 5.94	-29°0.49					
Procyon	244°50.76	5°9.57 27°57.96					
Pollux Avior	243°17.20 234°15.00	-59°35.67					
Avior Suhail	234 15.00 222°46.28	-59 35.07 -43°32.33					
Miaplacidus	221°38.60	-69°49.55					
Alphard	$217^{\circ}47.56$	-8°46.21					
Regulus	207°34.16	11°50.60					
Dubhe	193°40.53	61°37.10					
Denebola Gienah	182°24.53 175°43.13	14°25.83 -17°41.13					
Acrux	175 45.15 172°59.45	-17 41.13 -63°14.69					
Gacrux	$171^{\circ}51.03$	-57°15.61					
Alioth	166°12.35	55°49.50					
Spica	158°21.75	-11°17.75					
Alkaid Hadar	152°51.37 148°35.06	49°11.29 -60°29.94					
Menkent	140°55.00	-36°29.87					
Arcturus	145°47.34	19°3.00					
Rigil Kent.	$139^{\circ}39.30$	-60°56.59					
Kochab	137°18.68	74°3.12					
Zuben'ubi Alphecca	136°55.37 126°3.12	-16°8.95 26°37.71					
Antares	120 3.12 112°15.09	-26°29.35					
Atria	107°8.48	-69°4.36					
Sabik	$102^{\circ}2.09$	-15°45.43					
Shaula	96° 9.55	-37°7.32					
Rasalhague Eltanin	95°57.93 90°41.53	12°32.39 51°28.95					
Kaus Aust.	83°31.75	-34°22.30					
Vega	80°32.64	38°48.24					
Nunki	75°47.07	-26°15.87					
Altair	61°59.43	8°56.02					
Peacock Deneb	53° 4.91 49° 25.37	-56°38.98 45°21.98					
Deneb Enif	49°25.37 33°38.42	45°21.98 9°59.37					
Al Na'ir	27°32.46	-46°50.06					
Fomalhaut	$15^{\circ}14.21$	-29°29.13					
Scheat	13°44.96	28°13.03					
Markab	13°29.64	15°20.38					
May 28 Wed	SHA	Mer.pass					
Venus	339°44.43	08:58					
Mars	218° 8.42	17:03					
Jupiter Saturn	273°8.86 358°58.53	13:23 07:40					
May 29 Thu	SHA	Mer.pass					
Venus Mars	338°50.64 217°37.48	08:57 17:01					
Jupiter	272°54.35	13:20					
Saturn	358°54.53	07:36					
May 30 Fri	SHA	Mer.pass					
Venus	337°56.42	08:57					
Mars	217°6.48	16:59					
Jupiter Saturn	272°39.81 358°50.60	13:17 07:32					
Saturn 358°50.60 07:32							
Horizon	ital parallax	0.2					
Horizon	tal parallax Venus: Mars:	0.2 0.1					
Horizon	Venus:						

Stars SHA

Dec

Page 100

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.30	N21°28.00	167°59.99	1.6'	N27°59.44	3.3'	60.4'
1	195°41.22	28.41	182°20.61	1.6'	28°2.77	3.1'	60.4
2 3	210°41.14 225°41.06	28.81 •• 29.21	196°41.23 211°1.84	1.6' 1.6'	28°5.88 28°8.77	2.9' 2.7'	60.4' 60.4'
4	240°40.98	29.61	225°22.46	1.6'	28° 11.46	2.5'	60.3
5	255°40.91	30.01	239°43.07	1.6'	28° 13.92	2.3'	60.3
6	270°40.83	N21°30.40	254°3.69	1.6'	$N28^{\circ}16.18$	2.0'	60.3'
7	285°40.74	30.80	268°24.33	1.6'	28° 18.21	1.8'	60.3'
8 9	300°40.66 315°40.58	31.20 · · 31.60	282°44.97 297°5.63	1.7' 1.7'	28°20.04 28°21.65	1.6' 1.4'	60.2' 60.2'
10	330°40.50	31.99	311°26.31	1.7'	28°23.04	1.4	60.2
11	345°40.42	32.39	325°47.01	1.7'	28° 24.22	1.0'	60.2'
12	0°40.34	N21°32.78	340°7.74	1.8'	N28° 25.19	0.8'	60.1'
13	15°40.26	33.18	354°28.50	1.8'	28° 25.94	0.5'	60.1'
14 15	30°40.18 45°40.10	33.57 •• 33.96	8°49.29 23°10.12	1.8' 1.9'	28°26.48 28°26.81	0.3' 0.1'	60.1' 60.0'
16	60°40.01	34.35	37°30.99	1.9'	28° 26.93	-0.1	60.0'
17	75°39.93	34.74	51°51.90	2.0'	$28^{\circ}26.83$	-0.3'	60.0'
18	90°39.85	N21°35.14	66°12.86	2.0'	N28° 26.53	-0.5'	59.9'
19	105°39.77 120°39.68	35.53	80°33.86	2.1'	28° 26.02 28° 25.29	-0.7'	59.9'
20 21	120°39.68 135°39.60	35.91 •• 36.30	94°54.92 109°16.04	2.1' 2.2'	28° 25.29 28° 24.36	-0.9' -1.1'	59.9' 59.9'
22	150°39.52	36.69	123°37.21	2.2'	28° 23.23	-1.3'	59.8'
23	165°39.44	37.08	137°58.45	2.3'	28°21.88	-1.5'	59.8'
	SD = 15.8'	d = 0.4'		SI	D = 16.5'		
Thu	GHA	Dec	GHA		Dec	d	HP
i nu O	180°39.35	N21°37.47	152°19.75	u 2.4'	N28° 20.33	a -1.8'	пР 59.8'
1	195°39.27	37.85	166°41.12	2.4'	28° 18.58	-2.0'	59.7'
2	210°39.18	38.24	181°2.56	2.5'	28° 16.63	-2.2'	59.7'
3 4	225°39.10 240°39.02	38.62	195°24.08 209°45.67	2.6'	28° 14.47 28° 12.11	-2.4' -2.6'	59.7'
4 5	255°38.93	39.01 39.39	209 45.67 224°7.34	2.7' 2.8'	28°9.55	-2.8'	59.6' 59.6'
6	270°38.85	N21°39.77	238°29.09	2.8'	N28°6.80	-3.0'	59.6'
7	285°38.76	40.15	252°50.93	2.9'	28°3.84	-3.1'	59.5'
8	300°38.68	40.54	267°12.85	3.0'	28°0.69	-3.3'	59.5'
9 10	315°38.59 330°38.51	· · 40.92 41.30	281°34.87 295°56.98	3.1' 3.2'	27°57.35 27°53.82	-3.5' -3.7'	59.5' 59.4'
11	345°38.42	41.50	310°19.18	3.3'	27°50.09	-3.1 -3.9'	59.4'
12	0°38.34	N21°42.06	324°41.48	3.4'	N27°46.17	-4.1'	59.3'
13	15°38.25	42.43	339°3.88	3.5'	27°42.07	-4.3'	59.3'
14	30°38.16 45°38.08	42.81 •• 43.19	353°26.39 7°48.99	3.6' 3.7'	27°37.78 27°33.30	-4.5' -4.7'	59.3' 59.2'
15 16	45 38.08 60°37.99	43.19	7 48.99 22°11.71	3. <i>1</i> '	27°28.64	-4.7 -4.8'	59.2'
17	75°37.91	43.94	36°34.53	3.9'	27°23.80	-5.0'	59.2'
18	90°37.82	N21°44.32	50°57.46	4.0'	N27° 18.77	-5.2'	59.1'
19	105°37.73	44.69	65°20.50	4.2'	27° 13.57	-5.4'	59.1'
20 21	120°37.64 135°37.56	45.06 •• 45.44	79°43.66 94°6.94	4.3' 4.4'	27°8.20 27°2.64	-5.6' -5.7'	59.1' 59.0'
22	150°37.47	45.81	108°30.33	4.5'	26°56.92	-5.9'	59.0'
23	165°37.38	46.18	122°53.84	4.6'	$26^{\circ}51.02$	-6.1'	58.9'
	SD = 15.8′	d = 0.4'		SI	O = 16.3'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	180°37.29	N21°46.55	$137^{\circ}17.47$	4.8'	N26°44.95	-6.2'	58.9'
1	195°37.21	46.92	151°41.22	4.9'	26° 38.72	-6.4'	58.9'
2 3	210°37.12 225°37.03	47.29 •• 47.66	166°5.10 180°29.10	5.0' 5.1'	26°32.32 26°25.75	-6.6' -6.7'	58.8' 58.8'
3 4	240°36.94	48.03	194°53.23	5.3'	26° 19.03	-6.9'	58.8'
5	255°36.85	48.40	209°17.49	5.4'	$26^{\circ}12.14$	-7.0'	58.7'
6	270°36.76	N21°48.76	223°41.87	5.5'	N26°5.09	-7.2'	58.7'
7 8	285°36.67 300°36.58	49.13 49.50	238°6.38 252°31.03	5.6' 5.8'	25°57.89 25°50.54	-7.4' -7.5'	58.6' 58.6'
9	315°36.50	49.50 •• 49.86	252 31.03 266°55.80	5.8 5.9'	25° 43.03	-7.5 -7.7'	58.6'
10	330°36.41	50.22	281°20.71	6.0'	25° 35.37	-7.8'	58.5
11	345°36.32	50.59	295°45.75	6.2'	25° 27.56	-8.0'	58.5'
12	0°36.23 15°36.14	N21°50.95 51.31	310°10.93 324°36.24	6.3' 6.4'	N25°19.60 25°11.50	-8.1'	58.5'
13 14	15°36.14 30°36.05	51.31 51.68	324°36.24 339°1.68	6.6'	25°11.50 25°3.26	-8.2' -8.4'	58.4' 58.4'
15	45°35.95	52.04	353° 27.26	6.7'	24°54.87	-8.5'	58.3
16	60°35.86	52.40	7°52.98	6.9'	24°46.35	-8.7'	58.3'
17	75°35.77	52.76	22°18.83	7.0'	24° 37.69	-8.8'	58.3'
18 19	90°35.68 105°35.59	N21°53.12 53.47	36°44.82 51°10.95	7.1' 7.3'	N24°28.89 24°19.96	-8.9' -9.1'	58.2' 58.2'
20	105 35.59 120°35.50	53.47	65°37.21	7.3 7.4'	24 19.96 24°10.90	-9.1 -9.2'	58.2 58.1'
21	135°35.41	• • 54.19	80°3.61	7.5'	24°1.72	-9.3'	58.1'
22	150°35.32	54.55	94°30.15	7.7'	23°52.40	-9.4'	58.1'
23	165°35.22	54.90	108°56.83	7.8'	23°42.96	-9.6'	58.0'
	SD = 15.8'	d = 0.4'		SI	D = 16.1'		

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

Lat.		Moonris	e		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
<b>N</b> 70°						
68°						
66°						
64° 62°	01.12		04.22	00.00		01.20
62°	01:13 02:27	03:30	04:33 05:12	00:23	00:24	01:32 00:52
N 58°					00:24	
N 58° 56°	03:03 03:29	04:07 04:34	05:40 06:01	23:46 23:19	•• ••	00:24 00:03
54°	03:29	04:54	06:01	23:19	23:45	
52°	03:30	05:13	06:33	22:41	23:29	
50°	04:22	05:28	06:46	22:25	23:16	23:50
45°	04:52	05:58	07:13	21:55	22:49	23:28
N 40°	05:16	06:22	07:34	21:31	22:27	23:10
35°	05:35	06:41	07:51	21:11	22:09	22:55
30°	05:52	06:58	08:06	20:55	21:53	22:42
20°	06:20	07:26	08:31	20:26	21:27	22:19
N 10° 0°	06:45	07:50	08:53	20:02	21:04	21:59
	07:07	08:12	09:13	19:39	20:42	21:41
<b>S</b> 10°	07:30	08:35	09:34	19:16	20:21	21:22
20° 30°	07:55 08:24	08:59 09:27	09:55 10:20	18:51 18:22	19:57 19:30	21:02 20:38
35°	08:41	09:27	10:20	18:05	19:30	20:36
40°	09:00	10:03	10.55	17:45	18:55	20:25
45°	09:25	10:26	11:12	17:21	18:32	19:49
<b>S</b> 50°	09:56	10:56	11:37	16:50	18:03	19:25
52°	10:11	11:11	11:49	16:34	17:49	19:13
54°	10:30	11:28	12:03	16:16	17:32	19:00
56°	10:52	11:48	12:19	15:54	17:12	18:44
58°	11:20	12:14	12:38	15:25	16:46	18:26
<b>S</b> 60°	12:02	12:49	13:02	14:43	16:12	18:03

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	248°44.82	225°46.61 N07°21.09	105°20.24 N16°2.34	161°10.06 N23°14.35	247°31.56 \$01°45.76	Alpheratz 357°34.59 29°13.66
1	263°47.29	240°46.79 21.84	120°21.41 1.88	176°11.92 14.36	262°33.87 45.70	Alpheratz 357°34.59 29°13.66 Ankaa 353°7.01 -42°9.88
2	278° 49.75	255°46.96 22.58	135° 22.58 1.42	191°13.78 14.37	277°36.17 45.65	Schedar 349°30.99 56°40.34
3	293°52.21	270°47.14 · · 23.32	150°23.75 · · 0.96	206°15.63 · · 14.39	292°38.48 · · 45.59	Diphda 348°47.15 -17°50.77
4 5	308° 54.68 323° 57.14	285°47.32 24.07 300°47.49 24.81	165°24.92 0.49 180°26.09 16°0.03	221°17.49 14.40 236°19.34 14.41	307°40.78 45.53 322°43.09 45.47	Achernar 335°20.35 -57°6.25
6	338° 59.61	315°47.67 N07°25.56	195°27.25 N15°59.57	251°21.20 N23°14.43	337°45.40 S01°45.41	Hamal 327°51.12 23°34.84
7	354°2.07	330°47.84 26.30	210°28.42 59.11	266°23.06 14.44	352°47.70 45.36	Polaris 314°19.69 89°22.12
8	9°4.54	345°48.02 27.04	225°29.59 58.64	281°24.91 14.46	7°50.01 45.30	Acamar 315°11.91 -40°12.06
9	24°7.00	0°48.19 · · 27.79	240°30.76 · · 58.18	296°26.77 · · 14.47	22°52.31 · · 45.24	Menkar 314°6.12 4°11.33 Mirfak 308°28.29 49°56.97
10	39°9.46	15°48.36 28.53	255° 31.93 57.72	311°28.62 14.48	37°54.62 45.18	Aldebaran 290°39.61 16°33.59
11	54°11.93	30°48.54 29.28	270°33.09 57.25	326°30.48 14.50	52°56.93 45.13	Rigel 281°3.90 -8°10.36
12	69°14.39	45°48.71 N07°30.03	285°34.26 N15°56.79	341°32.34 N23°14.51	67°59.23 S01°45.07 83°1.54 45.01	Capella 280°21.90 46°1.40
13 14	84° 16.86 99° 19.32	60°48.88 30.77 75°49.05 31.52	300°35.43 56.33 315°36.60 55.86	356°34.19 14.52 11°36.05 14.54	83°1.54 45.01 98°3.85 44.95	Bellatrix 278°22.87 6°22.34
15	114°21.78	90°49.22 · · 32.26	330°37.76 · · 55.40	26°37.90 · · 14.55	113°6.15 · · 44.90	Elnath 278°1.85 28°37.72
16	129°24.25	105°49.38 33.01	345°38.93 54.93	41°39.76 14.56	128°8.46 44.84	Alnilam 275°37.74 -1°11.16
17	$144^{\circ}26.71$	120°49.55 33.76	0°40.10 54.47	56°41.62 14.57	143°10.77 44.78	Betelgeuse 270°52.07 7°24.69 Canopus 263°52.76 -52°42.62
18	159°29.18	135°49.72 N07°34.51	15°41.27 N15°54.00	71°43.47 N23°14.59	158°13.07 <b>S</b> 01°44.72	Sirius 258°26.27 -16°45.12
19	174°31.64	150°49.89 35.25	30°42.43 53.54	86°45.33 14.60	173°15.38 44.67	Adhara 255°5.94 -29°0.48
20 21	189°34.11 204°36.57	165°50.05 36.00 180°50.22 · · 36.75	45° 43.60 53.08 60° 44.77 •• 52.61	101°47.18 14.61 116°49.04 · · 14.63	188°17.69 44.61 203°20.00 •• 44.55	Procyon 244°50.76 5°9.58
22	204 30.57 219°39.03	195°50.38 37.50	75°45.93 52.14	131°50.89 14.64	218°22.31 44.49	Pollux 243°17.19 27°57.96
23	234°41.50	210°50.54 38.25	90° 47.10 51.68	146°52.75 14.65	233°24.61 44.44	Avior 234°15.02 -59°35.66
				$\frac{110.92.79}{\nu 1.9' \ d0.0' \ \text{m}-1.92}$		Suhail 222°46.29 -43°32.32
Mer.	pass. 07:24	ν0.2′ d0.7′ m-4.40	ν1.2′ d-0.5′ m1.28	ν1.9' d0.0' m-1.92	$\nu 2.3' \ d$ -0.1' m1.09	Miaplacidus 221°38.65 -69°49.54 Alphard 217°47.57 -8°46.21
						Regulus 207°34.16 11°50.60
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.55 61°37.10
0	249° 43.96	225°50.71 N07°39.00	105°48.27 N15°51.21	161°54.60 N23°14.67	248°26.92 S01°44.38	Denebola 182°24.53 14°25.83
1 2	264° 46.43 279° 48.89	240°50.87 39.75 255°51.03 40.50	120° 49.43 50.75 135° 50.60 50.28	176° 56.46 14.68 191° 58.31 14.69	263°29.23 44.32 278°31.54 44.27	Gienah 175°43.14 -17°41.13
3	279 46.69 294°51.35	270°51.19 · · 41.25	150°51.77 · · 49.82	191°58.31 14.69 207°0.17 · · 14.70	278°31.54 44.27 293°33.85 •• 44.21	Acrux 172°59.47 -63°14.70
4	309°53.82	285°51.35 42.00	165°52.93 49.35	222° 2.02 14.72	308°36.15 44.15	Gacrux 171°51.05 -57°15.62
5	324° 56.28	300°51.51 42.75	180°54.10 48.88	237° 3.88 14.73	323°38.46 44.10	Alioth 166°12.36 55°49.50 Spica 158°21.75 -11°17.75
6	339° 58.75	315°51.67 N07°43.50	195°55.26 N15°48.42	252°5.73 N23°14.74	338°40.77 <b>S</b> 01°44.04	Alkaid 152°51.38 49°11.30
7	355°1.21	330°51.83 44.25	210° 56.43 47.95	267°7.59 14.75	353°43.08 43.98	Hadar 148°35.06 -60°29.95
8	10°3.68	345°51.98 45.00	225° 57.60 47.48	282° 9.44 14.77	8°45.39 43.93	Menkent 147°56.93 -36°29.87
9	25°6.14	0°52.14 · · 45.75	240°58.76 · · 47.02	297°11.30 · · 14.78	23°47.70 · · 43.87	Arcturus 145°47.34 19°3.00
10 11	40°8.60 55°11.07	15° 52.29 46.50 30° 52.45 47.25	255°59.93 46.55 271°1.09 46.08	312°13.15 14.79 327°15.01 14.80	38°50.01 43.82 53°52.32 43.76	Rigil Kent. 139°39.31 -60°56.61
12	70° 13.53	45°52.60 N07°48.01	286°2.26 N15°45.61	342°16.86 N23°14.82	68°54.63 S01°43.70	Kochab 137°18.70 74°3.13
13	85° 16.00	60°52.76 48.76	301°3.42 45.15	357°18.72 14.83	83°56.94 43.65	Zuben'ubi 136°55.36 -16°8.95
14	$100^{\circ}18.46$	75°52.91 49.51	316°4.59 44.68	12°20.57 14.84	98°59.25 43.59	Alphecca 126°3.11 26°37.72 Antares 112°15.07 -26°29.36
15	$115^{\circ}20.92$	90°53.06 · · 50.26	331°5.75 · · 44.21	27°22.43 · · 14.85	114°1.56 · · 43.53	Atria 107°8.45 -69°4.38
16	130°23.39	105°53.21 51.02	346°6.92 43.74	42°24.28 14.87	129°3.87 43.48	Sabik 102°2.07 -15°45.43
17	145°25.85	120° 53.37 51.77	1°8.08 43.27	57°26.14 14.88	144°6.18 43.42	Shaula 96° 9.53 -37° 7.32
18 19	160° 28.32 175° 30.78	135°53.52 N07°52.52 150°53.67 53.28	16°9.25 N15°42.80 31°10.41 42.34	72°27.99 N23°14.89 87°29.85 14.90	159°8.49 S01°43.37 174°10.80 43.31	Rasalhague 95°57.92 12°32.40
20	190°33.24	165°53.81 54.03	46° 11.58 41.87	102°31.70 14.91	189°13.11 43.26	Eltanin 90°41.52 51°28.96
21	205°35.71	180°53.96 · · 54.79	61° 12.74 · · · 41.40	117°33.55 · · 14.93	204°15.42 · · 43.20	Kaus Aust. 83°31.72 -34°22.30 Vega 80°32.63 38°48.25
22	220°38.17	195°54.11 55.54	76°13.91 40.93	132°35.41 14.94	219°17.73 43.14	Vega 80°32.63 38°48.25 Nunki 75°47.05 -26°15.87
23	235° 40.64	210°54.26 56.30	91°15.07 40.46	147°37.26 14.95	234°20.04 43.09	Altair 61°59.41 8°56.03
Mer.ı	pass. 07:20	ν0.2' d0.7' m-4.39	$\nu$ 1.2' d-0.5' m1.29	$\nu 1.9' \ d0.0' \ \text{m-}1.91$	ν2.3' d-0.1' m1.08	Peacock 53°4.86 -56°38.98
						Deneb 49°25.35 45°21.99
Man	CHA	CHA Doo	CHA Dos	CHA Doo	CHA Doo	Enif 33°38.40 9°59.38
Mon 0	<b>GHA</b> 250° 43.10	<b>GHA Dec</b> 225° 54.40 N07° 57.05	<b>GHA Dec</b> 106°16.24 N15°39.99	<b>GHA Dec</b> 162°39.12 N23°14.96	<b>GHA Dec</b> 249°22.35 <b>S</b> 01°43.03	Al Na'ir 27°32.42 -46°50.06
1	265° 45.57	240°54.55 57.81	121°17.40 39.52	177°40.97 14.97	264°24.66 42.98	Fomalhaut 15°14.18 -29°29.12 Scheat 13°44.93 28°13.04
2	280°48.03	255°54.69 58.56	136° 18.56 39.05	192°42.82 14.99	279°26.98 42.92	Markab 13°29.61 15°20.39
3	295°50.49	270°54.84 07°59.32	151° 19.73 · · · 38.58	207°44.68 · · 15.00	294°29.29 · · 42.87	
4	310°52.96	285°54.98 08°0.08	166°20.89 38.11	222°46.53 15.01	309°31.60 42.81	May 31 Sat SHA Mer.pass
5	325°55.42	300°55.12 0.83	181°22.05 37.64	237°48.39 15.02	324°33.91 42.76	Venus 337°1.78 08:57 Mars 216°35.42 16:57
6 7	340° 57.89 356° 0.35	315°55.26 N08°1.59 330°55.41 2.34	196°23.22 N15°37.17 211°24.38 36.70	252°50.24 N23°15.03 267°52.09 15.04	339°36.22 S01°42.70 354°38.54 42.65	Jupiter 272°25.24 13:14
8	11°2.81	345°55.55 3.10	226°25.55 36.23	282°53.95 15.06	9°40.85 42.59	Saturn 358°46.74 07:29
9	26°5.28	0°55.69 · · 3.86	241°26.71 · · 35.75	297°55.80 · · 15.07	24°43.16 · · 42.54	
10	41°7.74	15°55.83 4.62	256°27.87 35.28	312°57.66 15.08	39°45.47 42.48	Jun 01 Sun         SHA         Mer.pass           Venus         336°6.74         08:57
11	56° 10.21	30°55.96 5.37	271°29.04 34.81	327°59.51 15.09	54°47.79 42.43	Mars 216°4.31 16:55
12	71°12.67	45°56.10 N08°6.13	286°30.20 N15°34.34	343°1.36 N23°15.10	69°50.10 S01°42.37	Jupiter 272°10.64 13:11
13 14	86° 15.13 101° 17.60	60° 56.24 6.89 75° 56.38 7.65	301°31.36 33.87 316°32.52 33.40	358° 3.22 15.11 13° 5.07 15.12	84°52.41 42.32 99°54.72 42.26	Saturn 358°42.96 07:25
15	116° 20.06	90°56.51 · · 8.41	331°33.69 · · 32.92	28° 6.92 · · 15.14	114°57.04 · · 42.21	Jun 02 Mon SHA Mer.pass
16	131°22.53	105°56.65 9.17	346°34.85 32.45	43° 8.78 15.15	129°59.35 42.15	Venus 335°11.30 08:56
17	146°24.99	120°56.78 9.93	1°36.01 31.98	58°10.63 15.16	145°1.66 42.10	Mars 215°33.13 16:54
18	161°27.45	135°56.91 N08°10.69	16°37.18 N15°31.51	73°12.48 N23°15.17	160°3.98 <b>S</b> 01°42.05	Jupiter 271°56.02 13:08
19	176°29.92	150°57.05 11.44	31°38.34 31.03	88°14.34 15.18	175°6.29 41.99	Saturn 358°39.25 07:21
20 21	191°32.38 206°34.85	165°57.18 12.20 180°57.31 · · 12.96	46°39.50 30.56 61°40.66 · · 30.09	103°16.19 15.19 118°18.04 · · 15.20	190°8.60 41.94 205°10.92 · 41.88	Horizontal parallax
22	200 34.65 221°37.31	195°57.44 13.72	76°41.83 29.61	133°19.90 15.21	200°13.23 41.83	Venus: 0.2
23	236°39.78	210°57.57 14.49	91°42.99 29.14	148°21.75 15.23	235°15.55 41.77	Mars: 0.1
	pass. 07:16	ν0.1' d0.8' m-4.38	ν1.2' d-0.5' m1.29	ν1.9' d0.0' m-1.91	ν2.3' d-0.1' m1.08	
ivier.	pass. 01:10	νυ.1 αυ.ο III-4.38	ν1.∠ u-U.3 III1.∠9	ν1.5 dU.U III-1.91	ν2.3 α-0.1 III1.00	

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.13	N21°55.26	123°23.64	8.0'	N23°33.39	-9.7'	58.0'
1	195°35.04	55.61	137° 50.59	8.1'	23°23.70	-9.8'	57.9'
2	210°34.95 225°34.86	55.96 •• 56.32	152° 17.68 166° 44.91	8.2' 8.4'	23°13.90 23°3.97	-9.9' -10.0'	57.9' 57.9'
4	240°34.76	56.67	181° 12.27	8.5	22°53.94	-10.2	57.8'
5	255°34.67	57.02	195°39.77	8.6'	22°43.78	-10.3'	57.8'
6	270°34.58	N21°57.37	210°7.41	8.8'	N22°33.52	-10.4'	57.7'
7 8	285°34.48 300°34.39	57.72 58.07	224°35.18 239°3.09	8.9' 9.0'	22°23.14 22°12.66	-10.5' -10.6'	57.7' 57.7'
9	315°34.30	58.42	259 3.09 253° 31.14	9.0 9.2'	22 12.00 22°2.07	-10.0	57.7 57.6'
10	330°34.20	58.77	267°59.32	9.3'	21°51.37	-10.8'	57.6'
11	345°34.11	59.12	282°27.63	9.4'	$21^{\circ}40.58$	-10.9'	57.6'
12	0°34.01 15°33.92	N21°59.47 21°59.81	296°56.08 311°24.66	9.6' 9.7'	N21°29.68 21°18.68	-11.0'	57.5'
13 14	30°33.83	21 59.81 22°0.16	311 24.00 325°53.37	9. <i>1</i> 9.8'	21 18.08 21°7.59	-11.1' -11.2'	57.5' 57.4'
15	45°33.73	• • 0.50	340°22.22	10.0'	20°56.40	-11.3'	57.4'
16	60°33.64	0.85	$354^{\circ}51.19$	10.1'	$20^{\circ}45.11$	-11.4'	57.4'
17	75°33.54	1.19	9°20.30	10.2'	20°33.74	-11.5'	57.3'
18 19	90°33.45 105°33.35	N22°1.53 1.88	23°49.54 38°18.90	10.4' 10.5'	N20°22.27 20°10.72	-11.6' -11.6'	57.3' 57.2'
20	105 33.35 120°33.26	2.22	52°48.40	10.6'	19°59.08	-11.7	57.2'
21	135°33.16	• • 2.56	67° 18.02	10.7'	19°47.35	-11.8'	57.2'
22	150°33.06	2.90	81°47.77	10.9'	19°35.54	-11.9'	57.1'
23	165°32.97	3.24	96° 17.64	11.0'	19°23.65	-12.0'	57.1'
	SD = 15.8'	d = 0.4'		SI	D = 15.8'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.87	N22°3.58	110°47.64	11.1'	N19°11.68	-12.0'	57.1'
1	195°32.78	3.92	125° 17.76	11.2'	18°59.63	-12.1'	57.0'
2 3	210°32.68 225°32.58	4.26 • • 4.59	139° 48.00 154° 18.36	11.4' 11.5'	18° 47.50 18° 35.30	-12.2' -12.3'	57.0' 56.9'
4	240°32.49	4.93	168° 48.85	11.6'	18° 23.03	-12.3'	56.9'
5	255°32.39	5.26	183° 19.45	11.7'	18° 10.68	-12.4'	56.9'
6	270°32.29	N22°5.60	197°50.18	11.8'	N17°58.26	-12.5'	56.8'
7	285°32.19 300°32.10	5.93 6.27	212°21.02 226°51.97	12.0' 12.1'	17° 45.77 17° 33.22	-12.6' -12.6'	56.8' 56.8'
8 9	315°32.10	. 6.60	241°23.04	12.1	17 33.22 17°20.60	-12.0 -12.7'	56.7
10	330°31.90	6.93	255°54.23	12.3'	17°7.91	-12.7'	56.7'
11	345°31.80	7.27	270°25.53	12.4'	$16^{\circ}55.16$	-12.8'	56.6'
12 13	0°31.71 15°31.61	N22°7.60 7.93	284° 56.94 299° 28.46	12.5' 12.6'	N16° 42.35 16° 29.48	-12.9' -12.9'	56.6' 56.6'
14	30°31.51	7.93 8.26	314°0.08	12.7	16° 29.46	-12.9 -13.0'	56.5'
15	45°31.41	• • 8.59	328° 31.82	12.8'	16°3.56	-13.0'	56.5'
16	60°31.31	8.91	343°3.66	12.9'	15°50.52	-13.1'	56.5'
17	75°31.21 90°31.11	9.24 N22°9.57	357°35.61 12°7.67	13.1' 13.2'	15°37.42 N15°24.27	-13.2'	56.4' 56.4'
18 19	105°31.02	N22 9.57 9.89	26° 39.82	13.2	15° 11.07	-13.2' -13.3'	56.4'
20	120°30.92		41°12.08		14°57.82		
21	135°30.82	•• 10.55	55°44.44	13.5'	14° 44.52	-13.4'	56.3'
22	150°30.72 165°30.62	10.87	70° 16.89 84° 49.45	13.6'	14°31.16 14°17.77	-13.4'	56.3'
23	$\frac{165^{\circ}30.62}{SD = 15.8'}$	$\frac{11.19}{d = 0.3'}$	84 49.45	13.7'	D = 15.6'	-13.4'	56.2'
	3D = 15.6	u = 0.5		31	J = 15.0		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°30.52 195°30.42	N22°11.52 11.84	99°22.10 113°54.84	13.7' 13.8'	N14°4.32 13°50.84	-13.5' -13.5'	56.2' 56.2'
2	210°30.32	12.16	128° 27.68	13.9'	13° 37.31	-13.6'	56.1
3	225°30.22	• • 12.48	143°0.62	14.0'	13°23.73	-13.6'	56.1'
4	240°30.12	12.80	157° 33.64	14.1'	13° 10.12	-13.7'	56.1'
5 6	255°30.02 270°29.91	13.12 N22°13.44	172°6.75 186°39.96	14.2' 14.3'	12°56.47 N12°42.78	-13.7' -13.7'	56.0' 56.0'
7	285°29.81	13.76	201°13.25	14.4'	12° 29.05	-13.8'	56.0'
8	300°29.71	14.08	215°46.62	14.5'	12° 15.29	-13.8'	55.9'
9	315°29.61	• • 14.39	230°20.08	14.5'	12°1.49	-13.8'	55.9'
10 11	330°29.51 345°29.41	14.71 15.02	244° 53.62 259° 27.25	14.6' 14.7'	11°47.65 11°33.79	-13.9' -13.9'	55.9' 55.8'
12	0°29.31	N22° 15.34	274°0.95	14.8'	N11° 19.89	-13.9'	55.8'
13	15°29.20	15.65	288°34.73	14.9'	$11^{\circ}5.96$	-14.0'	55.8'
14	30°29.10	15.97	303°8.60	14.9'	10°52.01	-14.0'	55.7'
15 16	45°29.00 60°28.90	· · 16.28 16.59	317° 42.53 332° 16.55	15.0' 15.1'	10°38.02 10°24.01	-14.0' -14.0'	55.7' 55.7'
17	75°28.79	16.90	346° 50.63	15.1	10° 24.01	-14.1	55.7'
18	90°28.69	N22° 17.21	1°24.79	15.2'	N09°55.91	-14.1'	55.6'
19	105°28.59	17.52	15°59.02	15.3'	09°41.82	-14.1'	55.6'
20 21	120°28.49 135°28.38	17.83 •• 18.14	30°33.32 45°7.69	15.4' 15.4'	09°27.70 09°13.57	-14.1' -14.2'	55.6' 55.5'
22	150°28.28	18.45	59° 42.12	15.4 15.5'	09 13.57 08°59.41	-14.2'	55.5'
23	165°28.18	18.76	74° 16.62	15.6'	08°45.24	-14.2'	55.5'
	SD = 15.8'	d = 0.3'		SI	O = 15.3'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
Juy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-39%
31	02:21	02:16	11:58	16:21	03:55	
01	02:11	02:07	11:58	17:10	04:46	
02	02:02	01:57	11:58	17:54	05:33	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	251° 42.24	225°57.70 N08°15.25	106°44.15 N15°28.67	163°23.60 N23°15.24	250°17.86 \$01°41.72	Alpheratz 357°34.56 29°13.67
1	266° 44.70	240°57.83 16.01	121°45.31 28.19	178°25.46 15.25	265°20.18 41.67	Ankaa 353°6.98 -42°9.87
2	281°47.17	255° 57.96 16.77	136°46.47 27.72	193°27.31 15.26	280°22.49 41.61	Schedar 349°30.96 56°40.34
3 4	296°49.63	270°58.09 · · 17.53	151° 47.63 · · · 27.25	208°29.16 · · 15.27	295°24.80 · · 41.56	Diphda 348°47.13 -17°50.76
4 5	311°52.10 326°54.56	285°58.21 18.29 300°58.34 19.05	166° 48.80 26.77 181° 49.96 26.30	223°31.02 15.28 238°32.87 15.29	310°27.12 41.51 325°29.43 41.45	Achernar 335°20.32 -57°6.24
6	341°57.02	315°58.47 N08°19.81	196°51.12 N15°25.82	253°34.72 N23°15.30	340°31.75 S01°41.40	Hamal 327°51.11 23°34.85
7	$356^{\circ}59.49$	330°58.59 20.58	211°52.28 25.35	268°36.57 15.31	355°34.06 41.34	Polaris 314°19.00 89°22.11 Acamar 315°11.90 -40°12.05
8	12°1.95	345°58.71 21.34	226°53.44 24.87	283°38.43 15.32	10°36.38 41.29	Menkar 314°6.11 4°11.34
9	27°4.42	0°58.84 · · 22.10	241°54.60 · · 24.40	298°40.28 · · 15.33	25°38.70 · · 41.24	Mirfak 308°28.28 49°56.96
10 11	42°6.88 57°9.34	15°58.96 22.86 30°59.08 23.63	256°55.76 23.92 271°56.93 23.45	313°42.13 15.34 328°43.98 15.35	40°41.01 41.18 55°43.33 41.13	Aldebaran 290°39.60 16°33.59
12	72°11.81	45°59.20 N08°24.39	286°58.09 N15°22.97	343°45.84 N23°15.36	70°45.64 S01°41.08	Rigel 281°3.90 -8°10.35
13	87° 14.27	60°59.33 25.15	301°59.25 22.49	358°47.69 15.37	85°47.96 41.02	Capella 280°21.90 46°1.40
14	$102^{\circ}16.74$	75°59.45 25.92	317°0.41 22.02	13°49.54 15.38	100°50.28 40.97	Bellatrix 278°22.87 6°22.35 Elnath 278°1.84 28°37.72
15	117° 19.20	90°59.56 · · 26.68	332°1.57 · · 21.54	28°51.39 · · 15.40	115°52.59 · · 40.92	Alnilam 275°37.74 -1°11.15
16 17	132°21.66 147°24.13	105°59.68 27.45 120°59.80 28.21	347°2.73 21.07 2°3.89 20.59	43°53.25 15.41 58°55.10 15.42	130°54.91 40.87 145°57.22 40.81	Betelgeuse 270°52.07 7°24.70
18	162° 26.59	135°59.92 N08°28.97	17°5.05 N15°20.11	73°56.95 N23°15.43	160°59.54 \$01°40.76	Canopus 263°52.77 -52°42.60
19	177°29.06	151°0.04 29.74	32°6.21 19.64	88°58.80 15.44	176°1.86 40.71	Sirius 258°26.27 -16°45.10
20	192°31.52	$166^{\circ}0.15$ 30.50	47°7.37 19.16	104°0.66 15.45	191°4.18 40.65	Adhara 255°5.95 -29°0.47 Procyon 244°50.76 5°9.58
21	207°33.99	181°0.27 · · 31.27	62°8.53 · · 18.68	119°2.51 · · 15.46	206°6.49 · · 40.60	Pollux 243°17.20 27°57.96
22	222°36.45	196°0.38 32.03	77°9.69 18.21	134° 4.36 15.47	221°8.81 40.55	Avior 234°15.05 -59°35.65
23	237°38.91	211°0.50 32.80	92°10.85 17.73	149°6.21 15.48	236°11.13 40.50	Suhail 222°46.31 -43°32.31
Mer.p	pass. 07:12	ν0.1' d0.8' m-4.37	ν1.2' d-0.5' m1.30	ν1.9′ d0.0′ m-1.91	ν2.3′ d-0.1′ m1.08	Miaplacidus 221°38.69 -69°49.54
						Alphard 217°47.58 -8°46.20
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.18 11°50.61 Dubhe 193°40.57 61°37.10
0	252°41.38	226°0.61 N08°33.56	107°12.01 N15°17.25	164°8.06 N23°15.49	251°13.44 <b>S</b> 01°40.44	Denebola 182°24.55 14°25.83
1	267° 43.84	241°0.72 34.33	122°13.17 16.77	179° 9.92 15.50	266°15.76 40.39	Gienah 175°43.15 -17°41.13
2	282° 46.31 297° 48.77	256°0.83 35.10 271°0.95 · · 35.86	137°14.33 16.29 152°15.49 · · 15.82	194°11.77 15.51 209°13.62 · · 15.52	281°18.08 40.34 296°20.40 • 40.29	Acrux 172°59.50 -63°14.70
4	312°51.23	286°1.06 36.63	167°16.65 15.34	224°15.47 15.53	311°22.72 40.23	Gacrux 171°51.07 -57°15.62
5	327°53.70	301°1.17 37.39	182°17.81 14.86	239°17.32 15.54	326°25.03 40.18	Alioth 166°12.38 55°49.51 Spica 158°21.76 -11°17.75
6	342°56.16	316°1.28 N08°38.16	197°18.97 N15°14.38	254°19.18 N23°15.55	341°27.35 <b>S</b> 01°40.13	Spica 158°21.76 -11°17.75   Alkaid 152°51.39 49°11.31
7	357°58.63	331°1.38 38.93	212°20.13 13.90	269°21.03 15.55	356°29.67 40.08	Hadar 148°35.08 -60°29.96
8	13°1.09	346°1.49 39.69	227°21.29 13.42	284°22.88 15.56	11°31.99 40.03 26°34.31 · · 39.97	Menkent 147°56.94 -36°29.88
9 10	28°3.55 43°6.02	1°1.60 · · 40.46 16°1.71 41.23	242°22.45 · · 12.94 257°23.61 12.47	299°24.73 · · 15.57 314°26.58	26°34.31 · · 39.97 41°36.63 39.92	Arcturus 145°47.35 19°3.01
11	58°8.48	31°1.81 42.00	272°24.77 11.99	329°28.44 15.59	56°38.95 39.87	Rigil Kent. 139°39.32 -60°56.62
12	73° 10.95	46°1.92 N08°42.76	287°25.92 N15°11.51	344°30.29 N23°15.60	71°41.26 S01°39.82	Kochab 137°18.73 74°3.15 Zuben'ubi 136°55.37 -16°8.95
13	$88^{\circ}13.41$	61°2.02 43.53	302°27.08 11.03	359°32.14 15.61	86°43.58 39.77	Alphecca 126°3.11 26°37.73
14	103° 15.87	76°2.13 44.30	317°28.24 10.55	14°33.99 15.62	101°45.90 39.71	Antares 112°15.07 -26°29.36
15	118° 18.34	91°2.23 ·· 45.07 106°2.33     45.84	332°29.40 · · 10.07 347°30.56 9.59	29°35.84 · · 15.63 44°37.69 15.64	116°48.22 · · 39.66 131°50.54 39.61	Atria 107°8.44 -69°4.39
16 17	133°20.80 148°23.27	106°2.33 45.84 121°2.43 46.61	347°30.56 9.59 2°31.72 9.11	44°37.69 15.64 59°39.54 15.65	131°50.54 39.61 146°52.86 39.56	Sabik 102°2.06 -15°45.43
18	163°25.73	136°2.53 N08°47.37	17°32.88 N15°8.63	74°41.40 N23°15.66	161°55.18 S01°39.51	Shaula 96°9.51 -37°7.33
19	178°28.19	151°2.64 48.14	32°34.03 8.14	89°43.25 15.67	176°57.50 39.46	Rasalhague 95°57.91 12°32.41 Eltanin 90°41.51 51°28.97
20	193°30.66	166°2.74 48.91	47° 35.19 7.66	104°45.10 15.68	191°59.82 39.41	Kaus Aust. 83°31.71 -34°22.31
21	208°33.12	181°2.83 · · 49.68	62°36.35 · · 7.18	119°46.95 · · 15.69	207°2.14 · · 39.35	Vega 80°32.61 38°48.26
22 23	223°35.59 238°38.05	196°2.93 50.45 211°3.03 51.22	77° 37.51 6.70 92° 38.67 6.22	134°48.80 15.69 149°50.65 15.70	222°4.46 39.30 237°6.78 39.25	Nunki 75°47.03 -26°15.87
			-			Altair 61°59.39 8°56.03
Mer.p	pass. 07:08	ν0.1' d0.8' m-4.36	ν1.2' d-0.5' m1.31	ν1.9' d0.0' m-1.91	$\nu 2.3' \ d$ -0.1' m1.07	Peacock 53°4.83 -56°38.98 Deneb 49°25.33 45°22.00
						Deneb 49°25.33 45°22.00 Enif 33°38.37 9°59.39
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.39 -46°50.05
0	253° 40.52	226°3.13 N08°51.99	107°39.83 N15°5.74	164°52.50 N23°15.71	252°9.10 S01°39.20	Fomalhaut 15°14.15 -29°29.11
1 2	268° 42.98 283° 45.44	241°3.22 52.76 256°3.32 53.53	122° 40.98 5.26 137° 42.14 4.77	179°54.35 15.72 194°56.20 15.73	267°11.43 39.15 282°13.75 39.10	Scheat 13°44.91 28°13.05
3	203 45.44 298° 47.91	271°3.42 · · 54.30	157 42.14 4.77 152°43.30 •• 4.29	209°58.06 · · 15.74	297°16.07 · · 39.05	Markab 13°29.59 15°20.40
4	313°50.37	286°3.51 55.07	167° 44.46 3.81	224°59.91 15.75	312°18.39 39.00	Jun 03 Tue SHA Mer.pass
5	328° 52.84	301°3.60 55.84	182°45.61 3.33	240° 1.76 15.76	327°20.71 38.95	Venus 334°15.46 08:56
6	343°55.30	316°3.70 N08°56.61	197° 46.77 N15° 2.85	255°3.61 N23°15.77	342°23.03 S01°38.90	Mars 215°1.91 16:52
7 Ω	358° 57.76 14° 0.23	331°3.79 57.38 346°3.88 58.15	212° 47.93 2.36 227° 49.09 1.88	270° 5.46 15.77 285° 7.31 15.78	357°25.35 38.85 12°27.67 38.79	Jupiter 271°41.36 13:05 Saturn 358°35.62 07:18
8 9	14°0.23 29°2.69	346°3.88 58.15 1°3.97 · · 58.93	227°49.09 1.88 242°50.24 •• 1.40	285°7.31 15.78 300°9.16 · · 15.79	12°27.67 38.79 27°30.00 · · 38.74	
10	44°5.16	16°4.06 08°59.70	257°51.40 0.91	315°11.01 15.80	42°32.32 38.69	Jun 04 Wed SHA Mer.pass
11	59°7.62	31°4.15 09°0.47	272°52.56 15°0.43	330°12.86 15.81	57°34.64 38.64	Venus 333°19.23 08:56 Mars 214°30.63 16:50
12	74°10.08	46°4.24 N09°1.24	287°53.71 N14°59.95	345°14.71 N23°15.82	72°36.96	Jupiter 271°26.69 13:02
13	89°12.55	61°4.33 2.01	302°54.87 59.46	0°16.56 15.83	87°39.29 38.54	Saturn 358°32.07 07:14
14 15	104° 15.01 119° 17.48	76°4.42 2.78 91°4.51 · · 3.56	317°56.03 58.98 332°57.18 • 58.50	15°18.41 15.83 30°20.26 · · 15.84	102°41.61 38.49 117°43.93 · · 38.44	
16	134° 19.94	106°4.59 4.33	347°58.34 58.01	45°22.12 15.85	132°46.25 38.39	Jun 05 Thu         SHA         Mer.pass           Venus         332°22.61         08:56
17	149°22.40	121°4.68 5.10	2°59.50 57.53	60°23.97 15.86	147°48.58 38.34	Mars 213°59.31 16:48
18	164°24.87	136°4.76 N09°5.87	18°0.65 N14°57.04	75°25.82 N23°15.87	162°50.90 S01°38.29	Jupiter 271°11.99 12:59
19	179°27.33	151°4.85 6.65	33°1.81 56.56	90°27.67 15.88	177°53.22 38.24	Saturn 358°28.59 07:10
20 21	194° 29.80 209° 32.26	166°4.93 7.42 181°5.02 · · 8.19	48°2.97 56.07 63°4.12 · · 55.59	105°29.52 15.88 120°31.37 · · 15.89	192°55.55 38.19 207°57.87 · · 38.14	Horizontal parallax
22	209 32.20 224°34.72	196°5.10 8.97	78°5.28 55.10	135°33.22 15.90	223°0.19 38.09	Venus: 0.2
23	239°37.19	211°5.18 9.74	93°6.43 54.62	150°35.07 15.91	238° 2.52 38.04	Mars: 0.1
Merr	pass. 07:04	ν0.1' d0.8' m-4.35	ν1.2' d-0.5' m1.32	ν1.9' d0.0' m-1.91	ν2.3' d-0.1' m1.07	
.,,,,,						!

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.07	N22°19.06	88°51.19	15.6'	N08°31.04	-14.2'	55.5'
1	195°27.97	19.37	103°25.81	15.7'	08°16.82	-14.2'	55.4'
2	210°27.87	19.68	118°0.50	15.7'	08°2.59	-14.2'	55.4'
3 4	225°27.76 240°27.66	· · 19.98 20.28	132°35.25 147°10.06	15.8' 15.9'	07°48.34 07°34.07	-14.3' -14.3'	55.4' 55.3'
5	255°27.55	20.28	147 10.00 161°44.92	15.9'	07 34.07 07°19.79	-14.3'	55.3'
6	270°27.45	N22°20.89	176°19.84	16.0'	N07°5.50	-14.3'	55.3'
7	285°27.34	21.19	190°54.82	16.0'	$06^{\circ}51.19$	-14.3'	55.3'
8	300°27.24	21.49	205°29.85	16.1'	06°36.87	-14.3'	55.2'
9	315°27.13	• • 21.79	220°4.93	16.1'	06°22.54	-14.3'	55.2'
10 11	330°27.03 345°26.92	22.09 22.39	234°40.06 249°15.24	16.2' 16.2'	06°8.19 05°53.84	-14.4' -14.4'	55.2' 55.2'
12	0°26.82	N22°22.69	263°50.47	16.3	N05°39.48	-14.4'	55.1'
13	15°26.71	22.99	278°25.75	16.3'	05°25.11	-14.4'	55.1'
14	$30^{\circ}26.61$	23.29	293°1.07	16.4'	$05^{\circ}10.73$	-14.4'	55.1'
15	45°26.50	• • 23.58	307°36.43	16.4'	04°56.34	-14.4'	55.1'
16 17	60°26.40 75°26.29	23.88 24.17	322°11.84 336°47.29	16.4' 16.5'	04°41.95 04°27.56	-14.4' -14.4'	55.0' 55.0'
18	90°26.18	N22°24.47	351°22.78	16.5	N04° 13.16	-14.4'	55.0'
19	105°26.08	24.76	5°58.31	16.6'	03°58.75	-14.4'	55.0'
20	120°25.97	25.06	20°33.88	16.6'	03°44.35	-14.4'	54.9'
21	135°25.86	• • 25.35	35°9.48	16.6'	03°29.94	-14.4'	54.9'
22	150°25.76 165°25.65	25.64	49°45.12 64°20.79	16.7'	03°15.53 03°1.12	-14.4'	54.9'
23		25.93	04 20.79	16.7'		-14.4'	54.9'
	SD = 15.8'	d = 0.3'		SI	D = 15.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°25.54	N22°26.22	78°56.49	16.7'	N02°46.71	-14.4'	54.9'
1	195°25.44	26.51	93°32.23	16.8'	$02^{\circ}32.30$	-14.4'	54.8'
2	210°25.33	26.80	108°7.99	16.8'	02°17.89	-14.4'	54.8'
3 4	225°25.22 240°25.11	· · 27.09 27.38	122°43.79 137°19.61	16.8' 16.8'	02°3.49 01°49.09	-14.4' -14.4'	54.8' 54.8'
4 5	240 25.11 255°25.01	27.38 27.66	151°55.46	16.8	01 49.09 01°34.69	-14.4' -14.4'	54.8'
6	270°24.90	N22°27.95	166°31.33	16.9'	N01°20.29	-14.4'	54.7'
7	285°24.79	28.23	181°7.23	16.9'	$01^{\circ}5.91$	-14.4'	54.7'
8	300°24.68	28.52	195°43.15	16.9'	00°51.52	-14.4'	54.7'
9	315°24.57	• • 28.80	210°19.09	17.0'	00°37.15	-14.4'	54.7'
10 11	330°24.46 345°24.36	29.09 29.37	224°55.04 239°31.02	17.0' 17.0'	00°22.78 N00°8.42	-14.4' -14.4'	54.7' 54.6'
12	0°24.25	N22°29.65	254°7.02	17.0'	S00°5.93	14.3	54.6
13	15°24.14	29.93	268°43.03	17.0'	00°20.27	14.3'	54.6'
14	30°24.03	30.21	283°19.06	17.0'	$00^{\circ}34.60$	14.3'	54.6'
15	45°23.92	30.49	297°55.10	17.1'	00°48.92	14.3'	54.6'
16 17	60°23.81 75°23.70	30.77 31.05	312°31.15 327°7.21	17.1' 17.1'	01°3.23 01°17.53	14.3' 14.3'	54.5' 54.5'
18	90°23.59	N22°31.33	341°43.29	17.1'	501°31.81	14.3	54.5
19	105°23.48	31.61	356°19.37	17.1'	01°46.09	14.3'	54.5'
20	120°23.37	31.88	$10^{\circ}55.46$	17.1'	$02^{\circ}0.34$	14.2'	54.5'
21	135°23.26	• • 32.16	25°31.56	17.1'	02°14.58	14.2'	54.5'
22 23	150°23.15 165°23.04	32.44 32.71	40°7.66 54°43.77	17.1' 17.1'	02°28.81 02°43.02	14.2' 14.2'	54.4' 54.4'
23			54 43.77			14.2	54.4
	SD = 15.8'	d = 0.3'		51	D = 15.0'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°22.93	N22°32.98	69°19.88	17.1'	S02°57.21	14.2'	54.4'
1 2	195°22.82 210°22.71	33.26 33.53	83°55.99 98°32.10	17.1' 17.1'	03°11.39 03°25.55	14.2' 14.1'	54.4' 54.4'
3	210°22.71 225°22.60	· · 33.80	98° 32.10 113° 8.21	17.1' 17.1'	03°25.55 03°39.68	14.1' 14.1'	54.4' 54.4'
4	240°22.49	34.07	127°44.32	17.1	03°53.80	14.1	54.4'
5	255°22.38	34.34	$142^{\circ}20.43$	17.1'	$04^{\circ}7.90$	14.1'	54.3'
6	270°22.27	N22°34.61	156°56.53	17.1'	S04°21.98	14.1'	54.3'
7	285°22.16 300°22.04	34.88 35.15	171°32.63 186°8.72	17.1' 17.1'	04°36.04 04°50.07	14.0'	54.3' 54.3'
8 9	300°22.04 315°21.93	35.15 · · 35.42	186°8.72 200°44.80	17.1' 17.1'	04°50.07 05°4.08	14.0' 14.0'	54.3'
10	330°21.82	35.69	215°20.88	17.1'	05°18.07	14.0'	54.3'
11	345°21.71	35.95	229°56.94	17.1'	05°32.03	13.9'	54.3'
12	0°21.60	N22°36.22	244°32.99	17.0'	S05°45.97	13.9'	54.3'
13	15°21.48	36.48	259°9.04	17.0'	05°59.88	13.9'	54.2'
14 15	30°21.37 45°21.26	36.75 •• 37.01	273°45.06 288°21.08	17.0' 17.0'	06°13.77 06°27.63	13.9' 13.8'	54.2' 54.2'
16	60°21.15	37.01	302°57.08	17.0'	06°41.46	13.8'	54.2'
17	75°21.04	37.54	317°33.06	17.0'	$06^{\circ}55.27$	13.8'	54.2'
18	90°20.92	N22°37.80	332°9.02	16.9'	S07°9.04	13.7'	54.2'
19	105°20.81	38.06	346°44.97	16.9'	07°22.79	13.7'	54.2'
20 21	120°20.70 135°20.58	38.32 •• 38.58	1°20.89 15°56.80	16.9' 16.9'	07°36.51 07°50.19	13.7' 13.7'	54.2' 54.2'
22	150°20.47	38.84	30°32.68	16.9'	07 50.19 08°3.84	13.6'	54.2'
23	165°20.36	39.10	45°8.54	16.8'	08°17.46	13.6'	54.1'
	SD = 15.8'	d = 0.3'		SI	D = 14.8'		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	49-68%
03	01:52	01:47	11:58	18:35	06:15	
04	01:42	01:37	11:58	19:15	06:55	
05	01:32	01:26	11:59	19:54	07:35	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
- Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	254°39.65	226°5.26 N09°10.51	108°7.59 N14°54.13	165°36.92 N23°15.92	253°4.84 S01°37.99	
1	269°42.12	241°5.34 11.29	123° 8.75 53.65	180°38.77 15.92	268°7.17 37.94	Alpheratz 357°34.54 29°13.67 Ankaa 353°6.96 -42°9.86
2	284°44.58	256° 5.42 12.06	138° 9.90 53.16	195°40.62 15.93	283°9.49 37.90	Ankaa 353°6.96 -42°9.86 Schedar 349°30.93 56°40.34
3	299° 47.05	271°5.50 · · 12.83	153°11.06 · · 52.68	210°42.47 · · 15.94	298°11.81 · · 37.85	Diphda 348°47.11 -17°50.75
4	314° 49.51	286°5.58 13.61	168°12.21 52.19	225°44.32 15.95	313°14.14 37.80	Achernar 335°20.30 -57°6.22
5 6	329°51.97 344°54.44	301°5.66 14.38 316°5.74 N09°15.16	183°13.37 51.70 198°14.52 N14°51.22	240°46.17 15.96 255°48.02 N23°15.96	328°16.46 37.75 343°18.79 S01°37.70	Hamal 327°51.09 23°34.85
7	359°56.90	331° 5.81 15.93	213°15.68 50.73	270°49.87 15.97	358°21.11 37.65	Polaris 314°18.12 89°22.09
8	14° 59.37	346°5.89 16.70	228°16.84 50.24	285°51.72 15.98	13°23.44 37.60	Acamar 315°11.89 -40°12.03
9	$30^{\circ}1.83$	1°5.96 · · 17.48	243°17.99 · · 49.76	300°53.57 · · 15.99	28°25.76 · · 37.55	Menkar 314°6.10 4°11.34 Mirfak 308°28.26 49°56.96
10	45°4.29	16°6.04 18.25	258°19.15 49.27	315°55.42 15.99	43°28.09 37.50	Aldebaran 290°39.60 16°33.59
11 12	60°6.76 75°9.22	31°6.11 19.03 46°6.19 N09°19.80	273°20.30 48.78 288°21.46 N14°48.29	330°57.27 16.00 345°59.12 N23°16.01	58°30.41 37.45 73°32.74 S01°37.40	Rigel 281°3.90 -8°10.34
13	90°11.69	61°6.26 20.58	303°22.61 47.81	1°0.97 16.02	88°35.06 37.35	Capella 280°21.90 46°1.39
14	105° 14.15	76°6.33 21.35	318°23.77 47.32	16°2.82 16.02	103°37.39 37.31	Bellatrix 278°22.87 6°22.35
15	$120^{\circ}16.61$	91°6.40 · · 22.13	333°24.92 · · 46.83	31°4.67 · · 16.03	118°39.72 · · 37.26	Elnath 278°1.84 28°37.72 Alnilam 275°37.73 -1°11.15
16	135° 19.08	106°6.47 22.90	348°26.07 46.34	46°6.52 16.04	133°42.04 37.21	Betelgeuse 270°52.07 7°24.70
17	150°21.54	121°6.54 23.68	3°27.23 45.86	61°8.37 16.05	148°44.37 37.16	Canopus 263°52.78 -52°42.59
18 19	165°24.01 180°26.47	136°6.61 N09°24.46 151°6.68 25.23	18°28.38 N14°45.37 33°29.54 44.88	76°10.22 N23°16.05 91°12.07 16.06	163°46.69 S01°37.11 178°49.02 37.06	Sirius 258°26.28 -16°45.10
20	195°28.93	166° 6.75 26.01	48°30.69 44.39	106°13.91 16.07	193°51.35 37.02	Adhara 255°5.96 -29°0.46
21	210°31.40	181°6.82 · · 26.78	63°31.85 · · 43.90	121°15.76 · · 16.07	208°53.67 · · 36.97	Procyon 244°50.77 5°9.59
22	225°33.86	196° 6.88 27.56	78°33.00 43.41	136°17.61 16.08	223°56.00 36.92	Pollux 243°17.21 27°57.96 Avior 234°15.07 -59°35.64
23	240°36.33	211°6.95 28.34	93°34.16 42.92	151°19.46 16.09	238°58.33 36.87	Suhail 222°46.32 -43°32.31
Mer.	pass. 07:00	ν0.1' d0.8' m-4.34	ν1.2' d-0.5' m1.33	$\nu$ 1.9' d0.0' m-1.91	ν2.3' d-0.0' m1.06	Miaplacidus 221°38.73 -69°49.53
						Alphard 217°47.59 -8°46.20
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.19 11°50.61
0	255°38.79	226°7.01 N09°29.11	108°35.31 N14°42.43	166°21.31 N23°16.10	254°0.66 \$01°36.82	Dubhe 193°40.61 61°37.11 Denebola 182°24.56 14°25.84
1	$270^{\circ}41.26$	241°7.08 29.89	123°36.46 41.94	181°23.16 16.10	269°2.98 36.77	Gienah 175°43.16 -17°41.13
2	285° 43.72	256°7.14 30.67	138°37.62 41.45	196°25.01 16.11	284°5.31 36.73	Acrux 172°59.52 -63°14.71
3	300°46.18	271°7.21 · · 31.44	153°38.77 · · 40.96	211°26.86 · · 16.12	299°7.64 · · 36.68	Gacrux 171°51.09 -57°15.63
4 5	315° 48.65 330° 51.11	286°7.27 32.22 301°7.33 33.00	168°39.92 40.47 183°41.08 39.98	226°28.71 16.12 241°30.56 16.13	314°9.97 36.63 329°12.29 36.58	Alioth 166°12.40 55°49.52
6	345°53.58	316°7.39 N09°33.77	198°42.23 N14°39.49	256°32.41 N23°16.14	344°14.62 S01°36.53	Spica 158°21.77 -11°17.74
7	0°56.04	331°7.45 34.55	213°43.39 39.00	271°34.26 16.14	359°16.95 36.49	Alkaid 152°51.40 49°11.32 Hadar 148°35.09 -60°29.97
8	$15^{\circ}58.50$	346°7.51 35.33	228°44.54 38.51	286°36.11 16.15	14°19.28 36.44	Menkent 147°56.95 -36°29.88
9	31°0.97	1°7.57 · · 36.11	243°45.69 · · 38.02	301°37.96 · · 16.16	29°21.61 · · 36.39	Arcturus 145°47.35 19°3.02
10 11	46°3.43 61°5.90	16° 7.63 36.88 31° 7.69 37.66	258°46.85 37.53 273°48.00 37.04	316°39.80 16.16 331°41.65 16.17	44°23.94 36.34 59°26.26 36.30	Rigil Kent. 139°39.33 -60°56.63
12	76°8.36	46°7.75 N09°38.44	288°49.15 N14°36.55	346°43.50 N23°16.18	74°28.59 S01°36.25	Kochab 137°18.76 74°3.16
13	91° 10.82	61°7.80 39.22	303°50.30 36.06	1°45.35 16.18	89°30.92 36.20	Zuben'ubi 136°55.37 -16°8.95 Alphecca 126°3.12 26°37.74
14	$106^{\circ}13.29$	76°7.86 39.99	318°51.46 35.57	16°47.20 16.19	104° 33.25 36.16	Alphecca 126°3.12 26°37.74 Antares 112°15.07 -26°29.36
15	121° 15.75	91°7.92 · · 40.77	333°52.61 · · 35.07	31°49.05 · · 16.20	119°35.58 · · 36.11	Atria 107°8.43 -69°4.40
16	136° 18.22	106°7.97 41.55	348°53.76 34.58	46°50.90 16.20	134°37.91 36.06	Sabik 102°2.06 -15°45.42
17 18	151°20.68 166°23.15	121°8.02 42.33 136°8.08 N09°43.11	3°54.92 34.09 18°56.07 N14°33.60	61°52.75 16.21 76°54.60 N23°16.21	149°40.24 36.01 164°42.57 \$01°35.97	Shaula 96° 9.51 -37° 7.33
19	181°25.61	151°8.13 43.89	33°57.22 33.11	91°56.44 16.22	179° 44.90 35.92	Rasalhague 95°57.90 12°32.42
20	196°28.07	166°8.18 44.66	48°58.37 32.61	106°58.29 16.23	194° 47.23 35.87	Eltanin 90°41.50 51°28.99 Kaus Aust. 83°31.69 -34°22.31
21	211° 30.54	181°8.23 · · 45.44	63°59.53 · · 32.12	122°0.14 · · 16.23	209°49.56 · · 35.83	Vega 80°32.60 38°48.28
22	226°33.00	196°8.29 46.22	79°0.68 31.63	137°1.99 16.24	224°51.89 35.78	Nunki 75°47.02 -26°15.87
23	241°35.47	211°8.34 47.00	94°1.83 31.14	152°3.84 16.25	239° 54.22 35.73	Altair 61°59.38 8°56.04
Mer. <sub>I</sub>	pass. 06:56	$ u 0.1' \ d0.8' \ \text{m-4.33} $	$\nu 1.2' \; d\text{-}0.5' \; \text{m}1.34$	$ u 1.8' \ d0.0' \ \text{m-}1.91$	$\nu 2.3' \ d$ -0.0' m1.06	Peacock 53°4.80 -56°38.98
						Deneb 49°25.30 45°22.02
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.36 9°59.40 Al Na'ir 27°32.36 -46°50.05
0	256° 37.93	226°8.39 N09°47.78	109°2.98 N14°30.64	167°5.69 N23°16.25	254°56.55 S01°35.69	Fomalhaut 15°14.13 -29°29.11
1	271°40.39	241°8.43 48.56	124° 4.14 30.15	182°7.54 16.26	269° 58.88 35.64	Scheat 13°44.89 28°13.06
2	286° 42.86	256°8.48 49.34	139° 5.29 29.66	197°9.38 16.26	285°1.21 35.59	Markab 13°29.57 15°20.41
3 4	301° 45.32 316° 47.79	271°8.53 · · 50.12 286°8.58 50.90	154°6.44 · · 29.16 169°7.59 28.67	212°11.23 · · 16.27 227°13.08 16.27	300°3.54 · · 35.55 315°5.87 35.50	Jun 06 Fri SHA Mer.pass
5	331°50.25	301°8.62 51.67	184°8.74 28.17	242°14.93 16.28	330°8.20 35.45	Venus 331°25.61 08:56
6	346° 52.71	316°8.67 N09°52.45	199° 9.89 N14° 27.68	257°16.78 N23°16.29	345°10.53 S01°35.41	Mars 213°27.94 16:46
7	1°55.18	331°8.71 53.23	214°11.05 27.19	272°18.63 16.29	0°12.87 35.36	Jupiter 270°57.27 12:56
8	16°57.64	346°8.76 54.01	229°12.20 26.69	287°20.47 16.30	15°15.20 35.32	Saturn 358°25.19 07:07
9 10	32°0.11 47°2.57	1°8.80 · · 54.79 16°8.85 55.57	244°13.35 · · 26.20 259°14.50 25.70	302°22.32 ·· 16.30 317°24.17 16.31	30°17.53 · · 35.27 45°19.86 35.22	Jun 07 Sat SHA Mer.pass
11	47 2.57 62°5.04	16°8.85 55.57 31°8.89 56.35	259°14.50 25.70 274°15.65 25.21	317°24.17 16.31 332°26.02 16.31	45° 19.86 35.22 60° 22.19 35.18	Venus 330°28.22 08:55
12	77°7.50	46°8.93 N09°57.13	289°16.80 N14°24.71	347°27.87 N23°16.32	75°24.53 S01°35.13	Mars 212°56.52 16:44
13	92°9.96	61°8.97 57.91	304°17.96 24.22	2°29.72 16.33	90°26.86 35.09	Jupiter 270°42.52 12:53 Saturn 358°21.86 07:03
14	107°12.43	76°9.01 58.69	319°19.11 23.72	17°31.56 16.33	105°29.19 35.04	
15	122° 14.89	91°9.05 09°59.47	334°20.26 · · 23.23	32°33.41 · · 16.34	120°31.52 · · 34.99	Jun 08 Sun SHA Mer.pass
16 17	137° 17.36 152° 19.82	106°9.09 10°0.25 121°9.13 1.03	349°21.41 22.73 4°22.56 22.24	47°35.26 16.34 62°37.11 16.35	135°33.85 34.95 150°36.19 34.90	Venus 329°30.46 08:55
18	167°22.28	136° 9.17 N10° 1.81	19°23.71 N14°21.74	77°38.96 N23°16.35	165°38.52 S01°34.86	Mars 212°25.05 16:43 Jupiter 270°27.76 12:50
19	182°24.75	151°9.20 2.59	34°24.86 21.24	92°40.80 16.36	180°40.85 34.81	Saturn 358°18.62 06:59
20	197°27.21	166° 9.24 3.37	49°26.01 20.75	107°42.65 16.36	195° 43.19 34.77	
21	212°29.68	181°9.28 · · 4.15	64°27.16 · · 20.25	122°44.50 · · 16.37	210° 45.52 · · 34.72	Horizontal parallax Venus: 0.2
22 23	227°32.14 242°34.61	196° 9.31 4.93 211° 9.35 5.72	79°28.31 19.75 94°29.46 19.26	137°46.35 16.37 152°48.19 16.38	225°47.85 34.68 240°50.19 34.63	Mars: 0.2
						0.1
Mer. <sub>l</sub>	pass. 06:52	$ u 0.0' \ d0.8' \ \text{m-4.32}$	$ u 1.2' \ d$ -0.5 $' \ m 1.34$	$ u 1.8' \; d 0.0' \;  ext{m-} 1.91$	$\nu 2.3' \ d$ -0.0' m $1.06$	

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°20.24	N22°39.35	59°44.37	16.8'	S08°31.05	13.6'	54.1'
1	195°20.13 210°20.02	39.61	74°20.18 88°55.97	16.8'	08°44.61 08°58.13	13.5'	54.1'
2	210 20.02 225°19.90	39.87 •• 40.12	103°31.72	16.8' 16.7'	00° 50.15 09° 11.61	13.5' 13.4'	54.1' 54.1'
4	240°19.79	40.38	118°7.45	16.7'	09°25.06	13.4'	54.1'
5	255°19.67	40.63	132°43.15	16.7'	09°38.47	13.4'	54.1'
6	270°19.56 285°19.45	N22°40.88 41.13	147°18.82 161°54.45	16.6' 16.6'	\$09°51.85 10°5.19	13.3' 13.3'	54.1' 54.1'
7 8	285 19.45 300°19.33	41.13	176° 30.06	16.6'	10 5.19 10°18.48	13.3'	54.1'
9	315°19.22	• • 41.64	191°5.63	16.5'	10°31.74	13.2'	54.1'
10	330°19.10	41.89	205°41.16	16.5'	10°44.96	13.2'	54.1'
11 12	345°18.99 0°18.87	42.14 N22°42.39	220°16.66 234°52.12	16.5' 16.4'	10°58.14 \$11°11.28	13.1' 13.1'	54.1' 54.1'
13	15°18.76	42.64	249°27.55	16.4	11°24.38	13.1	54.1'
14	30°18.64	42.88	264°2.93	16.3'	11°37.43	13.0'	54.0'
15	45°18.53	• • 43.13	278°38.28	16.3'	11°50.44	13.0'	54.0'
16 17	60°18.41 75°18.30	43.38 43.62	293°13.58 307°48.85	16.3' 16.2'	12°3.40 12°16.32	12.9' 12.9'	54.0' 54.0'
18	90°18.18	N22°43.87	322°24.07	16.2'	S12°29.19	12.8'	54.0'
19	105°18.06	44.11	336°59.25	16.1'	12°42.02	12.8'	54.0'
20	120°17.95	44.36	351°34.38	16.1'	12°54.80	12.7'	54.0'
21	135°17.83 150°17.72	• • 44.60	6°9.47	16.0'	13°7.53	12.7'	54.0'
22 23	150°17.72 165°17.60	44.84 45.08	20°44.51 35°19.50	16.0' 15.9'	13°20.21 13°32.84	12.6' 12.6'	54.0' 54.0'
	SD = 15.8'	d = 0.3'			0 = 14.8'	0	
	JD — 13.0°	u = 0.5		)L	/ — 14.0°		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°17.48	N22°45.32	49°54.45	15.9'	\$13°45.42	12.5'	54.0'
1 2	195°17.37 210°17.25	45.56 45.80	64°29.35 79°4.19	15.8' 15.8'	13°57.95 14°10.43	12.5' 12.4'	54.0' 54.0'
3	225°17.13	• • 46.04	93°38.99	15.7'	14°10.45	12.4	54.0'
4	240°17.02	46.28	108°13.73	15.7'	$14^{\circ}35.23$	12.3'	54.0'
5	255°16.90	46.52	122°48.42	15.6'	14°47.55	12.3'	54.0'
6 7	270°16.78 285°16.66	N22°46.75 46.99	137°23.06 151°57.64	15.6' 15.5'	\$14°59.81 15°12.01	12.2' 12.1'	54.0' 54.0'
8	300°16.55	47.22	166°32.17	15.5'	15°24.16	12.1	54.0'
9	315°16.43	• • 47.46	181°6.64	15.4'	15°36.25	12.0'	54.0'
10	330°16.31	47.69	195°41.05	15.4'	15°48.28	12.0'	54.0'
11 12	345°16.19 0°16.08	47.93 N22°48.16	210°15.41 224°49.71	15.3' 15.2'	16°0.26 \$16°12.17	11.9' 11.9'	54.0' 54.0'
13	15°15.96	48.39	239°23.95	15.2'	16°24.02	11.8'	54.0'
14	30°15.84	48.62	253°58.12	15.1'	$16^{\circ}35.81$	11.7'	54.0'
15	45°15.72	• • 48.85	268°32.24	15.1'	16°47.54	11.7'	54.0'
16 17	60°15.60 75°15.49	49.08 49.31	283°6.30 297°40.29	15.0' 14.9'	16°59.20 17°10.80	11.6' 11.5'	54.0' 54.0'
18	90°15.37	N22°49.54	312°14.22	14.9'	S17°22.33	11.5'	54.0'
19	105°15.25	49.77	326°48.08	14.8'	17°33.79	11.4'	54.0'
20	120°15.13	49.99	341°21.88 355°55.62	14.7'	17°45.19		54.0'
21 22	135°15.01 150°14.89	· · 50.22 50.44	355°55.62 10°29.29	14.7' 14.6'	17°56.52 18°7.79	11.3' 11.2'	54.0' 54.0'
23	165°14.77	50.67	25°2.89	14.5'	18° 18.98	11.1'	54.0'
	SD = 15.8'	d = 0.2'		SE	0 = 14.7'		
			· -				
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°14.65 195°14.54	N22°50.89 51.12	39°36.43 54°9.89	14.5' 14.4'	\$18°30.10 18°41.15	11.0' 11.0'	54.0' 54.0'
2	210°14.42	51.12	68°43.29	14.4	18°52.13	10.9'	54.0'
3	225°14.30	•• 51.56	83°16.62	14.3'	19°3.03	10.8'	54.0'
4	240°14.18	51.78	97°49.88 112°23.07	14.2'	19°13.86	10.8'	54.0'
5 6	255°14.06 270°13.94	52.00 N22°52.22	112°23.07 126°56.19	14.1' 14.0'	19°24.61 \$19°35.29	10.7' 10.6'	54.0' 54.0'
7	285°13.82	52.44	141°29.23	14.0'	19°45.89	10.5	54.0'
8	300°13.70	52.66	156°2.21	13.9'	19°56.41	10.4'	54.0'
9	315°13.58 330°13.46	• • 52.88	170°35.11	13.8'	20°6.86	10.4'	54.1'
10 11	330°13.46 345°13.34	53.10 53.31	185°7.94 199°40.69	13.8' 13.7'	20°17.22 20°27.50	10.3' 10.2'	54.1' 54.1'
12	0°13.22	N22°53.53	214°13.37	13.6'	S20°37.70	10.1	54.1'
13	15°13.10	53.74	228°45.98	13.5'	20°47.82	10.0'	54.1'
14 15	30°12.97 45°12.85	53.96 •• 54.17	243°18.51 257°50.96	13.5' 13.4'	20°57.85 21°7.80	9.9' 9.9'	54.1' 54.1'
15 16	45°12.85 60°12.73	54.38	257°50.96 272°23.34	13.4	21° 7.80 21° 17.66	9.9 9.8'	54.1'
17	75°12.61	54.60	286°55.65	13.2'	21°27.44	9.7'	54.1'
18	90°12.49	N22°54.81	301°27.88	13.2'	S21°37.12	9.6'	54.1'
19 20	105°12.37 120°12.25	55.02 55.23	316°0.03 330°32.10	13.1' 13.0'	21°46.72 21°56.23	9.5' 9.4'	54.1' 54.1'
20	120°12.25 135°12.13	55.23	330°32.10 345°4.10	13.0	21°56.23 22°5.65	9.4	54.1'
22	150°12.01	55.65	359°36.02	12.8'	22°14.98	9.2'	54.1'
23	165°11.88	55.85	14°7.86	12.8'	22°24.21	9.1'	54.1'
	SD = 15.8'	d = 0.2'		SE	0 = 14.7'		

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

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

		Sun		Moon		
Day Eqn.of Time		Mer.	Mer.Pass.		Age	
24,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	76-90%
06	01:21	01:15	11:59	20:35	08:14	
07	01:10	01:04	11:59	21:17	08:55	
80	00:59	00:53	11:59	22:02	09:39	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	257° 37.07	226°9.38 N10°6.50	109°30.61 N14°18.76	167°50.04 N23°16.38	255°52.52 \$01°34.59	
1	272°39.53	241°9.41 7.28	124°31.76 18.26	182°51.89 16.39	270°54.85 34.54	Alpheratz 357°34.52 29°13.68
2	287° 42.00	256°9.45 8.06	139°32.91 17.77	197°53.74 16.39	285°57.19 34.50	Ankaa 353°6.94 -42°9.85
3	302°44.46	271°9.48 · · 8.84	154°34.06 · · 17.27	212°55.59 · · 16.40	300°59.52 · · 34.45	Schedar 349°30.89 56°40.34
4	317°46.93	286°9.51 9.62	169°35.21 16.77	227°57.43 16.40	316°1.86 34.41	Diphda 348°47.09 -17°50.74
5	332°49.39	301°9.54 10.40	184°36.36 16.27	242°59.28 16.41	331°4.19 34.36	Achernar 335°20.27 -57°6.21
6	347°51.85	316°9.57 N10°11.18	199°37.51 N14°15.77	258°1.13 N23°16.41	346°6.53 <b>S</b> 01°34.32	Hamal 327°51.07 23°34.85
7	2°54.32	331°9.60 11.96	214° 38.66 15.28	273°2.98 16.42	1°8.86 34.27	Polaris 314°16.97 89°22.08 Acamar 315°11.87 -40°12.02
8	17°56.78	346°9.63 12.74	229° 39.81 14.78	288° 4.82 16.42	16°11.20 34.23	Acamar 315°11.87 -40°12.02 Menkar 314°6.08 4°11.35
9	32°59.25	1°9.66 · · 13.52	244°40.96 · · 14.28	303°6.67 · · 16.43	31°13.53 · · 34.18	Mirfak 308°28.24 49°56.95
10	48°1.71	16°9.68 14.31	259° 42.11 13.78	318° 8.52 16.43	46°15.87 34.14	Aldebaran 290°39.58 16°33.59
11	63°4.18	31°9.71 15.09	274°43.26 13.28	333°10.37 16.44	61°18.20 34.09	Rigel 281°3.89 -8°10.33
12	78°6.64	46°9.74 N10°15.87	289°44.41 N14°12.78	348°12.21 N23°16.44	76°20.54 S01°34.05	Capella 280°21.88 46°1.38
13	93°9.10	61°9.76 16.65	304°45.56 12.29	3°14.06 16.45	91°22.87 34.00	Bellatrix 278°22.86 6°22.36
14	108° 11.57	76°9.79 17.43	319°46.71 11.79	18°15.91 16.45	106°25.21 33.96	Elnath 278° 1.83 28° 37.71
15	123°14.03	91°9.81 · · 18.21	334°47.86 · · 11.29	33°17.76 · · 16.45	121°27.54 · · 33.92	Alnilam 275°37.73 -1°11.14
16	138° 16.50	106°9.84 18.99	349°49.01 10.79	48°19.60 16.46	136°29.88 33.87	Betelgeuse 270°52.06 7°24.70
17	153° 18.96	121°9.86 19.78	4°50.16 10.29	63°21.45 16.46	151°32.22 33.83	Canopus 263°52.79 -52°42.58
18	168°21.42 183°23.89	136°9.88 N10°20.56	19°51.31 N14°9.79	78°23.30 N23°16.47 93°25.15 16.47	166°34.55 S01°33.78	Sirius 258°26.28 -16°45.09
19 20	183 23.89 198°26.35	151°9.90 21.34 166°9.92 22.12	34°52.46 9.29 49°53.61 8.79		181°36.89 33.74 196°39.23 33.70	Adhara 255° 5.96 -29° 0.45
21	213° 28.82	181°9.94 · · 22.90	49°53.61 8.79 64°54.76 • 8.29	108°26.99 16.48 123°28.84 · · 16.48	196°39.23 33.70 211°41.56 · · 33.65	Procyon 244°50.77 5°9.59
22	213 20.02 228° 31.28	196°9.96 23.69	79°55.90 7.79	138°30.69 16.48	226°43.90 33.61	Pollux 243°17.21 27°57.95
23	243°33.75		94°57.05 7.29	153°32.53 16.49		Avior 234°15.09 -59°35.63
		-				Suhail 222°46.33 -43°32.30
Mer.p	pass. 06:48	$ u 0.0' \ d0.8' \ \text{m-4.31}$	$ u 1.2' \ d \text{-} 0.5' \ \text{m} 1.35$	$\nu$ 1.8 $^{\prime}$ $d$ 0.0 $^{\prime}$ m-1.90	$\nu 2.3' \ d\text{-}0.0' \ \text{m}1.05$	Miaplacidus 221°38.76 -69°49.52
						Alphard 217°47.59 -8°46.19
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.19 11°50.61
0	258° 36.21	226°10.00 N10°25.25	109°58.20 N14°6.79	168°34.38 N23°16.49	256°48.57 S01°33.52	Dubhe 193°40.63 61°37.10
1	273°38.67	241°10.02 26.03	124° 59.35 6.29	183°36.23 16.50	271°50.91 33.48	Denebola 182°24.57 14°25.84
2	288°41.14	256°10.04 26.81	140°0.50 5.78	198°38.08 16.50	286°53.25 33.43	Gienah 175°43.16 -17°41.12
3	303°43.60	271°10.05 · · 27.60	155°1.65 · · 5.28	213°39.92 · · 16.50	301°55.58 · · 33.39	Acrux 172°59.54 -63°14.71
4	318°46.07	286°10.07 28.38	170°2.80 4.78	228°41.77 16.51	316°57.92 33.35	Gacrux 171°51.10 -57°15.63
5	333°48.53	301°10.08 29.16	185°3.94 4.28	243°43.62 16.51	332°0.26 33.30	Alioth 166°12.42 55°49.53
6	348° 50.99	316°10.10 N10°29.94	200°5.09 N14°3.78	258°45.46 N23°16.52	347°2.60 S01°33.26	Spica 158°21.77 -11°17.74
7	3°53.46	331°10.11 30.72	215°6.24 3.28	273°47.31 16.52	2°4.94 33.22	Alkaid 152°51.42 49°11.33 Hadar 148°35.10 -60°29.97
8	18°55.92	346°10.12 31.51	230°7.39 2.78	288°49.16 16.52	17°7.27 33.17	Hadar 148°35.10 -60°29.97   Menkent 147°56.95 -36°29.88
9	33°58.39	1°10.14 · · 32.29	245°8.54 · · 2.27	303°51.00 · · 16.53	32°9.61 · · 33.13	Arcturus 145°47.36 19°3.03
10	49°0.85	16° 10.15 33.07	260°9.68 1.77	318°52.85 16.53	47°11.95 33.09	Rigil Kent. 139°39.34 -60°56.64
11	64°3.32	31°10.16 33.85	275° 10.83 1.27	333°54.70 16.53	62°14.29 33.04	Kochab 137°18.80 74°3.17
12	79°5.78	46°10.17 N10°34.63	290°11.98 N14°0.77	348°56.54 N23°16.54	77°16.63 <b>S</b> 01°33.00	Zuben'ubi 136°55.37 -16°8.94
13	94°8.24	61°10.18 35.42	305°13.13 14°0.26	3°58.39 16.54	92°18.97 32.96	Alphecca 126°3.12 26°37.75
14	109° 10.71	76°10.19 36.20	320°14.28 13°59.76	19° 0.24 16.55	107°21.31 32.92	Antares 112°15.06 -26°29.36
15	124° 13.17	91°10.20 · · 36.98	335°15.42 · · 59.26	34°2.08 · · 16.55	122°23.65 · · 32.87	Atria 107°8.41 -69°4.42
16	139° 15.64	106°10.21 37.76	350°16.57 58.75	49° 3.93 16.55	137°25.98 32.83	Sabik 102°2.05 -15°45.42
17	154° 18.10	121°10.21 38.55	5°17.72 58.25	64° 5.78 16.56	152°28.32 32.79	Shaula 96° 9.49 -37° 7.33
18	169°20.57	136°10.22 N10°39.33	20°18.86 N13°57.75	79°7.62 N23°16.56	167°30.66 S01°32.75	Rasalhague 95°57.89 12°32.43
19	184°23.03	151°10.23 40.11	35°20.01 57.24	94°9.47 16.56	182°33.00 32.70	Eltanin 90°41.49 51°29.01
20	199°25.49 214°27.96	166°10.23 40.89 181°10.24 •• 41.68	50°21.16 56.74	109°11.32 16.57 124°13.16 · · 16.57	197°35.34 32.66	Kaus Aust. 83°31.68 -34°22.31
21 22	214 27.90 229°30.42	181°10.24 · · 41.68 196°10.24	65°22.31 · · 56.24 80°23.45 55.73		212°37.68 · · 32.62 227°40.02 32.58	Vega 80°32.59 38°48.30
23	244° 32.89		_			Nunki 75°47.00 -26°15.86
						Altair 61°59.36 8°56.06
Mer.p	oass. 06:44	$\nu$ 0.0′ $d$ 0.8′ m-4.30	$ u 1.1' \ d$ -0.5' m $1.36$	$ u 1.8' \ d 0.0' \ \text{m-} 1.90$	$ u 2.3' \ d$ -0.0 $' \ m 1.05$	Peacock 53°4.77 -56°38.98
						Deneb 49°25.28 45°22.03
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.33 9°59.41
0	259°35.35	226°10.25 N10°44.02	110°25.75 N13°54.72	169°18.70 N23°16.58	257°44.70 S01°32.49	Al Na'ir 27°32.33 -46°50.04
1	274° 37.81	241°10.25 44.81	125°26.89 54.22	184°20.55 16.58	272°47.05 32.45	Fomalhaut 15°14.10 -29°29.10
2	289° 40.28	256°10.25 45.59	140°28.04 53.71	199°22.40 16.58	287°49.39 32.41	Scheat 13°44.86 28°13.07 Markab 13°29.55 15°20.42
3	304° 42.74	271°10.25 · · 46.37	155°29.19 · · 53.21	214°24.24 · · 16.59	302°51.73 · · 32.37	Markab 13°29.55 15°20.42
4	319° 45.21	286° 10.25 47.15	170° 30.33 52.70	229°26.09 16.59	317°54.07 32.32	Jun 09 Mon SHA Mer.pass
5	334°47.67	301°10.25 47.94	185°31.48 52.20	244°27.93 16.59	332°56.41 32.28	Venus 328°32.31 08:55
6	349°50.14	316°10.25 N10°48.72	200°32.63 N13°51.69	259°29.78 N23°16.60	347°58.75 <b>S</b> 01°32.24	Mars 211°53.54 16:41
7	4°52.60	331°10.25 49.50	215°33.77 51.19	274°31.63 16.60	3°1.09 32.20	Jupiter 270°12.97 12:47
8	19°55.06	346°10.25 50.29	230°34.92 50.68	289°33.47 16.60	18°3.43 32.16	Saturn 358°15.45 06:55
9	34°57.53	1°10.24 · · 51.07	245°36.07 · · 50.18	304°35.32 · · 16.60	33°5.77 · · 32.12	Jun 10 Tue SHA Mer.pass
10	49°59.99	16°10.24 51.85	260° 37.21 49.67	319°37.17 16.61	48°8.12 32.07	Jun 10 Tue         SHA         Mer.pass           Venus         327°33.79         08:55
11	65°2.46	31°10.24 52.63	275°38.36 49.17	334°39.01 16.61	63°10.46 32.03	Mars 211°21.99 16:39
12	80°4.92	46°10.23 N10°53.42	290°39.51 N13°48.66	349°40.86 N23°16.61	78°12.80 <b>S</b> 01°31.99	Jupiter 269°58.17 12:44
13	95°7.39	61°10.23 54.20	305°40.65 48.15	4°42.70 16.61	93°15.14 31.95	Saturn 358°12.36 06:52
14	110°9.85	76°10.22 54.98	320°41.80 47.65	19°44.55 16.62	108°17.49 31.91	
15	125° 12.31	91°10.21 · · 55.76	335°42.94 · · 47.14	34°46.40 · · 16.62	123°19.83 · · 31.87	Jun 11 Wed SHA Mer.pass
16	140° 14.78	106°10.20 56.55	350°44.09 46.63	49°48.24 16.62	138°22.17 31.83	Venus 326°34.90 08:55
17	155° 17.24	121°10.20 57.33	5°45.23 46.13	64°50.09 16.62	153°24.51 31.79	Mars 210°50.40 16:37
18	170° 19.71	136°10.19 N10°58.11	20°46.38 N13°45.62	79°51.93 N23°16.63	168°26.86 S01°31.74	Jupiter 269°43.35 12:41
19	185°22.17	151°10.18 58.89	35°47.53 45.11	94°53.78 16.63	183°29.20 31.70	Saturn 358° 9.35 06:48
20	200°24.63	166°10.17 10°59.68	50°48.67 44.60	109°55.63 16.63	198°31.54 31.66	Horizontal parallax
21	215°27.10	181°10.16 11°0.46	65°49.82 · · 44.10	124°57.47 · · 16.63	213°33.89 · · 31.62	Venus: 0.2
22	230°29.56	196°10.15 1.24	80°50.96 43.59	139°59.32 16.64	228°36.23 31.58	Mars: 0.1
23	245°32.03	211°10.13 2.02	95°52.11 43.08	155°1.16 16.64	243°38.57 31.54	
Mer.p	pass. 06:41	$\nu$ 0.0′ $d$ 0.8′ m-4.29	$ u 1.1' \ d$ -0.5 $' \ m 1.37$	$\nu 1.8' \ d0.0' \ \text{m-}1.90$	$\nu 2.3' \ d\text{-}0.0' \ \text{m}1.04$	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°11.76	N22°56.06	28°39.63	12.7'	S22°33.35	9.0'	54.1'
1	195°11.64	56.27	43°11.31	12.6'	22°42.40	9.0'	54.1'
2	210°11.52 225°11.40	56.47 •• 56.68	57° 42.92 72° 14.45	12.5' 12.5'	22°51.35 23°0.20	8.9' 8.8'	54.2' 54.2'
4	240°11.27	56.88	86°45.90	12.4'	23°8.96	8.7'	54.2'
5	255°11.15	57.09	101°17.27	12.3'	23° 17.62	8.6'	54.2'
6	270°11.03	N22° 57.29	115° 48.57	12.2'	\$23°26.17	8.5'	54.2'
7 8	285°10.91 300°10.78	57.49 57.70	130° 19.78 144° 50.92	12.1' 12.1'	23°34.63 23°42.99	8.4' 8.3'	54.2' 54.2'
9	315°10.66	57.90	159° 21.98	12.1	23°51.24	8.1	54.2'
10	330°10.54	58.10	173°52.96	11.9'	23°59.39	8.0'	54.2'
11	345°10.42	58.30	188°23.86	11.8'	24°7.43	7.9'	54.2'
12 13	0°10.29 15°10.17	N22°58.50 58.69	202°54.68 217°25.42	11.7' 11.7'	\$24° 15.37 24° 23.21	7.8' 7.7'	54.2' 54.3'
14	30°10.05	58.89	231°56.09	11.6'	24° 30.93	7.6'	54.3'
15	45°9.92	• • 59.09	246°26.68	11.5'	$24^{\circ}38.55$	7.5'	54.3'
16	60°9.80	59.28	260°57.19	11.4'	24°46.05	7.4'	54.3'
17 18	75°9.68 90°9.55	59.48 N22° 59.67	275°27.62 289°57.98	11.4' 11.3'	24°53.45 \$25°0.73	7.3' 7.2'	54.3' 54.3'
19	105°9.43	22°59.87	304°28.26	11.2'	25°7.91	7.1'	54.3'
20	120°9.31	$23^{\circ}0.06$	$318^{\circ}58.46$	11.1'	$25^{\circ}14.96$	6.9'	54.3'
21	135°9.18 150°9.06	• • 0.25	333°28.58 347°58.64	11.1'	25°21.91	6.8'	54.3'
22 23	150°9.06 165°8.93	0.45 0.64	347°58.64 2°28.61	11.0' 10.9'	25° 28.74 25° 35.45	6.7' 6.6'	54.3' 54.4'
23						0.0	J 1. 1
	SD = 15.8'	d = 0.2'		20	= 14.8′		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°8.81	N23°0.83	16°58.51	10.8'	S25°42.05	6.5'	54.4'
1	195°8.69 210°8.56	1.02 1.21	31°28.34 45°58.09	10.8' 10.7'	25° 48.52 25° 54.88	6.4' 6.2'	54.4' 54.4'
2	210 8.50 225°8.44	1.21	45 58.09 60°27.77	10.7	25 54.88 26°1.12	6.1	54.4' 54.4'
4	240°8.31	1.58	74° 57.37	10.5'	26°7.23	6.0'	54.4'
5	255°8.19	1.77	89°26.90	10.5'	26° 13.23	5.9'	54.4'
6 7	270°8.06 285°7.94	N23°1.96 2.14	103°56.37 118°25.76	10.4' 10.3'	\$26° 19.10 26° 24.85	5.7' 5.6'	54.4' 54.4'
8	300°7.81	2.14	132° 55.08	10.3	26°30.47	5.5'	54.4 54.5'
9	315°7.69	2.51	147° 24.33	10.2'	26°35.97	5.4'	54.5'
10	330°7.56	2.69	161°53.51	10.1'	26°41.34	5.2'	54.5'
11 12	345°7.44 0°7.31	2.88 N23°3.06	176°22.62 190°51.67	10.0' 10.0'	26° 46.58 \$26° 51.69	5.1' 5.0'	54.5' 54.5'
13	15°7.19	3.24	205°20.65	9.9'	26° 56.68	5.0 4.9'	54.5'
14	30°7.06	3.42	219°49.57	9.9'	27°1.54	4.7'	54.5'
15	45°6.94	• • 3.60	234° 18.42	9.8'	27°6.26	4.6'	54.5'
16 17	60°6.81 75°6.69	3.78 3.96	248°47.20 263°15.93	9.7' 9.7'	27° 10.85 27° 15.32	4.5' 4.3'	54.6' 54.6'
18	90°6.56	N23°4.14	277° 44.59	9.6'	\$27° 19.64	4.2'	54.6'
19	105°6.44	4.31	292° 13.19	9.5'	$27^{\circ}23.84$	4.1'	54.6'
20	120°6.31	4.49	306°41.73	9.5'	27°27.90	3.9'	54.6'
21 22	135°6.18 150°6.06	· · 4.67 4.84	321°10.22 335°38.64	9.4' 9.4'	27°31.82 27°35.61	3.8' 3.6'	54.6' 54.6'
23	165°5.93	5.02	350°7.01	9.3'	27°39.26	3.5'	54.7'
	SD = 15.7'	d = 0.2'		SD	= 14.8'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	180°5.80 195°5.68	N23°5.19 5.36	4°35.33 19°3.59	9.3' 9.2'	\$27° 42.77 27° 46.14	3.4' 3.2'	54.7' 54.7'
2	210°5.55	5.53	33°31.79	9.2' 9.2'	27°49.38	3.2 3.1	54.7'
3	225°5.43	•• 5.71	47°59.95	9.1'	$27^{\circ}52.47$	3.0'	54.7'
4	240°5.30 255°5.17	5.88	62°28.06 76°56.11	9.1'	27°55.42	2.8'	54.7'
5 6	255°5.17 270°5.04	6.05 N23°6.22	76°56.11 91°24.12	9.0' 9.0'	27°58.24 \$28°0.91	2.7' 2.5'	54.7' 54.8'
7	285°4.92	6.39	105° 52.08	8.9'	28°3.44	2.4	54.8'
8	300°4.79	6.55	120° 20.00	8.9'	28°5.82	2.2'	54.8'
9	315°4.66 330°4.54	6.72	134° 47.87 149° 15.70	8.8'	28°8.06 28°10.16	2.1' 2.0'	54.8' 54.8'
10 11	330°4.54 345°4.41	6.89 7.05	149° 15.70 163° 43.49	8.8' 8.7'	28° 10.16 28° 12.11	1.8'	54.8'
12	0°4.28	N23°7.22	178° 11.24	8.7'	S28° 13.92	1.7'	54.9'
13	15°4.15	7.38	192°38.95	8.7'	28° 15.58	1.5'	54.9'
14 15	30°4.03 45°3.90	7.55 • • 7.71	207°6.62 221°34.26	8.6' 8.6'	28° 17.10 28° 18.47	1.4' 1.2'	54.9' 54.9'
16	45° 3.90 60° 3.77	7.87	236°1.87	8.6'	28° 19.69	1.1'	54.9'
17	75°3.64	8.03	250°29.44	8.5'	$28^{\circ}20.77$	0.9'	54.9'
18	90°3.52	N23°8.19	264° 56.98	8.5'	\$28°21.69	0.8'	54.9'
19 20	105°3.39 120°3.26	8.35 8.51	279°24.49 293°51.98	8.5' 8.5'	28° 22.47 28° 23.10	0.6' 0.5'	55.0' 55.0'
21	135°3.13	8.67	308° 19.44	8.4'	28° 23.58	0.3	55.0'
22	150°3.00	8.83	322°46.87	8.4'	28°23.91	0.2'	55.0'
23	165°2.88	8.99	337° 14.28	8.4'	28°24.09	0.0'	55.0'
	SD = 15.7'	d = 0.2'		SD	= 14.9'		

				une 09		0
Lat.	<b>Twi</b> Naut.	light Civil	Sunrise	Sunset	<b>Tw</b> i	ilight Naut.
N 72°	ivaut.	CIVII			CIVII	ivaut.
N 70°						
68° 66°		////	00:27	23:39	////	////
64°	11111	////	01:39	23:39	////	////
62°	11111	////	01.39	21:46	////	////
60°	11111	01:02	02:14	21:40	22:59	////
N 58°	////			21:01		
56°	////	01:46 02:14	02:59	20:45	22:14	//// ////
54°	00:57	02:14	03:15 03:29	20:45	21:46 21:25	23:04
52°	01:37	02:52	03:29	20:31	21:07	22:23
50°	02:03	02:32	03:51	20:19	20:52	21:57
45°	02:03	03:36	03:31	19:46	20:32	21:12
N 40°	03:17	03:58	04:31	19:28	20:01	20:42
35° 30°	03:40	04:16	04:46	19:14	19:43	20:20
30° 20°	03:58 04:26	04:31 04:55	04:58 05:20	19:01 18:39	19:28 19:04	20:01 19:33
N 10°	04:20	04:55	05:20	18:20	18:43	19:33
0°	05:07	05:33	05:56	18:03	18:26	18:52
<b>S</b> 10°	05:24	05:50	06:13	17:46	18:09	18:35
20° 30°	05:40	06:07	06:31	17:28	17:52	18:19
30° 35°	05:56	06:26	06:52 07:04	17:07 16:55	17:33	18:03
35 40°	06:04 06:14	06:36 06:48	07:04	16:55	17:23 17:11	17:54 17:45
45°	06:24	07:01	07:18	16:24	16:58	17:45
<b>S</b> 50°	06:35	07:17	07:55	16:04	16:42	17:24
52° 54°	06:40	07:24	08:04	15:54	16:35	17:19
54°	06:46	07:32	08:15	15:44	16:27	17:13
50°	06:52 06:58	07:41 07:51	08:28 08:42	15:31 15:17	16:18 16:08	17:07 17:00
<b>S</b> 60°	07:06	08:02	08:59	15:17	15:57	16:53
3 00		Moonris		13.00	Moonse	
Lat.	Mon	Tue	Wed	Mon	Tue	ι Wed
N 72°						
N 70°						
68°						
66°						
				00:10		
64°	22:04			23:26		
62°	21:00	23:07		00:38	00:30	00:10
60°	20:26	21:59	23:12	01:00	01:05	01:19
N 58°	20:01	21:24	22:31	01:18	01:30	01:54
56°	19:42	20:59	22:03	01:18	01:51	02:19
54°	19:25	20:39	21:42	01:46	02:07	02:40
52°	19:11	20:22	21:24	01:58	02:22	02:57
50°	18:59	20:08	21:08	02:08	02:35	03:11
45°	18:34	19:38	20:38	02:29	03:01	03:41
<b>N</b> 40°	18:13	19:15	20:14	02:47	03:21	04:04
35°	17:57	18:57	19:54	03:01	03:39	04:04
30°	17:42	18:41	19:37	03:14	03:54	04:23
20°	17:18	18:13	19:09	03:36	04:19	05:07
N 10°	16:57	17:50	18:44	03:55	04:41	05:31
0°	16:38	17:28	18:21	04:13	05:02	05:54
	16:19	17:07	17:59	04:31	05:23	06:16
S 10°		11.01				
<b>S</b> 10°	I	16.44	17.21	04.50	05·15	06.40
20°	15:58	16:44 16:17	17:34 17:06	04:50 05:12	05:45 06:11	06:40 07:08
20° 30°	15:58 15:34	16:17	17:06	05:12	06:11	07:08
20° 30° 35°	15:58 15:34 15:20	16:17 16:01	17:06 16:49	05:12 05:26	06:11 06:26	07:08 07:25
20° 30°	15:58 15:34	16:17	17:06	05:12	06:11	07:08

<b>S</b> 60°	13:05	13:14	13:38	07:36	09:10	10:35	
		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	95-100%	
09	00:47	00:41	11:59	22:50	10:25		
10	00:35	00:29	12:00	23:41	11:15		
11	00:23	00:17	12:00	-:-	12:08		

15:36

15:21

15:04

14:43

14:16

14:22

14:10

13:58

13:43

13:26

 $\textbf{S}~50^{\circ}$ 

52°

54°

 $56^{\circ}$ 

58°

14:53

14:39

14:24

14:05

13:43

07:32

07:45

08:01

08:19

08:41

08:37

08:52

09:10

09:31

09:57

06:21

06:32

06:45

06:59

07:16

June 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	260°34.49	226°10.12 N11°2.81	110°53.25 N13°42.57	170°3.01 N23°16.64	258°40.92 S01°31.50	
1	275°36.96	241°10.11 3.59	125° 54.40 42.06	185° 4.86 16.64	273°43.26 31.46	Alpheratz 357°34.48 29°13.69 Ankaa 353°6.90 -42°9.83
2	$290^{\circ}39.42$	256°10.09 4.37	140°55.54 41.56	200° 6.70 16.64	288°45.61 31.42	Ankaa 353°6.90 -42°9.83 Schedar 349°30.85 56°40.35
3	305°41.88	271°10.08 · · 5.15	155°56.69 · · 41.05	215°8.55 · · 16.65	303°47.95 · · 31.38	Diphda 348°47.06 -17°50.72
4	320°44.35	286°10.06 5.94	170°57.83 40.54	230°10.39 16.65	318°50.29 31.34	Achernar 335°20.24 -57°6.19
5 6	335° 46.81 350° 49.28	301°10.05 6.72 316°10.03 N11°7.50	185°58.98 40.03 201°0.12 N13°39.52	245°12.24 16.65 260°14.08 N23°16.65	333°52.64 31.30 348°54.98 S01°31.26	Hamal 327°51.04 23°34.86
7	5°51.74	331°10.01 8.28	216°1.27 39.01	275°15.93 16.65	3°57.33 31.22	Polaris 314°15.75 89°22.07
8	20°54.21	346°10.00 9.07	231°2.41 38.50	290°17.78 16.66	18°59.67 31.18	Acamar 315°11.85 -40°12.00
9	35° 56.67	1°9.98 · · 9.85	246°3.56 · · 37.99	305°19.62 · · 16.66	34°2.02 · · 31.14	Menkar 314°6.06 4°11.36 Mirfak 308°28.21 49°56.95
10	50°59.13	16°9.96 10.63	261°4.70 37.48	320°21.47 16.66	49°4.36 31.10	Aldebaran 290°39.57 16°33.60
11	66°1.60 81°4.06	31°9.94 11.41 46°9.92 N11°12.20	276°5.85 36.97 291°6.99 N13°36.46	335°23.31 16.66 350°25.16 N23°16.66	64°6.71 31.06 79°9.05 S01°31.02	Rigel 281°3.88 -8°10.32
12 13	96°6.53	61°9.90 12.98	306°8.14 35.95	5°27.00 16.66	94°11.40 30.98	Capella 280°21.87 46°1.37
14	111°8.99	76°9.88 13.76	321°9.28 35.44	20°28.85 16.67	109°13.75 30.94	Bellatrix 278°22.85 6°22.36
15	$126^{\circ}11.45$	91°9.85 · · 14.54	336°10.42 · · 34.93	35°30.69 · · 16.67	124°16.09 · · 30.90	Elnath 278°1.82 28°37.71 Alnilam 275°37.72 -1°11.14
16	141° 13.92	106° 9.83 15.33	351°11.57 34.42	50°32.54 16.67	139°18.44 30.86	Betelgeuse 270°52.05 7°24.71
17	156° 16.38	121°9.81 16.11	6°12.71 33.91	65°34.39 16.67	154°20.78 30.82	Canopus 263°52.79 -52°42.56
18 19	171° 18.85 186° 21.31	136°9.78 N11°16.89 151°9.76 17.67	21°13.86 N13°33.40 36°15.00 32.89	80°36.23 N23°16.67 95°38.08 16.67	169°23.13 <b>S</b> 01°30.78 184°25.48 30.74	Sirius 258°26.27 -16°45.08
20	201°23.78	166°9.73 18.45	51°16.14 32.38	110°39.92 16.67	199°27.82 30.70	Adhara 255° 5.96 -29° 0.44
21	216°26.24	181°9.71 · · 19.24	66°17.29 · · 31.87	125°41.77 · · 16.67	214°30.17 · · · 30.66	Procyon 244°50.77 5°9.59
22	231°28.70	196°9.68 20.02	81°18.43 31.36	140°43.61 16.68	229°32.52 30.62	Pollux 243°17.21 27°57.95 Avior 234°15.10 -59°35.62
23	$246^{\circ}31.17$	211°9.65 20.80	96°19.58 30.84	155°45.46 16.68	244°34.86 30.58	Suhail 222°46.34 -43°32.29
Mer.ı	pass. 06:37	ν-0.0' d0.8' m-4.29	ν1.1' d-0.5' m1.37	ν1.8' d0.0' m-1.90	ν2.3' d-0.0' m1.04	Miaplacidus 221°38.80 -69°49.52
						Alphard 217°47.60 -8°46.19
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.20 11°50.61
0	261°33.63	226°9.62 N11°21.58	111°20.72 N13°30.33	170°47.30 N23°16.68	259°37.21 S01°30.54	Dubhe 193°40.65 61°37.10
1	$276^{\circ}36.10$	241°9.60 22.36	126°21.86 29.82	185°49.15 16.68	274°39.56 30.50	Denebola 182°24.57 14°25.84 Gienah 175°43.17 -17°41.12
2	291°38.56	256°9.57 23.15	141°23.01 29.31	200°50.99 16.68	289°41.91 30.47	Acrux 172°59.56 -63°14.72
3	306°41.03	271°9.54 · · 23.93	156°24.15 · · 28.80	215°52.84 · · 16.68	304°44.25 · · 30.43	Gacrux 171°51.12 -57°15.64
4	321°43.49	286°9.51 24.71 301°9.47 25.49	171°25.29 28.28	230°54.68 16.68	319°46.60 30.39	Alioth 166°12.44 55°49.53
5 6	336° 45.95 351° 48.42	301°9.47 25.49 316°9.44 N11°26.27	186°26.44 27.77 201°27.58 N13°27.26	245°56.53 16.68 260°58.37 N23°16.68	334°48.95 30.35 349°51.30 S01°30.31	Spica 158°21.77 -11°17.74
7	6°50.88	331°9.41 27.06	216°28.72 26.75	276° 0.22 16.69	4°53.65 30.27	Alkaid 152°51.43 49°11.34
8	21°53.35	346°9.38 27.84	231°29.87 26.23	291°2.06 16.69	19°55.99 30.23	Hadar 148°35.10 -60°29.98 Menkent 147°56.95 -36°29.89
9	36°55.81	1°9.34 · · 28.62	246°31.01 · · 25.72	306°3.91 · · 16.69	34°58.34 · · 30.20	Arcturus 145°47.36 19°3.03
10	51°58.27	16°9.31 29.40	261°32.15 25.21	321°5.76 16.69	50°0.69 30.16	Rigil Kent. 139°39.34 -60°56.65
11 12	67°0.74 82°3.20	31°9.27 30.18 46°9.24 N11°30.96	276°33.29 24.69 291°34.44 N13°24.18	336°7.60 16.69 351°9.45 N23°16.69	65°3.04 30.12 80°5.39 \$01°30.08	Kochab 137°18.84 74°3.18
13	97°5.67	61°9.20 31.74	306°35.58 23.67	6°11.29 16.69	95°7.74 30.04	Zuben'ubi 136°55.37 -16°8.94
14	112°8.13	76°9.16 32.53	321°36.72 23.15	21°13.14 16.69	110°10.09 30.00	Alphecca 126°3.11 26°37.76 Antares 112°15.05 -26°29.37
15	$127^{\circ}10.60$	91°9.13 · · 33.31	336°37.86 · · 22.64	36°14.98 · · 16.69	125°12.44 · · 29.97	Antares 112°15.05 -26°29.37 Atria 107°8.39 -69°4.43
16	142° 13.06	106°9.09 34.09	351°39.01 22.12	51°16.83 16.69	140°14.79 29.93	Sabik 102°2.04 -15°45.42
17 18	157° 15.52	121°9.05 34.87 136°9.01 N11°35.65	6°40.15 21.61 21°41.29 N13°21.10	66°18.67 16.69	155°17.14 29.89 170°19.49 S01°29.85	Shaula 96° 9.47 -37° 7.34
19	172° 17.99 187° 20.45	136°9.01 N11°35.65 151°8.97 36.43	21°41.29 N13°21.10 36°42.43 20.58	81°20.51 N23°16.69 96°22.36 16.69	170°19.49 S01°29.85 185°21.84 29.81	Rasalhague 95°57.88 12°32.44
20	202°22.92	166°8.93 37.21	51°43.58 20.07	111°24.20 16.69	200°24.19 29.78	Eltanin 90°41.48 51°29.03
21	217°25.38	181°8.89 · · 37.99	66°44.72 · · 19.55	126°26.05 · · 16.69	215°26.54 · · 29.74	Kaus Aust. 83°31.66 -34°22.31 Vega 80°32.57 38°48.31
22	232°27.85	196°8.84 38.78	81°45.86 19.04	141°27.89 16.69	230°28.89 29.70	Nunki 75°46.98 -26°15.86
23	247°30.31	211°8.80 39.56	96°47.00 18.52	156°29.74 16.69	245°31.24 29.66	Altair 61°59.34 8°56.07
Mer. <sub>I</sub>	pass. 06:33	$\nu$ -0.0′ $d$ 0.8′ $m$ -4.28	$\nu 1.1' \ d$ -0.5 $' \ m1.38$	$\nu 1.8^\prime~d0.0^\prime~\text{m-}1.90$	$\nu 2.3' \ d\text{-}0.0' \ \text{m}1.04$	Peacock 53°4.73 -56°38.99
						Deneb 49°25.25 45°22.05
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.31 9°59.43 Al Na'ir 27°32.30 -46°50.04
0	262°32.77	226°8.76 N11°40.34	111°48.14 N13°18.01	171°31.58 N23°16.69	260°33.59 <b>S</b> 01°29.63	Fomalhaut 15°14.07 -29°29.09
1	277° 35.24	241°8.71 41.12	126°49.29 17.49	186°33.43 16.69	275°35.94 29.59	Scheat 13°44.83 28°13.08
2	292°37.70	256°8.67 41.90	141°50.43 16.98	201°35.27 16.69	290°38.29 29.55	Markab 13°29.52 15°20.43
3	307°40.17	271°8.62 · · 42.68 286°8.58 43.46	156°51.57 · · 16.46 171°52.71 15.94	216°37.12 · · 16.69 231°38.96 16.69	305°40.64 · · 29.51 320°42.99 29.48	Jun 12 Thu SHA Mer.pass
4 5	322° 42.63 337° 45.09	286°8.58 43.46 301°8.53 44.24	171°52.71 15.94 186°53.85 15.43	231°38.96 16.69 246°40.81 16.69	320°42.99 29.48 335°45.34 29.44	Venus 325°35.63 08:55
6	352° 47.56	316°8.48 N11°45.02	201°55.00 N13°14.91	261°42.65 N23°16.69	350°47.69 S01°29.40	Mars 210°18.76 16:35
7	$7^{\circ}50.02$	331°8.44 45.80	216°56.14 14.39	276°44.50 16.69	5°50.05 29.36	Jupiter 269°28.52 12:38
8	22°52.49	346°8.39 46.58	231° 57.28 13.88	291°46.34 16.69	20°52.40 29.33	Saturn 358° 6.43 06:44
9	37° 54.95	1°8.34 · · 47.36	246°58.42 · · 13.36	306°48.19 · · 16.69	35°54.75 · · 29.29	Jun 13 Fri SHA Mer.pass
10 11	52° 57.42 67° 59.88	16°8.29 48.14 31°8.24 48.92	261°59.56 12.84 277°0.70 12.33	321°50.03 16.69 336°51.88 16.69	50°57.10 29.25 65°59.45 29.22	Venus 324°35.99 08:55
12	83°2.34	46°8.19 N11°49.70	292°1.84 N13°11.81	351°53.72 N23°16.69	81°1.81 S01°29.18	Mars 209°47.09 16:33
13	98°4.81	61°8.13 50.48	307°2.98 11.29	6°55.56 16.69	96°4.16 29.14	Jupiter 269°13.67 12:35 Saturn 358°3.58 06:40
14	113°7.27	76°8.08 51.26	322°4.13 10.78	21°57.41 16.69	111°6.51 29.11	Saturn 358° 3.58 06:40
15	128° 9.74	91°8.03 · · 52.04	337°5.27 · · 10.26	36°59.25 · · 16.69	126°8.86 · · 29.07	Jun 14 Sat SHA Mer.pass
16 17	143°12.20	106°7.98 52.82 121°7.92 53.60	352°6.41 9.74 7°7.55 9.22	52°1.10 16.69 67°2.94 16.69	141°11.22 29.03	Venus 323°35.98 08:55
17 18	158° 14.66 173° 17.13	121°7.92 53.60 136°7.87 N11°54.38	7°7.55 9.22 22°8.69 N13°8.70	67°2.94 16.69 82°4.79 N23°16.69	156°13.57 29.00 171°15.92 S01°28.96	Mars 209°15.37 16:32 Jupiter 268°58.81 12:32
19	188° 19.59	151°7.81 55.16	37°9.83 8.19	97° 6.63 16.69	186°18.28 28.92	Saturn 358° 0.81 06:37
20	203°22.06	166°7.75 55.94	52°10.97 7.67	112°8.48 16.69	201°20.63 28.89	
21	218° 24.52	181°7.70 · · · 56.72	67° 12.11 · · · 7.15	127°10.32 · · 16.69	216°22.98 · · 28.85	Horizontal parallax
22 23	233°26.99 248°29.45	196°7.64 57.50 211°7.58 58.28	82°13.25 6.63	142°12.16 16.69 157°14.01 16.69	231°25.34 28.82 246°27.69 28.78	Venus: 0.2 Mars: 0.1
			97°14.39 6.11			
Mer. <sub>I</sub>	pass. 06:29	u-0.0 $'$ $d$ 0.8 $'$ m-4.27	$\nu 1.1' \ d$ -0.5 $' \ m1.39$	$\nu 1.8^{\prime}~d0.0^{\prime}~\text{m-}1.90$	$\nu$ 2.4′ <i>d</i> -0.0′ m1.03	

h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°2.75	N23°9.15	351°41.67	ν 8.4'	528° 24.12	-0.1'	55.0
1	195°2.62	9.30	6°9.04	8.4'	28°24.00	-0.3	55.1
2	210°2.49	9.46	20°36.39	8.3'	28° 23.74	-0.4	55.1
3	225°2.36	• • 9.61	35°3.73	8.3'	28°23.31	-0.6'	55.1
4	240°2.23	9.77	49°31.05	8.3'	28°22.74	-0.7'	55.1
5	255°2.11	9.92	63°58.35	8.3'	28°22.02	-0.9'	55.1
6	270°1.98	N23° 10.07	78°25.64	8.3'	S28°21.15	-1.0'	55.1
7	285°1.85	10.22	92°52.93	8.3'	28°20.12	-1.2'	55.2
8	300°1.72	10.37	$107^{\circ}20.20$	8.3'	28° 18.95	-1.3'	55.2
9	315°1.59	• • 10.52	121°47.47	8.3'	28° 17.62	-1.5'	55.2
10	330°1.46	10.67	$136^{\circ}14.73$	8.3'	28°16.14	-1.6'	55.2
11	345°1.33	10.82	150°41.99	8.3'	28° 14.51	-1.8'	55.2
12	0°1.20	N23° 10.97	165°9.24	8.3'	S28°12.72	-1.9'	55.3
13	15°1.07	11.12	179°36.50	8.3'	28° 10.79	-2.1'	55.3
14	30°0.94	11.27	194°3.75	8.3'	28°8.70	-2.2'	55.3
15	45°0.81	• • 11.41	208°31.01	8.3'	28°6.46	-2.4'	55.3
16	60°0.69	11.56	222°58.27	8.3'	28°4.07	-2.5'	55.3
17	75°0.56 90°0.43	11.70 N23° 11.85	237°25.54	8.3' 8.3'	28°1.53	-2.7'	55.3
18	90°0.43 105°0.30		251°52.81 266°20.10		\$27°58.84 27°55.99	-2.8'	55.4
19		11.99	280°47.39	8.3'		-3.0'	55.4
20	120°0.17 135°0.04	12.13	280° 47.39 295° 14.69	8.3'	27°53.00 27°49.85	-3.1' -3.3'	55.4
21	135°0.04 149°59.91	12.27	295°14.69 309°42.01	8.3' 8.3'	27°49.85 27°46.55		55.4
22 23	149°59.91 164°59.78	12.41 12.55	309°42.01 324°9.34	8.3'	27°46.55 27°43.10	-3.4' -3.6'	55.4 55.5
23			JZ4 9.34 ————————————————————————————————————			-3.0	ეე.ე
	SD = 15.7'	d = 0.2'		SI	O = 15.0'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.65	N23° 12.69	338° 36.69	ν 8.4'	\$27°39.50	-3.7'	55.5
1	194°59.52	12.83	353°4.06	8.4	27° 35.76	-3.7 -3.9'	55.5
2	209°59.39	12.97	7°31.44	8.4	27°31.86	-4.0'	55.5
3	224°59.26	13.11	21°58.84	8.4	27°27.81	-4.2'	55.5
4	239°59.13	13.25	36°26.27	8.4'	27°23.61	-4.3'	55.5
5	254°59.00	13.38	50°53.72	8.5'	27°19.26	-4.5'	55.6
6	269°58.86	N23°13.52	65°21.19	8.5'	S27°14.77	-4.6'	55.6
7	284°58.73	13.65	79°48.69	8.5'	27° 10.13	-4.8'	55.6
8	299°58.60	13.79	94°16.22	8.6'	27°5.34	-4.9'	55.6
9	314°58.47	• • 13.92	108°43.78	8.6'	27°0.40	-5.1'	55.6
10	329°58.34	14.05	123°11.36	8.6'	26°55.31	-5.2'	55.7
11	344°58.21	14.18	137°38.98	8.6'	26°50.08	-5.4'	55.7
12	359°58.08	N23° 14.32	152°6.63	8.7'	S26°44.70	-5.5'	55.7
13	14°57.95	14.45	166°34.31	8.7'	$26^{\circ}39.18$	-5.7'	55.7
14	29°57.82	14.58	181°2.02	8.8'	26°33.51	-5.8'	55.7
15	44°57.69	• • 14.70	195°29.77	8.8'	26°27.70	-6.0'	55.8
16	59°57.56	14.83	209°57.56	8.8'	26°21.75	-6.1'	55.8
17	74°57.42	14.96	224°25.39	8.9'	26°15.65	-6.2'	55.8
18	89°57.29	N23° 15.09	238°53.25 253°21.16	8.9'	\$26°9.41 26°3.02	-6.4'	55.8
19	104°57.16	15.21		8.9'		-6.5'	55.8
20	119°57.03	15.34	267°49.10	9.0'	25°56.50	-6.7'	55.9
21	134°56.90	· · 15.46 15.59	282°17.09	9.0'	25°49.83	-6.8'	55.9 55.9
22	149°56.77 164°56.64		296° 45.12 311° 13.20	9.1' 9.1'	25°43.02 25°36.08	-6.9'	
23		15.71	311 13.20			-7.1'	55.9
	SD = 15.7'	d = 0.1'		SI	O = 15.1'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0	179°56.50	N23° 15.83	325°41.32	9.2'	S25°28.99	-7.2'	55.9
1	194°56.37	15.96	340°9.48	9.2'	25°21.77	-7.4	56.0
2	209°56.24	16.08	354°37.69	9.3'	25° 14.41	-7.5'	56.0
3						7.61	56.0
	224°56.11	• • 16.20	9°5.95	9.3'	25°6.91	-7.6'	50.0
4	239°55.98	· · 16.20 16.32	9°5.95 23°34.25		24°59.28	-7.6° -7.8°	
		16.32 16.44	23°34.25 38°2.61	9.3' 9.4' 9.4'	24°59.28 24°51.51		56.0
4 5 6	239°55.98 254°55.84 269°55.71	16.32 16.44 N23°16.56	23°34.25 38°2.61 52°31.01	9.3' 9.4' 9.4' 9.5'	24°59.28 24°51.51 \$24°43.60	-7.8' -7.9' -8.0'	56.0 56.0 56.1
4 5 6 7	239° 55.98 254° 55.84 269° 55.71 284° 55.58	16.32 16.44 N23° 16.56 16.67	23°34.25 38°2.61 52°31.01 66°59.46	9.3' 9.4' 9.4' 9.5' 9.5'	24°59.28 24°51.51 \$24°43.60 24°35.57	-7.8' -7.9' -8.0' -8.2'	56.0 56.0 56.1 56.1
4 5 6 7 8	239° 55.98 254° 55.84 269° 55.71 284° 55.58 299° 55.45	16.32 16.44 N23° 16.56 16.67 16.79	23°34.25 38°2.61 52°31.01 66°59.46 81°27.97	9.3' 9.4' 9.4' 9.5' 9.5' 9.6'	24°59.28 24°51.51 \$24°43.60 24°35.57 24°27.40	-7.8' -7.9' -8.0' -8.2' -8.3'	56.0 56.0 56.1 56.1 56.1
4 5 6 7 8 9	239° 55.98 254° 55.84 269° 55.71 284° 55.58 299° 55.45 314° 55.32	16.32 16.44 N23°16.56 16.67 16.79 •• 16.91	23°34.25 38°2.61 52°31.01 66°59.46 81°27.97 95°56.52	9.3' 9.4' 9.4' 9.5' 9.5' 9.6' 9.6'	24° 59.28 24° 51.51 \$24° 43.60 24° 35.57 24° 27.40 24° 19.09	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4'	56.0 56.0 56.1 56.1 56.1
4 5 6 7 8 9	239° 55.98 254° 55.84 269° 55.71 284° 55.58 299° 55.45 314° 55.32 329° 55.18	16.32 16.44 N23° 16.56 16.67 16.79 • 16.91 17.02	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13	9.3' 9.4' 9.4' 9.5' 9.5' 9.6' 9.6' 9.7'	24° 59.28 24° 51.51 \$24° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6'	56.0 56.1 56.1 56.1 56.1 56.1
4 5 6 7 8 9 10 11	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05	16.32 16.44 N23°16.56 16.67 16.79 · · 16.91 17.02 17.14	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79	9.3' 9.4' 9.4' 9.5' 9.5' 9.6' 9.6' 9.7' 9.7'	24° 59.28 24° 51.51 \$24° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7'	56.0 56.0 56.1 56.1 56.1 56.1 56.2
4 5 6 7 8 9 10 11 12	239°55.98 254°55.84 269°55.71 284°55.58 299°55.42 314°55.32 329°55.18 344°55.05 359°54.92	16.32 16.44 N23° 16.56 16.67 16.79 • 16.91 17.02 17.14 N23° 17.25	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50	9.3' 9.4' 9.4' 9.5' 9.5' 9.6' 9.6' 9.7' 9.7' 9.8'	24° 59.28 24° 51.51 \$24° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 \$23° 53.40	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8'	56.0 56.1 56.1 56.1 56.1 56.1 56.2 56.2
4 5 6 7 8 9 10 11 12 13	239°55.98 254°55.84 269°55.71 284°55.58 299°55.32 329°55.18 344°55.05 359°54.92 14°54.79	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26	9.3' 9.4' 9.4' 9.5' 9.6' 9.6' 9.7' 9.7' 9.8' 9.8'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 523° 53.40 23° 44.58	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0'	56.0 56.1 56.1 56.1 56.1 56.1 56.2 56.2
4 5 6 7 8 9 10 11 12 13 14	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05 349°54.92 14°54.79 29°54.65	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.7' 9.8' 9.9'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 523° 53.40 23° 44.58 23° 35.63	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1'	56.0 56.1 56.1 56.1 56.1 56.1 56.2 56.2 56.2
4 5 6 7 8 9 10 11 12 13 14	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.7' 9.8' 9.9' 9.9'	24° 59.28 24° 51.51 \$24° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 \$23° 53.40 23° 44.58 23° 35.63 23° 26.55	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.2 56.3
4 5 6 7 8 9 10 11 12 13 14 15	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39	16.32 16.44 N23°16.56 16.67 16.79 · 16.91 17.02 17.14 N23°17.25 17.37 17.48 · 17.59 17.70	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.7' 9.8' 9.9' 9.9'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 523° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2' -9.3'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.2 56.3 56.3
4 5 6 7 8 9 10 11 12 13 14 15 16 17	239°55.98 254°55.84 269°55.75 289°55.58 299°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.8' 9.9' 9.9' 10.0'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 523° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35 23° 8.02	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2' -9.3' -9.5'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26 89°54.12	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81 N23° 17.92	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86 226° 15.90	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.8' 9.8' 9.9' 9.9' 10.0' 10.0' 10.1'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 10.66 24° 2.10 523° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35 23° 8.02 \$22° 58.57	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.9.0' -9.1' -9.2' -9.3' -9.5'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26 89°54.12 104°53.99	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81 N23° 17.92 18.03	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86 226° 15.90 240° 44.99	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.7' 9.8' 9.9' 9.9' 10.0' 10.0' 10.1' 10.1'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 10.66 24° 2.10 523° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35 23° 8.02 522° 58.57 22° 48.99	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2' -9.3' -9.5' -9.6' -9.7'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	239°55.98 254°55.84 269°55.71 284°55.58 299°55.48 314°55.32 329°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26 89°54.12 104°53.99 119°53.86	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81 N23° 17.92 18.03 18.14	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86 226° 15.90 240° 44.99 255° 14.14	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.7' 9.8' 9.9' 10.0' 10.1' 10.1' 10.1'	24°59.28 24°51.51 524°43.60 24°35.57 24°27.40 24°19.09 24°10.66 24°2.10 523°53.40 23°44.58 23°35.63 23°26.55 23°17.35 23°8.02 522°58.57 22°48.99 22°39.29	-7.8' -7.9' -8.0' -8.2' -8.3' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2' -9.5' -9.6' -9.7' -9.8'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3 56.3
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	239°55.98 254°55.84 269°55.71 284°55.58 299°55.43 314°55.92 349°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26 89°54.12 104°53.99 119°53.86 134°53.72	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81 N23° 17.92 18.03 18.14 18.25	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86 226° 15.90 240° 44.99 255° 14.14 269° 43.34	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.8' 9.9' 10.0' 10.0' 10.1' 10.1' 10.2' 10.3'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 \$23° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35 23° 8.02 \$22° 58.57 22° 48.99 22° 39.29 22° 29.47	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2' -9.3' -9.6' -9.7' -9.8' -9.9'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3 56.3 56.4 56.4
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	239°55.98 254°55.84 269°55.71 284°55.58 299°55.45 314°55.32 329°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26 89°54.12 104°53.99 119°53.86 134°53.72 149°53.59	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81 N23° 17.92 18.03 18.14 18.25 18.35	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86 226° 15.90 240° 44.99 255° 14.14 269° 43.34 284° 12.60	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.8' 9.9' 10.0' 10.1' 10.1' 10.2' 10.3' 10.3'	24° 59.28 24° 51.51 S24° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 S23° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35 23° 8.02 S22° 58.57 22° 48.99 22° 39.29 22° 39.29 22° 29.47 22° 19.52	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -9.0' -9.1' -9.2' -9.3' -9.5' -9.6' -9.7' -9.8' -9.9' -10.1'	56.0 56.1 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3 56.3 56.4 56.4
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	239°55.98 254°55.84 269°55.71 284°55.58 299°55.43 314°55.92 349°55.18 344°55.05 359°54.92 14°54.79 29°54.65 44°54.52 59°54.39 74°54.26 89°54.12 104°53.99 119°53.86 134°53.72	16.32 16.44 N23° 16.56 16.67 16.79 17.02 17.14 N23° 17.25 17.37 17.48 17.59 17.70 17.81 N23° 17.92 18.03 18.14 18.25	23° 34.25 38° 2.61 52° 31.01 66° 59.46 81° 27.97 95° 56.52 110° 25.13 124° 53.79 139° 22.50 153° 51.26 168° 20.08 182° 48.96 197° 17.88 211° 46.86 226° 15.90 240° 44.99 255° 14.14 269° 43.34	9.3' 9.4' 9.5' 9.5' 9.6' 9.7' 9.8' 9.9' 10.0' 10.1' 10.1' 10.2' 10.3' 10.3' 10.4'	24° 59.28 24° 51.51 524° 43.60 24° 35.57 24° 27.40 24° 19.09 24° 10.66 24° 2.10 \$23° 53.40 23° 44.58 23° 35.63 23° 26.55 23° 17.35 23° 8.02 \$22° 58.57 22° 48.99 22° 39.29 22° 29.47	-7.8' -7.9' -8.0' -8.2' -8.3' -8.4' -8.6' -8.7' -8.8' -9.0' -9.1' -9.2' -9.3' -9.6' -9.7' -9.8' -9.9'	56.0 56.1 56.1 56.1 56.1 56.2 56.2 56.2 56.3 56.3 56.3 56.3 56.4 56.4

			2025 Ju	ıne 12 t	to Jun.	14 U
Lat.	<b>Twi</b> Naut.	<b>light</b> Civil	Sunrise	Sunset	<b>Twi</b> Civil	light Naut.
N 72°						
N 70°						
68°						
			· · · · · · · · · · · · · · · · · · ·			
66°						
64°	////	////	01:35	22:26	////	////
62°	////	////	02:11	21:50	////	////
60°	////	00:56	02:37	21:24	23:06	////
N 58°	////	01:43	02:57	21:04	22:18	////
56°	7777	02:12	03:14	20:47	21:49	7777
54°	00:51	02:34	03:14	20:33	21:27	23:11
52°	01:34	02:51	03:40	20:33	21:09	22:27
50°	02:01	03:06	03:50	20:10	20:54	21:59
45°	02:46	03:35	04:13	19:48	20:25	21:14
<b>N</b> 40°	03:16	03:58	04:31	19:30	20:03	20:44
35°	03:39	04:16	04:45	19:15	19:45	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:03
20°	04:27	04:56	05:20	18:40	19:05	19:34
N 10°	1	05:16	05:39			
0°	04:49			18:21	18:44	19:11
	05:08	05:34	05:56	18:04	18:26	18:52
S $10^{\circ}$	05:25	05:51	06:14	17:46	18:09	18:36
20°	05:41	06:08	06:32	17:28	17:52	18:20
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:06	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°		07:02	07:36			
	06:25			16:24	16:58	17:35
<b>S</b> 50°	06:37	07:18	07:57	16:03	16:42	17:23
52°	06:42	07:26	08:06	15:54	16:35	17:18
54°	06:48	07:34	08:17	15:43	16:26	17:13
56°	06:54	07:43	08:30	15:30	16:17	17:06
58°	07:00	07:53	08:44	15:16	16:07	17:00
<b>S</b> 60°	07:08	08:04	09:02	14:58	15:56	16:52
3 00	l	Moonris			Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
<b>N</b> 70°						
68°					=	
66°					=	
64°			01.20			02.27
		00.50	01:28		00.44	03:27
62°		00:52	00:34		02:11	04:20
60°	23:48		00:02	01:57	03:14	04:52
						04.52
N 58°	23:14	23:37	23:49	02:38	03:48	
	23:14 22:49	23:37 23:18	23:49 23:35	02:38 03:06	03:48 04:13	05:16
56°	22:49	23:18	23:35	03:06	04:13	05:16 05:35
56° 54°	22:49 22:29	23:18 23:01	23:35 23:23	03:06 03:27	04:13 04:33	05:16 05:35 05:51
56° 54° 52°	22:49 22:29 22:12	23:18 23:01 22:47	23:35 23:23 23:12	03:06 03:27 03:45	04:13 04:33 04:49	05:16 05:35 05:51 06:05
56° 54° 52° 50°	22:49 22:29 22:12 21:58	23:18 23:01 22:47 22:35	23:35 23:23 23:12 23:02	03:06 03:27 03:45 04:01	04:13 04:33 04:49 05:04	05:16 05:35 05:51 06:05 06:17
56° 54° 52°	22:49 22:29 22:12	23:18 23:01 22:47	23:35 23:23 23:12	03:06 03:27 03:45	04:13 04:33 04:49	05:16 05:35 05:51 06:05
56° 54° 52° 50°	22:49 22:29 22:12 21:58	23:18 23:01 22:47 22:35	23:35 23:23 23:12 23:02	03:06 03:27 03:45 04:01	04:13 04:33 04:49 05:04	05:16 05:35 05:51 06:05 06:17
56° 54° 52° 50° 45°	22:49 22:29 22:12 21:58 21:28	23:18 23:01 22:47 22:35 22:09	23:35 23:23 23:12 23:02 22:42	03:06 03:27 03:45 04:01 04:32	04:13 04:33 04:49 05:04 05:33	05:16 05:35 05:51 06:05 06:17 06:41
56° 54° 52° 50° 45° <b>N</b> 40°	22:49 22:29 22:12 21:58 21:28 21:05	23:18 23:01 22:47 22:35 22:09 21:49	23:35 23:23 23:12 23:02 22:42 22:25 22:11	03:06 03:27 03:45 04:01 04:32 04:56 05:15	04:13 04:33 04:49 05:04 05:33 05:55 06:14	05:16 05:35 05:51 06:05 06:17 06:41 07:01 07:17
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		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	16-18	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-93%	
12	00:11	00:05	12:00	00:34	13:02		
13	00:01	80:00	12:00	01:29	13:56		
14	00:14	00:20	12:00	02:22	14:48		

June 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	263°31.91	226°7.52 N11°59.06	112°15.53 N13°5.59	172°15.85 N23°16.68	261°30.05 <b>S</b> 01°28.74	
1	278°34.38	241°7.46 11°59.83	127°16.67 5.07	187°17.70 16.68	276°32.40 28.71	Alpheratz 357°34.46 29°13.70 Ankaa 353°6.87 -42°9.82
2	293°36.84	$256^{\circ}7.40$ $12^{\circ}0.61$	142°17.81 4.56	202°19.54 16.68	291°34.75 28.67	Schedar 349°30.81 56°40.35
3	308°39.31	271°7.34 · · 1.39	157°18.95 · · 4.04	217°21.39 · · 16.68	306°37.11 · · 28.64	Diphda 348°47.03 -17°50.71
4	323°41.77	286°7.28 2.17	172°20.09 3.52	232°23.23 16.68	321°39.46 28.60	Achernar 335°20.21 -57°6.18
5 6	338° 44.23 353° 46.70	301°7.22 2.95 316°7.16 N12°3.73	187°21.23 3.00 202°22.37 N13°2.48	247°25.07 16.68 262°26.92 N23°16.68	336° 41.82 28.57 351° 44.17 S01° 28.53	Hamal 327°51.02 23°34.86
7	8°49.16	331°7.09 4.51	217°23.51 1.96	277°28.76 16.68	6°46.53 28.49	Polaris 314°14.69 89°22.06
8	23°51.63	346°7.03 5.28	232°24.65 1.44	292°30.61 16.68	21°48.88 28.46	Acamar 315°11.83 -40°11.98
9	38° 54.09	1°6.96 · · 6.06	247°25.79 · · 0.92	307°32.45 · · 16.68	36°51.24 · · 28.42	Menkar 314°6.04 4°11.37
10	53° 56.56	16° 6.90 6.84	262°26.93 13°0.40	322°34.30 16.67	51°53.59 28.39	Mirfak 308°28.18 49°56.94 Aldebaran 290°39.55 16°33.60
11	68°59.02	31°6.83 7.62	277°28.07 12°59.88	337°36.14 16.67	66°55.95 28.35	Rigel 281°3.86 -8°10.31
12	84°1.48	46°6.77 N12°8.40	292°29.21 N12°59.36	352°37.98 N23°16.67	81°58.31 S01°28.32	Capella 280°21.85 46°1.37
13	99°3.95 114°6.41	61°6.70 9.17	307°30.35 58.83	7°39.83 16.67	97°0.66 28.28	Bellatrix 278°22.84 6°22.37
14 15	114 0.41 129°8.88	76°6.63 9.95 91°6.56 · · 10.73	322°31.49 58.31 337°32.63 · · 57.79	22°41.67 16.67 37°43.52 · · 16.67	112°3.02 28.25 127°5.37 · · 28.21	Elnath 278°1.80 28°37.71
16	144°11.34	106°6.50 11.51	352°33.77 57.27	52°45.36 16.67	142°7.73 28.18	Alnilam 275°37.71 -1°11.13
17	159° 13.80	121°6.43 12.29	7°34.91 56.75	67°47.20 16.66	157°10.09 28.14	Betelgeuse 270°52.04 7°24.71
18	174° 16.27	136°6.36 N12°13.06	22°36.05 N12°56.23	82°49.05 N23°16.66	172°12.44 <b>S</b> 01°28.11	Canopus 263°52.79 -52°42.55 Sirius 258°26.27 -16°45.07
19	$189^{\circ}18.73$	151°6.28 13.84	37°37.19 55.71	97°50.89 16.66	187°14.80 28.07	Sirius 258°26.27 -16°45.07 Adhara 255°5.95 -29°0.43
20	204°21.20	166° 6.21 14.62	52°38.33 55.18	112°52.74 16.66	202°17.16 28.04	Procyon 244°50.76 5°9.60
21	219°23.66	181°6.14 · · 15.39	67°39.46 · · 54.66	127°54.58 · · 16.66	217°19.52 · · 28.00	Pollux 243°17.20 27°57.95
22	234°26.13	196° 6.07 16.17	82°40.60 54.14	142°56.42 16.66	232°21.87 27.97	Avior 234°15.12 -59°35.61
23	249°28.59	211°5.99 16.95	97°41.74 53.62	157°58.27 16.65	247°24.23 27.94	Suhail 222°46.35 -43°32.28
Mer.p	pass. 06:25	$\nu$ -0.1 $'$ d0.8 $'$ m-4.26	$ u 1.1' \ d$ -0.5' m1.40	$\nu 1.8' \ d ext{-}0.0' \  ext{m-}1.90$	$\nu 2.4' \ d$ -0.0' m1.03	Miaplacidus 221°38.83 -69°49.51
						Alphard 217°47.60 -8°46.19
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.20 11°50.61 Dubhe 193°40.67 61°37.10
0	264°31.05	226°5.92 N12°17.72	112°42.88 N12°53.10	173°0.11 N23°16.65	262°26.59 <b>S</b> 01°27.90	Dubhe 193°40.67 61°37.10 Denebola 182°24.57 14°25.85
1	$279^{\circ}33.52$	241°5.85 18.50	127°44.02 52.57	188°1.96 16.65	277°28.95 27.87	Gienah 175°43.17 -17°41.12
2	294°35.98	256° 5.77 19.28	142°45.16 52.05	203°3.80 16.65	292°31.30 27.83	Acrux 172°59.58 -63°14.72
3	309°38.45	271°5.69 · · 20.05	157°46.30 · · 51.53	218°5.64 · · 16.65	307°33.66 · · 27.80	Gacrux 171°51.14 -57°15.64
4 5	324° 40.91 339° 43.37	286° 5.62 20.83 301° 5.54 21.61	172°47.44 51.00 187°48.57 50.48	233°7.49 16.65 248°9.33 16.64	322°36.02 27.76 337°38.38 27.73	Alioth 166°12.45 55°49.53
6	354° 45.84	301°5.54 21.61 316°5.46 N12°22.38	187°48.57 50.48 202°49.71 N12°49.96	263°11.18 N23°16.64	337°38.38 27.73 352°40.74 \$01°27.70	Spica 158°21.78 -11°17.74
7	9°48.30	331°5.38 23.16	217°50.85 49.43	278°13.02 16.64	7°43.10 27.66	Alkaid 152°51.44 49°11.35
8	24°50.77	346°5.30 23.93	232°51.99 48.91	293°14.86 16.64	22°45.45 27.63	Hadar 148°35.11 -60°29.99
9	39°53.23	1°5.22 · · 24.71	247°53.13 · · 48.39	308°16.71 · · 16.63	37°47.81 · · 27.60	Menkent 147°56.96 -36°29.90 Arcturus 145°47.36 19°3.04
10	54° 55.70	16°5.14 25.48	262°54.26 47.86	323°18.55 16.63	52°50.17 27.56	Rigil Kent. 139°39.35 -60°56.66
11	69°58.16	31°5.06 26.26	277°55.40 47.34	338°20.39 16.63	67°52.53 27.53	Kochab 137°18.87 74°3.19
12	85°0.62	46°4.98 N12°27.03	292°56.54 N12°46.81	353°22.24 N23°16.63	82°54.89 <b>S</b> 01°27.49	Zuben'ubi 136°55.37 -16°8.95
13 14	100°3.09 115°5.55	61°4.90 27.81 76°4.82 28.58	307°57.68 46.29 322°58.82 45.77	8°24.08 16.63 23°25.93 16.62	97° 57.25 27.46 112° 59.61 27.43	Alphecca 126°3.11 26°37.77
15	130°8.02	91°4.73 · · 29.36	337°59.95 · · 45.24	38°27.77 · · 16.62	128°1.97 · · 27.39	Antares 112°15.04 -26°29.37
16	145° 10.48	106° 4.65 30.13	353°1.09 44.72	53°29.61 16.62	143°4.33 27.36	Atria 107°8.38 -69°4.44 Sabik 102°2.02 -15°45.42
17	$160^{\circ}12.94$	121°4.56 30.91	8°2.23 44.19	68°31.46 16.62	158°6.69 27.33	Sabik 102°2.02 -15°45.42 Shaula 96°9.46 -37°7.34
18	175° 15.41	136°4.48 N12°31.68	23°3.37 N12°43.67	83°33.30 N23°16.61	173°9.05 \$01°27.29	Rasalhague 95°57.87 12°32.45
19	190° 17.87	151°4.39 32.46	38° 4.50 43.14	98°35.14 16.61	188°11.41 27.26	Eltanin 90°41.47 51°29.04
20	205°20.34 220°22.80	166° 4.30 33.23	53°5.64 42.61 68°6.78 • 42.09	113°36.99 16.61	203°13.77 27.23	Kaus Aust. 83°31.64 -34°22.32
21 22	220 22.80 235°25.26	181° 4.22 · · · 34.01 196° 4.13	68°6.78 · · 42.09 83°7.92 41.56	128°38.83 · · 16.60 143°40.67 16.60	218° 16.13 · · · 27.19 233° 18.49 27.16	Vega 80°32.56 38°48.33
23	250°27.73	211°4.04 35.55	98° 9.05 41.04	158°42.52 16.60	248° 20.85 27.13	Nunki 75°46.96 -26°15.86
						Altair 61°59.32 8°56.08 Peacock 53°4.69 -56°38.99
ivier.	pass. 06:21	ν-0.1′ d0.8′ m-4.25	$\nu 1.1' \ d$ -0.5' m1.40	ν1.8' d-0.0' m-1.90	$\nu 2.4' \ d$ -0.0' m1.02	Peacock 53°4.69 -56°38.99 Deneb 49°25.23 45°22.06
						Enif 33°38.28 9°59.44
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.26 -46°50.03
0	265°30.19 280°32.66	226°3.95 N12°36.33	113°10.19 N12°40.51	173°44.36 N23°16.60	263°23.21 S01°27.10 278°25.58 27.06	Fomalhaut 15°14.04 -29°29.08
1 2	280° 32.66 295° 35.12	241°3.86 37.10 256°3.77 37.87	128°11.33 39.99 143°12.46 39.46	188°46.21 16.59 203°48.05 16.59	278° 25.58 27.06 293° 27.94 27.03	Scheat 13°44.80 28°13.09
3	310°37.59	271°3.68 · · 38.65	158°13.60 · · 38.93	218°49.89 · · 16.59	308°30.30 · · 27.00	Markab 13°29.49 15°20.44
4	325° 40.05	286°3.59 39.42	173°14.74 38.41	233°51.74 16.58	323°32.66 26.97	Jun 15 Sun SHA Mer.pass
5	340°42.51	301°3.49 40.19	188°15.88 37.88	248°53.58 16.58	338°35.02 26.93	Venus 322°35.61 08:56
6	355° 44.98	316°3.40 N12°40.97	203°17.01 N12°37.35	263°55.42 N23°16.58	353°37.38 <b>S</b> 01°26.90	Mars 208°43.62 16:30
7	10°47.44	331°3.31 41.74	218°18.15 36.83	278°57.27 16.58	8°39.75 26.87	Jupiter 268°43.94 12:29
8	25°49.91	346°3.21 42.51	233°19.29 36.30	293°59.11 16.57	23°42.11 26.84	Saturn 357°58.13 06:33
9 10	40° 52.37 55° 54.83	1°3.12 · · 43.28 16°3.02 44.06	248°20.42 · · 35.77 263°21.56 35.24	309°0.95 · · 16.57 324°2.80	38° 44.47 · · · 26.80 53° 46.83 26.77	Jun 16 Mon SHA Mer.pass
11	70°57.30	31°2.92 44.83	278°22.70 34.72	339°4.64 16.56	68° 49.20 26.74	Venus 321°34.87 08:56
12	85° 59.76	46°2.83 N12°45.60	293°23.83 N12°34.19	354°6.48 N23°16.56	83°51.56 S01°26.71	Mars 208°11.83 16:28
13	101°2.23	61°2.73 46.37	308°24.97 33.66	9°8.33 16.56	98° 53.92 26.68	Jupiter 268°29.06 12:26
14	$116^{\circ}4.69$	76°2.63 47.14	323°26.10 33.13	24°10.17 16.55	113°56.29 26.64	Saturn 357°55.53 06:29
15	131°7.15	91°2.53 · · 47.92	338°27.24 · · 32.60	39°12.01 · · 16.55	128°58.65 · · 26.61	Jun 17 Tue SHA Mer.pass
16	146°9.62	106°2.43 48.69	353°28.38 32.08	54°13.86 16.55	144°1.01 26.58	Venus 320°33.76 08:56
17	161°12.08	121°2.33 49.46	8°29.51 31.55	69°15.70 16.54	159°3.38 26.55	Mars 207°40.00 16:26
18 19	176° 14.55 191° 17.01	136°2.23 N12°50.23 151°2.13 51.00	23°30.65 N12°31.02 38°31.78 30.49	84°17.54 N23°16.54 99°19.39 16.53	174°5.74 S01°26.52 189°8.10 26.49	Jupiter 268°14.17 12:24
20	206° 19.47	166°2.03 51.77	53°32.92 29.96	114°21.23 16.53	204° 10.47 26.45	Saturn 357°53.02 06:25
21	221°21.94	181°1.93 · · 52.54	68°34.06 · · 29.43	129°23.07 · · 16.53	219° 12.83 · · 26.42	Horizontal parallax
22	236°24.40	196°1.82 53.31	83°35.19 28.90	144°24.92 16.52	234°15.20 26.39	Venus: 0.2
23	251°26.87	211°1.72 54.08	98°36.33 28.37	159°26.76 16.52	249° 17.56 26.36	Mars: 0.1
Mer.	pass. 06:17	ν-0.1' d0.8' m-4.24	ν1.1' d-0.5' m1.41	ν1.8′ d-0.0′ m-1.90	ν2.4' d-0.0' m1.02	

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.33	N23° 18.57	$313^{\circ}11.29$	10.4'	S21°59.28	-10.3'	56.5'
1	194°53.19	18.67	327° 40.72	10.5'	21°48.98	-10.4'	56.5'
2	209°53.06 224°52.93	18.77 •• 18.88	342° 10.20 356° 39.74	10.5' 10.6'	21°38.57 21°28.03	-10.5' -10.6'	56.5' 56.5'
4	239°52.79	18.98	11°9.34	10.7'	21°17.39	-10.8'	56.5'
5	254°52.66	19.08	25°39.00	10.7'	$21^{\circ}6.63$	-10.9'	56.6'
6	269°52.53	N23°19.18	40°8.71	10.8'	\$20°55.75	-11.0'	56.6'
7 8	284°52.39 299°52.26	19.29 19.39	54°38.47 69°8.29	10.8' 10.9'	20°44.77 20°33.67	-11.1' -11.2'	56.6' 56.6'
9	314°52.13	• • 19.48	83°38.17	10.9'	20° 22.46	-11.3'	56.7'
10	329°51.99	19.58	$98^{\circ}8.11$	11.0'	$20^{\circ}11.15$	-11.4'	56.7'
11	344°51.86	19.68	112°38.10	11.0'	19°59.72	-11.5'	56.7'
12 13	359°51.72 14°51.59	N23°19.78 19.87	127°8.14 141°38.24	11.1' 11.2'	\$19°48.19 19°36.55	-11.6' -11.7'	56.7' 56.7'
14	29°51.46	19.97	156°8.40	11.2'	19° 24.81	-11.8'	56.8'
15	44°51.32	• • 20.06	$170^{\circ}38.61$	11.3'	$19^{\circ}12.96$	-11.9'	56.8'
16	59°51.19	20.16	185°8.87	11.3'	19°1.02	-12.1'	56.8'
17 18	74°51.05 89°50.92	20.25 N23°20.34	199°39.19 214°9.56	11.4' 11.4'	18° 48.96 \$18° 36.81	-12.2' -12.3'	56.8' 56.9'
19	104°50.79	20.44	214 9.50 228°39.99	11.5'	18° 24.56	-12.3 -12.4'	56.9'
20	119°50.65	20.53	243°10.46	11.5'	18° 12.21	-12.4	56.9'
21	134°50.52	• • 20.62	257°40.99	11.6'	$17^{\circ}59.76$	-12.5'	56.9'
22	149°50.38	20.71	272°11.57	11.6'	17°47.22	-12.6'	57.0'
23	164°50.25	20.80	286° 42.20	11.7'	17°34.58	-12.7'	57.0'
	SD = 15.7'	d = 0.1'		SI	O = 15.4'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.12	N23°20.89	301°12.89	11.7'	S17°21.84	-12.8'	57.0'
1	194°49.98	20.97	315° 43.62	11.8'	17°9.02	-12.9'	57.0'
2	209°49.85 224°49.71	21.06 •• 21.15	330° 14.40 344° 45.23	11.8' 11.9'	16°56.10 16°43.08	-13.0' -13.1'	57.0' 57.1'
4	239°49.58	21.13	359° 16.11	11.9'	16° 29.98	-13.1 -13.2'	57.1'
5	254°49.44	21.32	13°47.04	12.0'	16° 16.79	-13.3	57.1'
6	269°49.31	N23°21.40	28° 18.01	12.0'	S16°3.51	-13.4'	57.1'
7	284°49.17	21.49	42°49.03	12.1'	15°50.15	-13.5'	57.2'
8 9	299°49.04 314°48.91	21.57 •• 21.65	57°20.09 71°51.20	12.1' 12.2'	15°36.69 15°23.16	-13.5' -13.6'	57.2' 57.2'
10	329°48.77	21.73	86°22.36	12.2'	15°23.10	-13.7	57.2'
11	344°48.64	21.81	100°53.55	12.2'	14°55.83	-13.8'	57.3'
12	359°48.50	N23°21.89	115°24.79	12.3'	S14°42.05	-13.9'	57.3'
13 14	14°48.37 29°48.23	21.97 22.05	129°56.07 144°27.40	12.3' 12.4'	14°28.18 14°14.24	-13.9' -14.0'	57.3' 57.3'
15	44°48.10	22.13	158° 58.76	12.4'	14° 0.22	-14.1'	57.3 57.4'
16	59°47.96	22.20	173°30.16	12.4'	13°46.12	-14.2'	57.4'
17	74°47.83	22.28	188°1.60	12.5'	13°31.94	-14.3'	57.4'
18	89°47.69	N23°22.36	202°33.07	12.5'	\$13°17.69 13°3.36	-14.3'	57.4'
19 20	104°47.56 119°47.42	22.43 22.51	217°4.59 231°36.14	12.5'	13° 3.36 12° 48.97	-14.4' -14.5'	57.5' 57.5'
21	134°47.29	22.58	246°7.72	12.6'	12°34.50	-14.5'	57.5'
22	149°47.15	22.65	260°39.34	12.6'	$12^{\circ}19.96$	-14.6'	57.5'
23	164°47.01	22.72	275° 10.99	12.7'	12°5.35	-14.7'	57.6'
	SD = 15.7'	d = 0.1'		SI	O = 15.5'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°46.88	N23°22.80	289° 42.67	12.7'	S11°50.67	-14.7'	57.6'
1	194°46.74 209°46.61	22.87 22.94	304° 14.38 318° 46.12	12.7' 12.8'	11°35.92 11°21.11	-14.8' -14.9'	57.6'
2	209°46.61 224°46.47	. 23.00	318° 46.12 333° 17.89	12.8'	11° 6.23	-14.9' -14.9'	57.6' 57.7'
4	239°46.34	23.07	347°49.69	12.8'	10°51.29	-15.0'	57.7'
5	254°46.20	23.14	2°21.51	12.8'	10°36.29	-15.1'	57.7'
6	269°46.07	N23°23.21 23.27	16°53.36 31°25.23	12.9' 12.9'	\$10°21.23 10°6.10	-15.1'	57.7'
7 8	284°45.93 299°45.80	23.27	31°25.23 45°57.13	12.9' 12.9'	10°6.10 09°50.92	-15.2' -15.2'	57.8' 57.8'
9	314°45.66	• • 23.40	60°29.05	12.9'	09° 35.67	-15.3'	57.8'
10	329°45.52	23.47	75°0.99	13.0'	09°20.37	-15.4'	57.8'
11	344°45.39	23.53	89°32.95	13.0'	09°5.02	-15.4'	57.9'
12 13	359°45.25 14°45.12	N23°23.59 23.66	104°4.93 118°36.92	13.0' 13.0'	\$08°49.60 08°34.14	-15.5' -15.5'	57.9' 57.9'
13 14	14 45.12 29°44.98	23.72	118 30.92 133°8.94	13.0'	08 34.14 08° 18.62	-15.5' -15.6'	57.9' 57.9'
15	44°44.85	• • 23.78	147° 40.96	13.0'	08°3.05	-15.6'	58.0'
16	59°44.71	23.84	162° 13.01	13.1'	$07^{\circ}47.43$	-15.7'	58.0'
17	74°44.57	23.90	176° 45.06	13.1'	07°31.77	-15.7'	58.0'
18 19	89°44.44 104°44.30	N23°23.96 24.01	191°17.13 205°49.20	13.1' 13.1'	\$07°16.05 07°0.28	-15.8' -15.8'	58.0' 58.1'
20	119°44.17	24.01	205 49.20 220°21.29	13.1	07 0.28 06°44.48	-15.6 -15.9'	58.1
21	134°44.03	• • 24.13	234°53.38	13.1'	$06^{\circ}28.62$	-15.9'	58.1'
22	149°43.89	24.18	249°25.48	13.1'	06°12.72	-15.9'	58.1'
23	164°43.76	24.24	263°57.59	13.1'	05°56.79	-16.0'	58.2'
	SD = 15.7'	d = 0.1'		SI	O = 15.7'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	87-69%	
15	00:27	00:33	12:01	03:14	15:39		
16	00:40	00:46	12:01	04:03	16:27		
17	00:52	00:59	12:01	04:50	17:13		

h	Aries	Vei	nus	M	ars	Jup	piter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	266°29.33		N12°54.85	113° 37.46	N12°27.84	174°28.60	N23°16.52	264°19.92	S01°26.33			
1	281°31.80	241°1.51	55.62	128° 38.60	27.31	189°30.45	16.51	279°22.29	26.30	Alpheratz	357°34.44	29°13.71
2	296°34.26	256°1.40	56.39	143°39.73	26.78	204°32.29	16.51	294°24.65	26.27	Ankaa	353°6.84	-42°9.81
3	311°36.72	271°1.30	• • 57.16	158° 40.87	• • 26.25	219°34.13	• • 16.50	309°27.02	• • 26.24	Schedar	349°30.78	56°40.36
4	$326^{\circ}39.19$	286°1.19	57.93	173°42.00	25.72	234°35.98	16.50	324°29.38	26.21	Diphda Achernar	348°47.01 335°20.18	-17°50.70 -57°6.16
5	341°41.65	301°1.08	58.70	188°43.14	25.19	249°37.82	16.50	339°31.75	26.17	Hamal	327°51.00	23°34.87
6	356°44.12	316°0.97	N12°59.47	203°44.27	N12°24.66	264°39.66	N23°16.49	354°34.12	S01°26.14	Polaris	314°13.73	89°22.05
7	11°46.58	331°0.86	13°0.24	218° 45.41	24.13	279°41.51	16.49	9°36.48	26.11	Acamar	315°11.81	-40°11.97
8	26°49.04	346°0.75	1.01	233° 46.54	23.60	294°43.35	16.48	24°38.85	26.08	Menkar	314°6.02	4°11.38
9 10	41°51.51 56°53.97	1°0.64 16°0.53	· · 1.77 2.54	248° 47.68 263° 48.81	· · 23.07 22.54	309°45.19 324°47.04	· · 16.48 16.48	39°41.21 54°43.58	· · 26.05 26.02	Mirfak	308°28.16	49°56.94
11	71°56.44	31°0.42	3.31	278°49.95	22.01	339°48.88	16.47	69°45.95	25.99	Aldebaran	290°39.54	16°33.61
12	86°58.90	46°0.31	N13°4.08	293°51.08	N12°21.48	354°50.72	N23°16.47	84°48.31	S01°25.96	Rigel	281°3.86	-8°10.30
13	102°1.36	61°0.20	4.85	308° 52.22	20.95	9°52.57	16.46	99°50.68	25.93	Capella	280°21.84	46°1.37
14	117°3.83	76°0.08	5.62	323°53.35	20.42	24°54.41	16.46	114°53.05	25.90	Bellatrix	278°22.83	6°22.37
15	$132^{\circ}6.29$	90°59.97	• • 6.38	338°54.49	• • 19.88	39°56.25	• • 16.45	129°55.41	• • 25.87	Elnath Alnilam	278°1.80 275°37.70	28°37.71 -1°11.12
16	$147^{\circ}8.76$	105°59.85	7.15	353°55.62	19.35	54°58.09	16.45	144°57.78	25.84	Betelgeuse	270°52.04	7°24.72
17	162°11.22	120°59.74	7.92	8°56.76	18.82	69°59.94	16.44	160°0.15	25.81	Canopus	263°52.79	-52°42.53
18	177° 13.68	135°59.62	N13°8.68	23°57.89	N12°18.29	85° 1.78	N23°16.44	175°2.51	S01°25.78	Sirius	258° 26.27	-16°45.06
19	192° 16.15	150°59.51	9.45	38°59.03	17.76	100°3.62	16.44	190°4.88	25.75	Adhara	255°5.96	-29°0.41
20	207° 18.61	165°59.39	10.22	54°0.16	17.22	115° 5.47	16.43	205°7.25	25.72 •• 25.69	Procyon	244°50.76	5°9.60
21 22	222°21.08 237°23.54	180°59.27 195°59.15	· · 10.98 11.75	69°1.29 84°2.43	· · 16.69 16.16	130°7.31 145°9.15	· · 16.43 16.42	220°9.62 235°11.98	· · 25.69 25.66	Pollux	243°17.20	27°57.95
23	252° 26.00	210° 59.13	12.52	99°3.56	15.62	145 9.15 160°11.00	16.42	250°14.35	25.63	Avior	234°15.14	-59°35.59
							_			Suhail	222°46.37	-43°32.27
Mer.p	pass. 06:13	$\nu$ -0.1' d0.	.8′ m-4.23	$\nu 1.1' d$ -0	).5′ m1.42	$\nu 1.8' \ d$ -0	).0′ m-1.90	$\nu$ 2.4′ d-0	.0′ m1.02	Miaplacidus	221°38.87	-69°49.50
										Alphard	217°47.61 207°34.21	-8°46.18 11°50.62
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	193° 40.69	61°37.10
0	267°28.47		N13°13.28	114°4.70	N12°15.09	175°12.84	N23°16.41	$265^{\circ}16.72$	501°25.60	Denebola	182°24.59	14°25.85
1	282°30.93	240°58.79	14.05	129°5.83	14.56	190°14.68	16.41	280°19.09	25.57	Gienah	175°43.18	-17°41.12
2	297°33.40	255°58.67	14.81	144°6.96	14.03	205°16.52	16.40	295°21.46	25.54	Acrux	172°59.61	-63°14.73
3	312°35.86	270°58.55	• • 15.58	159°8.10	• • 13.49	220°18.37	• • 16.40	310°23.83	• • 25.51	Gacrux	171°51.16	-57°15.64
4 5	327° 38.33 342° 40.79	285°58.43 300°58.31	16.34	174°9.23 189°10.36	12.96	235°20.21 250°22.05	16.39	325°26.20 340°28.56	25.48	Alioth	$166^{\circ}12.47$	55°49.54
6	342 40.79 357°43.25	315°58.18	17.11 N13°17.87	204° 11.50	12.42 N12°11.89	250 22.05 265°23.90	16.39 N23°16.38	340 28.50 355°30.93	25.45 \$01°25.43	Spica	158°21.79	-11°17.74
7	12°45.72	330°58.06	18.64	219° 12.63	11.36	280°25.74	16.38	10°33.30	25.40	Alkaid	152°51.45	49°11.35
8	27°48.18	345°57.93	19.40	234° 13.77	10.82	295°27.58	16.37	25°35.67	25.37	Hadar	148°35.14	-60°30.00
9	42°50.65	0°57.81	20.17	249° 14.90	. 10.29	310°29.43	. 16.37	40°38.04	25.34	Menkent	147°56.97	-36°29.90
10	57°53.11	15°57.68	20.93	264° 16.03	9.75	325°31.27	16.36	55°40.41	25.31	Arcturus	145°47.37 139°39.37	19°3.04 -60°56.67
11	72°55.57	30°57.56	21.69	279°17.17	9.22	340°33.11	16.36	70°42.78	25.28	Rigil Kent. Kochab	139 39.37 137° 18.91	74°3.20
12	87°58.04	45°57.43	N13°22.46	294°18.30	N12°8.68	355°34.95	N23°16.35	85°45.15	S01°25.25	Zuben'ubi	136°55.37	-16°8.95
13	103°0.50	60°57.30	23.22	309° 19.43	8.15	10°36.80	16.34	100°47.52	25.22	Alphecca	126°3.12	26°37.78
14	118°2.97	75°57.17	23.98	324°20.56	7.61	25°38.64	16.34	115°49.89	25.19	Antares	112° 15.04	-26°29.37
15	133°5.43 148°7.89	90°57.04 105°56.91	• • 24.75	339°21.70 354°22.83	• • 7.08	40°40.48 55°42.33	• • 16.33	130°52.26 145°54.63	• • 25.17	Atria	107°8.38	-69°4.46
16 17	146 7.69 163° 10.36	105 56.91 120°56.78	25.51 26.27	9°23.96	6.54 6.01	70°44.17	16.33 16.32	145 54.03 160°57.00	25.14 25.11	Sabik	102°2.02	-15°45.42
18	178° 12.82		N13°27.03	24°25.10	N12° 5.47	85°46.01	N23°16.32	175°59.37	S01°25.08	Shaula	96°9.45	-37°7.35
19	193° 15.29	150°56.52	27.80	39° 26.23	4.94	100°47.85	16.31	191°1.75	25.05	Rasalhague	95°57.87	12°32.46 51°29.06
20	$208^{\circ}17.75$	165°56.39	28.56	54°27.36	4.40	115°49.70	16.31	206°4.12	25.02	Eltanin Kaus Aust.	90°41.47 83°31.63	-34°22.32
21	223°20.21	180°56.25	• • 29.32	69°28.49	• • 3.87	130°51.54	• • 16.30	221°6.49	• • 25.00	Vega	80° 32.55	38°48.34
22	238°22.68	195°56.12	30.08	84°29.63	3.33	145°53.38	16.29	236°8.86	24.97	Nunki	75°46.95	-26°15.86
23	253°25.14	210°55.99	30.84	99°30.76	2.79	160°55.23	16.29	251°11.23	24.94	Altair	61°59.31	8°56.09
Mer.	pass. 06:09	$\nu$ -0.1' d0.	.8′ m-4.23	$\nu 1.1'$ d-0	).5′ m1.42	$\nu$ 1.8′ d-0	0.0′ m-1.90	$\nu 2.4' \ d-0$	.0′ m1.01	Peacock	53°4.67	-56°39.00
										Deneb	49°25.21	45°22.07
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.26	9°59.45
0	268°27.61	225° 55.85		114°31.89	N12°2.26	175°57.07		266°13.60	S01°24.91	Al Na'ir	27°32.23	-46°50.03
1	283°30.07	240°55.72	32.37	129° 33.02	1.72	190°58.91	16.28	281°15.97	24.88	Fomalhaut Scheat	15°14.02 13°44.78	-29°29.07 28°13.10
2	298° 32.53	255°55.58	33.13	144°34.16	1.18	206° 0.75	16.27	296°18.35	24.86	Markab	13 44.78 13°29.47	28 13.10 15°20.45
3	313°35.00	270°55.44	• • 33.89	159°35.29	• • 0.65	221°2.60	• • 16.26	311°20.72	• • 24.83	IVIAIRAD	15 25.47	
4	328° 37.46	285°55.31	34.65	174° 36.42	12°0.11	236° 4.44	16.26	326°23.09	24.80	Jun 18 Wed	SHA	Mer.pass
5	343°39.93	300°55.17	35.41	189°37.55	11°59.57	251°6.28	16.25	341°25.46	24.77	Venus		08:56
6	358° 42.39		N13°36.17	204°38.68	N11°59.03	266° 8.12	N23°16.25	356°27.84	S01°24.75	Mars	207°8.13	16:24
7	13°44.86	330°54.89	36.93	219°39.82	58.50 57.06	281°9.97	16.24	11°30.21 26°32.58	24.72	Jupiter Saturn	267°59.27 357°50.59	12:21 06:22
8 9	28° 47.32 43° 49.78	345°54.75 0°54.61	37.69 •• 38.44	234° 40.95 249° 42.08	57.96 •• 57.42	296°11.81 311°13.65	16.23 •• 16.23	20 32.58 41°34.96	24.69 •• 24.66	Saturn	357 30.59	00.22
10	58° 52.25	15° 54.47	39.20	264° 43.21	56.88	326°15.50	16.22	56°37.33	24.64	Jun 19 Thu	SHA	Mer.pass
11	73°54.71	30°54.33	39.96	279°44.34	56.35	341°17.34	16.21	71°39.70	24.61	Venus	318°30.45	08:56
12	88°57.18	45°54.18	N13°40.72	294°45.47	N11°55.81	356°19.18	N23°16.21	86°42.08	S01°24.58	Mars		16:22
13	103° 59.64	60°54.04	41.48	309°46.61	55.27	11°21.02	16.20	101°44.45	24.55	Jupiter Saturn	267° 44.37 357° 48.25	12:18 06:18
14	119°2.10	75°53.90	42.24	324° 47.74	54.73	26°22.87	16.20	116°46.82	24.53	Saturn	JJ1 40.23	00:10
15	134°4.57	90°53.75	• • 42.99	339°48.87	• • 54.19	41°24.71	• • 16.19	131°49.20	• • 24.50	Jun 20 Fri	SHA	Mer.pass
16	149°7.03	105°53.61	43.75	354°50.00	53.65	56°26.55	16.18	146°51.57	24.47	Venus		08:56
17	164°9.50 179°11.96	120°53.46 135°53.32	44.51 N13°45.27	9°51.13 24°52.26	53.11 N11°52.57	71°28.39 86°30.24	16.18 N23°16.17	161°53.95 176°56.32	24.45 \$01°24.42	Mars	206°4.28	16:21
18 19	179 11.96 194° 14.42	150°53.32	46.02	24 52.20 39°53.39	52.04	101°32.08	16.16	176 56.32 191°58.70	24.42	Jupiter Saturn	267°29.46 357°46.00	12:15 06:14
20	209° 16.89	165°53.02	46.78	54° 54.52	51.50	116°33.92	16.16	207°1.07	24.37	Saturn	331 40.00	00:14
21	224° 19.35	180°52.88	• • 47.54	69° 55.65	• • 50.96	131°35.77	• • 16.15	222°3.45	• • 24.34	Horizoi	ntal parallax	
22	239°21.82	195°52.73	48.29	84° 56.79	50.42	146°37.61	16.14	237°5.82	24.31		Venus:	0.2
23	254°24.28	210°52.58	49.05	99°57.92	49.88	161°39.45	16.14	252°8.20	24.29		Mars:	0.1
Mer.	pass. 06:05	$\nu$ -0.1' d0.	.8′ m-4.22	$\nu 1.1' d-0$	0.5′ m1.43	$\nu 1.8' \ d-0$	0.0′ m-1.90	$\nu 2.4' \ d-0$	.0′ m1.01			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.62	N23°24.29	$278^{\circ}29.69$	13.1'	S05°40.81	-16.0'	58.2'
1	194°43.49	24.34	293°1.81	13.1'	05°24.79	-16.1'	58.2'
2	209°43.35 224°43.21	24.40 •• 24.45	307°33.92 322°6.03	13.1' 13.1'	05°8.73 04°52.63	-16.1' -16.1'	58.2' 58.3'
4	239°43.08	24.50	336°38.15	13.1'	04°36.50	-16.2	58.3'
5	254°42.94	24.55	$351^{\circ}10.26$	13.1'	$04^{\circ}20.33$	-16.2'	58.3'
6	269°42.81	N23°24.60	5°42.36	13.1'	S04°4.13	-16.2'	58.3'
7 8	284°42.67 299°42.53	24.65 24.70	20°14.46 34°46.56	13.1' 13.1'	03°47.90 03°31.63	-16.3' -16.3'	58.4' 58.4'
9	314°42.40	24.75	49°18.65	13.1'	03°15.33	-16.3'	58.4'
10	329°42.26	24.79	$63^{\circ}50.72$	13.1'	$02^{\circ}59.01$	-16.4'	58.4'
11	344°42.12	24.84	78°22.79	13.1'	02°42.66 502°26.28	-16.4'	58.5'
12 13	359°41.99 14°41.85	N23°24.88 24.93	92°54.85 107°26.89	13.0' 13.0'	02°26.28	-16.4' -16.4'	58.5' 58.5'
14	29°41.71	24.97	107 20.09 121°58.92	13.0'	01°53.45	-16.5'	58.5'
15	44°41.58	• • 25.02	$136^{\circ}30.93$	13.0'	$01^{\circ}37.00$	-16.5'	58.6'
16	59°41.44	25.06	151°2.93	13.0'	01°20.52	-16.5'	58.6'
17 18	74°41.31 89°41.17	25.10 N23°25.14	165°34.90 180°6.86	13.0' 12.9'	01°4.03 \$00°47.52	-16.5' -16.5'	58.6' 58.6'
19	104°41.03	25.18	194°38.79	12.9'	00°30.99	-16.5'	58.6'
20	119°40.90	25.22	209°10.70	12.9'	S00°14.45	-16.6'	58.7'
21	134°40.76	• • 25.26	223°42.59	12.9'	N00°2.11	16.6'	58.7'
22 23	149°40.62 164°40.49	25.30 25.34	238°14.45 252°46.29	12.8' 12.8'	00°18.69 00°35.27	16.6' 16.6'	58.7' 58.7'
23			232 40.29			10.0	50.1
	SD = 15.7'	d = 0.1'		SI	D = 15.9'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°40.35	N23°25.37	$267^{\circ}18.09$	12.8'	N00°51.87	16.6'	58.8'
1	194°40.21	25.41	281°49.87	12.7'	01°8.48 01°25.09	16.6'	58.8'
2	209°40.08 224°39.94	25.45 •• 25.48	296°21.61 310°53.32	12.7' 12.7'	01°25.09 01°41.72	16.6' 16.6'	58.8' 58.8'
4	239°39.80	25.51	325°25.00	12.6'	01°58.34	16.6'	58.9'
5	254°39.67	25.55	339°56.64	12.6'	$02^{\circ}14.98$	16.6'	58.9'
6	269°39.53	N23°25.58	354°28.24	12.6'	N02°31.61	16.6'	58.9'
7 8	284°39.39 299°39.26	25.61 25.64	8°59.81 23°31.33	12.5' 12.5'	02°48.25 03°4.88	16.6' 16.6'	58.9' 59.0'
9	314°39.12	25.67	38°2.81	12.4	03°21.52	16.6'	59.0'
10	329°38.98	25.70	52°34.25	12.4'	03°38.15	16.6'	59.0'
11	344°38.85	25.73	67°5.65	12.3'	03°54.78	16.6'	59.0'
12 13	359°38.71 14°38.57	N23°25.76 25.79	81°37.00 96°8.30	12.3' 12.3'	N04°11.40 04°28.02	16.6' 16.6'	59.1' 59.1'
14	29°38.44	25.79	110°39.55	12.2'	04° 26.02	16.6'	59.1'
15	44°38.30	• • 25.84	125°10.76	12.2'	05°1.22	16.6'	59.1'
16	59°38.16	25.87	139°41.91	12.1'	05°17.81	16.6'	59.2'
17 18	74°38.02 89°37.89	25.89 N23°25.91	154°13.00 168°44.05	12.0' 12.0'	05°34.38 N05°50.94	16.6' 16.5'	59.2' 59.2'
19	104°37.75	25.94	183°15.03	11.9'	06°7.48	16.5	59.2'
20	119°37.61	25.96	197°45.96		$06^{\circ}24.01$		59.2'
21	134°37.48	• • 25.98	212°16.83	11.8'	06°40.51	16.5'	59.3'
22 23	149°37.34 164°37.20	26.00 26.02	226°47.64 241°18.39	11.7' 11.7'	06°56.99 07°13.46	16.5' 16.4'	59.3' 59.3'
23			241 10.39			10.4	<u> </u>
	SD = 15.7'	d = 0.0'		SI	D = 16.0'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°37.07	N23°26.04	255°49.08	11.6'	N07°29.90	16.4'	59.3'
1	194°36.93 209°36.79	26.06	270°19.70 284°50.25	11.6' 11.5'	07°46.31 08°2.69	16.4' 16.4'	59.4' 59.4'
2	209°36.79 224°36.66	26.08 •• 26.10	284°50.25 299°20.74	11.5'	08°2.69 08°19.05	16.4	59.4' 59.4'
4	239°36.52	26.11	313°51.15	11.3'	08°35.38	16.3'	59.4
5	254°36.38	26.13	328°21.50	11.3'	08°51.67	16.3'	59.4'
6 7	269°36.24 284°36.11	N23°26.15 26.16	342°51.78 357°21.98	11.2' 11.1'	N09°7.93 09°24.16	16.2' 16.2'	59.5' 59.5'
8	284 36.11 299°35.97	26.16	357°21.98 11°52.11	11.1'	09°24.16	16.2'	59.5'
9	314°35.83	26.19	26°22.16	11.0'	09°56.50	16.1	59.5
10	329°35.70	26.20	40°52.13	10.9'	10°12.61	16.1'	59.5'
11	344°35.56	26.21 N23°26.22	55°22.03	10.8'	10°28.68 N10°44.70	16.0'	59.6'
12 13	359°35.42 14°35.29	N23°26.22 26.23	69°51.84 84°21.58	10.7' 10.7'	11°0.68	16.0' 15.9'	59.6' 59.6'
14	29°35.15	26.24	98°51.23	10.6'	11°16.61	15.9'	59.6'
15	44°35.01	•• 26.25	113°20.79	10.5'	11°32.49	15.8'	59.6'
16	59°34.88	26.26	127°50.28	10.4'	11°48.32	15.8'	59.7'
17 18	74°34.74 89°34.60	26.27 N23°26.27	142°19.67 156°48.98	10.3' 10.2'	12°4.10 N12°19.83	15.7' 15.7'	59.7' 59.7'
19	104°34.46	26.28	171°18.20	10.2	12°35.49	15.6'	59.7'
20	119°34.33	26.28	$185^{\circ}47.33$	10.0'	$12^{\circ}51.10$	15.5'	59.7'
21	134°34.19	• • 26.29	200°16.37	9.9'	13°6.65	15.5'	59.8'
22 23	149°34.05 164°33.92	26.29 26.30	214°45.31 229°14.16	9.9' 9.8'	13°22.14 13°37.56	15.4' 15.4'	59.8' 59.8'
23	SD = 15.7'	d = 0.0'			D = 16.2'	13.4	39.0
	3D = 15.1°	u = 0.0		31	J = 10.2°		

	Twi	light			Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°							
N 70°							
68°							
66°							
64°	////	////	01:31	22:32	////	////	
62°	////	////	02:09	21:54	////	////	
60°	////	00:49	02:36	21:27	23:14	////	
N 58°	////	01:40	02:56	21:07	22:23	////	
56°	////	02:10	03:13	20:50	21:53	////	
54°	00:45	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	20:13	20:57	22:03	
45°	02:46	03:35	04:13	19:50	20:27	21:17	
<b>N</b> 40°	03:16	03:58	04:31	19:32	20:05	20:47	
35°	03:40	04:16	04:46	19:17	19:47	20:23	
30°	03:58	04:32	04:59	19:04	19:31	20:05	
20°	04:27	04:57	05:21	18:42	19:06	19:36	
N 10°	04:50	05:17	05:40	18:23	18:46	19:13	
0°	05:09	05:35	05:58	18:05	18:28	18:54	
<b>S</b> 10°	05:26	05:52	06:15	17:48	18:10	18:37	
20°	05:42	06:10	06:34	17:29	17:53	18:21	
30°	05:59	06:29	06:55	17:08	17:34	18:04	
35°	06:08	06:39	07:07	16:55	17:24	17:55	
40°	06:17	06:51	07:22	16:41	17:12	17:46	
45°	06:27	07:05	07:38	16:24	16:58	17:36	
<b>S</b> 50°	06:39	07:21	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	15:43	16:26	17:13	
56°	06:56	07:45	08:33	15:30	16:17	17:07	
58°	07:03	07:56	08:48	15:15	16:07	17:00	
<b>S</b> 60°	07:11	08:07	09:05	14:58	15:55	16:52	
				l	N4		

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Age			
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	59-37%		
18	01:06	01:12	12:01	05:36	18:00			
19	01:19	01:25	12:01	06:23	18:47			
20	01:32	01:38	12:02	07:11	19:36			

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	269°26.75	225°52.43 N13°49.80	114°59.05 N11°49.34	176°41.29 N23°16.13	267°10.57 \$01°24.26	
1	284° 29.21	240°52.28 50.56	130°0.18 48.80	191°43.14 16.12	282°12.95 24.23	Alpheratz 357°34.41 29°13.71
2	299°31.67	255°52.13 51.32	145°1.31 48.26	206°44.98 16.11	297°15.32 24.21	Ankaa 353°6.82 -42°9.80 Schedar 349°30.74 56°40.36
3	314°34.14	270°51.97 · · 52.07	160°2.44 · · 47.72	221°46.82 · · 16.11	312°17.70 · · 24.18	Diphda 348°46.99 -17°50.69
4	329°36.60	285°51.82 52.83	175°3.57 47.18	236°48.66 16.10	327°20.08 24.16	Achernar 335°20.15 -57°6.15
5	344°39.07	300°51.67 53.58	190°4.70 46.64	251°50.51 16.09	342°22.45 24.13	Hamal 327°50.98 23°34.87
6	359°41.53	315°51.52 N13°54.33	205°5.83 N11°46.09	266°52.35 N23°16.09	357°24.83 S01°24.10	Polaris 314°12.46 89°22.04
7 8	14° 43.99 29° 46.46	330°51.36 55.09 345°51.21 55.84	220°6.96 45.55 235°8.09 45.01	281°54.19 16.08 296°56.03 16.07	12°27.20 24.08 27°29.58 24.05	Acamar 315°11.79 -40°11.96
9	44° 48.92	0°51.05 · · 56.60	250°9.22 · · 44.47	311°57.88 · · 16.06	42°31.96 · · 24.03	Menkar 314°6.01 4°11.38
10	59°51.39	15°50.90 57.35	265°10.35 43.93	326°59.72 16.06	57°34.33 24.00	Mirfak 308°28.14 49°56.94
11	74°53.85	30°50.74 58.10	280°11.48 43.39	342°1.56 16.05	72°36.71 23.98	Aldebaran 290°39.53 16°33.61
12	89°56.31	45°50.58 N13°58.85	295°12.61 N11°42.85	357°3.40 N23°16.04	87°39.09 <b>S</b> 01°23.95	Rigel 281°3.85 -8°10.29 Capella 280°21.83 46°1.36
13	104°58.78	60°50.42 13°59.61	310°13.74 42.31	12°5.25 16.03	102°41.47 23.92	Bellatrix 278°22.82 6°22.38
14	120°1.24	75°50.26 14°0.36	325°14.87 41.76	27°7.09 16.03	117°43.84 23.90	Elnath 278°1.79 28°37.71
15	135°3.71	90°50.11 · · 1.11	340°16.00 · · 41.22	42°8.93 · · 16.02	132°46.22 · · 23.87	Alnilam 275°37.69 -1°11.11
16 17	150°6.17 165°8.64	105°49.95 1.86 120°49.79 2.61	355°17.13 40.68 10°18.26 40.14	57°10.77 16.01 72°12.62 16.00	147°48.60 23.85 162°50.98 23.82	Betelgeuse 270°52.03 7°24.72
18	180° 11.10	135°49.62 N14°3.37	25°19.39 N11°39.59	87°14.46 N23°16.00	177°53.36 S01°23.80	Canopus 263°52.79 -52°42.51
19	195° 13.56	150°49.46 4.12	40° 20.52 39.05	102°16.30 15.99	192°55.73 23.77	Sirius 258°26.27 -16°45.05
20	210°16.03	165°49.30 4.87	55°21.65 38.51	117°18.14 15.98	207°58.11 23.75	Adhara 255°5.96 -29°0.40
21	225° 18.49	180°49.14 · · 5.62	70°22.78 · · 37.97	132°19.99 · · 15.97	223°0.49 · · 23.72	Procyon 244°50.77 5°9.60 Pollux 243°17.21 27°57.94
22	240° 20.96	195°48.97 6.37	85°23.91 37.42	147°21.83 15.97	238°2.87 23.70	Avior 234°15.16 -59°35.58
23	255°23.42	210°48.81 7.12	100°25.04 36.88	162°23.67 15.96	253°5.25 23.67	Suhail 222°46.38 -43°32.26
Mer.	pass. 06:01	ν-0.2' d0.8' m-4.21	ν1.1' d-0.5' m1.44	ν1.8' d-0.0' m-1.90	ν2.4' d-0.0' m1.00	Miaplacidus 221°38.90 -69°49.49
						Alphard 217°47.61 -8°46.17
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.22 11°50.62
Sun 0	270°25.88	225°48.64 N14°7.87	115°26.17 N11°36.34	177°25.51 N23°15.95	268°7.63 S01°23.65	Dubhe 193°40.72 61°37.10
1	285°28.35	240°48.48 8.62	130°27.29 35.79	192°27.36 15.94	283°10.01 23.62	Denebola 182°24.60 14°25.85
2	300°30.81	255°48.31 9.37	145°28.42 35.25	207°29.20 15.93	298°12.39 23.60	Gienah 175°43.19 -17°41.12 Acrux 172°59.64 -63°14.73
3	315°33.28	270°48.15 · · 10.12	160°29.55 · · 34.71	222°31.04 · · 15.93	313°14.77 · · 23.57	Acrux 172°59.64 -63°14.73 Gacrux 171°51.18 -57°15.64
4	330°35.74	285°47.98 10.86	175° 30.68 34.16	237°32.88 15.92	328°17.15 23.55	Alioth 166°12.50 55°49.54
5	345°38.21	300°47.81 11.61	190°31.81 33.62	252°34.73 15.91	343°19.53 23.53	Spica 158°21.80 -11°17.73
6	0°40.67	315°47.64 N14°12.36	205°32.94 N11°33.07	267°36.57 N23°15.90	358°21.91 S01°23.50	Alkaid 152°51.47 49°11.36
7	15° 43.13	330°47.47 13.11	220°34.07 32.53	282°38.41 15.89	13°24.29 23.48	Hadar 148°35.15 -60°30.01
8 9	30° 45.60 45° 48.06	345°47.30 13.86	235°35.20 31.98	297°40.25 15.89 312°42.10 · · 15.88	28°26.67 23.45 43°29.05 · · 23.43	Menkent 147°56.98 -36°29.90
9 10	45°48.06 60°50.53	0°47.13 · · 14.60 15°46.96 15.35	250°36.32 · · 31.44 265°37.45 30.89	312°42.10 · · 15.88 327°43.94 15.87	43°29.05 · · 23.43 58°31.43 23.40	Arcturus 145°47.38 19°3.05
11	75° 52.99	30°46.79 16.10	280° 38.58 30.35	342°45.78 15.86	73°33.81 23.38	Rigil Kent. 139°39.38 -60°56.67
12	90°55.45	45°46.62 N14°16.85	295°39.71 N11°29.80	357°47.62 N23°15.85	88°36.19 S01°23.36	Kochab 137°18.95 74°3.22
13	105° 57.92	60°46.45 17.59	310°40.84 29.26	12°49.47 15.84	103°38.57 23.33	Zuben'ubi 136°55.38 -16°8.94 Alphecca 126°3.12 26°37.79
14	121°0.38	75°46.27 18.34	325°41.97 28.71	27°51.31 15.84	118°40.95 23.31	Antares 112° 15.04 -26° 29.37
15	136°2.85	90°46.10 · · 19.08	340°43.09 · · 28.17	42°53.15 · · 15.83	133°43.33 · · 23.28	Atria 107°8.38 -69°4.47
16	151°5.31	105°45.92 19.83	355°44.22 27.62	57°54.99 15.82	148°45.71 23.26	Sabik 102°2.02 -15°45.41
17	166°7.78	120°45.75 20.57	10°45.35 27.08	72°56.84 15.81	163°48.10 23.24	Shaula 96° 9.45 -37° 7.35
18 19	181° 10.24 196° 12.70	135°45.57 N14°21.32 150°45.40 22.06	25°46.48 N11°26.53 40°47.61 25.99	87°58.68 N23°15.80	178°50.48 S01°23.21 193°52.86 23.19	Rasalhague 95°57.86 12°32.47
20	196° 12.70 211° 15.17	150° 45.40 22.06 165° 45.22 22.81	40°47.61 25.99 55°48.73 25.44	103° 0.52 15.79 118° 2.36 15.78	193°52.86 23.19 208°55.24 23.17	Eltanin 90°41.47 51°29.07
21	226° 17.63	180°45.04 · · 23.55	70°49.86 · · 24.89	133° 4.21 · · 15.77	223°57.62 · · 23.14	Kaus Aust. 83°31.62 -34°22.32
22	241°20.10	195°44.86 24.30	85°50.99 24.35	148° 6.05 15.77	239°0.01 23.12	Vega 80°32.55 38°48.36
23	256° 22.56	210°44.68 25.04	100°52.12 23.80	163°7.89 15.76	254°2.39 23.10	Nunki 75°46.94 -26°15.86 Altair 61°59.29 8°56.10
Merr	pass. 05:57	ν-0.2' d0.7' m-4.20	$\nu 1.1' \ d$ -0.5' m1.44	ν1.8′ d-0.0′ m-1.89	ν2.4' d-0.0' m1.00	Peacock 53°4.64 -56°39.00
	Juss. US.S1	ν-0.2 uo.1 III-4.20	ν1.1 U-U.J III1.44	ν 1.0 U-0.0 III-1.09	νΔ.¬ u-0.0 III1.00	Deneb 49°25.19 45°22.09
						Enif 33°38.24 9°59.46
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.21 -46°50.03
0 1	271°25.03 286°27.49	225°44.50 N14°25.78 240°44.32 26.53	115°53.24 N11°23.25 130°54.37 22.71	178° 9.73 N23° 15.75 193° 11.58 15.74	269°4.77 S01°23.07 284°7.15 23.05	Fomalhaut 15°14.00 -29°29.07
2	301°29.95	240 44.32 20.53 255°44.14 27.27	130 54.37 22.71 145°55.50 22.16	208°13.42 15.73	284 7.15 23.05 299° 9.54 23.03	Scheat 13°44.76 28°13.11
3	316° 32.42	270°43.96 · · 28.01	160°56.63 · · 21.61	208 13.42 13.73 223°15.26 · · 15.72	314°11.92 · · 23.01	Markab 13°29.45 15°20.46
4	331°34.88	285°43.78 28.75	175°57.75 21.06	238°17.10 15.71	329°14.30 22.98	Jun 21 Sat SHA Mer.pass
5	346°37.35	300°43.60 29.49	190°58.88 20.52	253°18.94 15.70	344°16.69 22.96	Venus 316°25.68 08:57
6	1°39.81	315°43.41 N14°30.24	206°0.01 N11°19.97	268°20.79 N23°15.69	359°19.07 <b>S</b> 01°22.94	Mars 205°32.30 16:19
7	16° 42.27	330°43.23 30.98	221°1.14 19.42	283°22.63 15.68	14°21.46 22.91	Jupiter 267°14.55 12:12
8	31°44.74	345°43.04 31.72	236°2.26 18.87	298°24.47 15.67	29°23.84 22.89	Saturn 357°43.83 06:10
9	46°47.20	0°42.86 · · 32.46	251°3.39 · · 18.33	313°26.31 · · 15.67	44°26.22 · · 22.87	Jun 22 Sun SHA Mer.pass
10 11	61° 49.67 76° 52.13	15° 42.67 33.20 30° 42.49 33.94	266°4.52 17.78 281°5.64 17.23	328°28.16 15.66 343°30.00 15.65	59°28.61 22.85 74°30.99 22.82	Venus 315°22.76 08:57
12	91°54.60	45°42.30 N14°34.68	296°6.77 N11°16.68	358°31.84 N23°15.64	89°33.38 S01°22.80	Mars 205° 0.28 16:17
13	106° 57.06	60°42.11 35.42	311°7.90 16.13	13°33.68 15.63	104°35.76 22.78	Jupiter 266°59.63 12:09
14	121°59.52	75°41.92 36.16	326°9.02 15.58	28°35.53 15.62	119°38.15 22.76	Saturn 357°41.74 06:07
15	137°1.99	90°41.74 · · 36.90	341°10.15 · · 15.04	43°37.37 · · 15.61	134°40.53 · · 22.74	Jun 23 Mon SHA Mer.pass
16	152°4.45	105°41.55 37.63	356°11.28 14.49	58°39.21 15.60	149°42.92 22.71	Venus 314°19.48 08:57
17	167°6.92	120°41.36 38.37	11°12.40 13.94	73°41.05 15.59	164°45.30 22.69	Mars 204°28.22 16:15
18	182°9.38	135°41.16 N14°39.11	26°13.53 N11°13.39	88°42.89 N23°15.58	179°47.69 S01°22.67	Jupiter 266°44.71 12:06
19	197°11.85	150°40.97 39.85	41°14.66 12.84	103°44.74 15.57	194°50.07 22.65	Saturn 357°39.75 06:03
20 21	212° 14.31 227° 16.77	165°40.78 40.59 180°40.59 • 41.32	56°15.78 12.29 71°16.91 · · 11.74	118°46.58 15.56 133°48.42 •• 15.55	209°52.46 22.63 224°54.85 •• 22.60	Horizontal parallax
22	242° 19.24	195°40.40 42.06	86° 18.03 11.19	148°50.26 15.54	239°57.23 22.58	Venus: 0.2
23	257°21.70	210° 40.20 42.80	101°19.16 10.64	163°52.10 15.53	254°59.62 22.56	Mars: 0.1
		ν-0.2' d0.7' m-4.20	ν1.1' d-0.5' m1.45	ν1.8' d-0.0' m-1.89	ν2.4' d-0.0' m0.99	
ivier.	pass. 05:53	ν-υ.∠ αυ.ι m-4.20	ν1.1 α-0.5 m1.45	ν1.ο α-υ.υ m-1.89	ν2.4 α-υ.υ mυ.99	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.78	N23°26.30	243°42.92	9.7'	$N13^{\circ}52.92$	15.3'	59.8'
1	194°33.64	26.30	258°11.58	9.6'	14°8.21	15.2'	59.8'
2	209°33.51	26.30	272°40.14	9.5'	14°23.43	15.1' 15.1'	59.8'
3 4	224°33.37 239°33.23	· · 26.30 26.30	287°8.60 301°36.97	9.4' 9.3'	14°38.58 14°53.66	15.1 15.0'	59.9' 59.9'
5	254°33.09	26.30	316° 5.23	9.3 9.2'	14 55.00 15°8.66	14.9'	59.9'
6	269°32.96	N23°26.30	330°33.39	9.1'	N15°23.58	14.8'	59.9'
7	284°32.82	26.29	$345^{\circ}1.45$	9.0'	15°38.43	14.8'	59.9'
8	299°32.68	26.29	359°29.41	8.9'	15°53.19	14.7'	59.9'
9	314°32.55 329°32.41	· · 26.29 26.28	13°57.26 28°25.01	8.7' 8.6'	16°7.87 16°22.46	14.6' 14.5'	60.0' 60.0'
10 11	329 32.41 344°32.27	26.28 26.28	42°52.65	8.5'	16°22.46	14.5 14.4'	60.0
12	359°32.14	N23°26.27	57°20.19	8.4'	N16°51.39	14.3'	60.0'
13	14°32.00	26.26	71°47.62	8.3'	17°5.72	14.2'	60.0'
14	29°31.86	26.25	86°14.93	8.2'	17°19.95	14.1'	60.0'
15	44°31.73 59°31.59	· · 26.25 26.24	100°42.14 115°9.24	8.1' 8.0'	17°34.09 17°48.13	14.0' 13.9'	60.0'
16 17	59 31.59 74°31.45	26.24	115 9.24 129°36.23	8.0 7.9'	17 48.13 18°2.07	13.8'	60.1' 60.1'
18	89°31.32	N23°26.22	144°3.11	7.8'	N18° 15.91	13.7'	60.1
19	104°31.18	26.21	158°29.87	7.7'	18°29.65	13.6'	60.1'
20	119°31.04	26.19	172°56.53	7.5'	18°43.28	13.5'	60.1'
21	134°30.90	• • 26.18	187°23.07	7.4'	18°56.80	13.4'	60.1'
22 23	149°30.77 164°30.63	26.17 26.15	201°49.50 216°15.81	7.3' 7.2'	19°10.22 19°23.52	13.3' 13.2'	60.1' 60.1'
23			210 15.81			13.2	00.1
	SD = 15.7'	d = 0.0'		SI	D = 16.3'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°30.49	N23°26.14	230°42.01	7.1'	N19°36.71	13.1'	60.1'
1	194°30.36	26.12	245°8.10	7.0'	19°49.78	13.0'	60.2'
2	209°30.22 224°30.08	26.11 •• 26.09	259°34.07 273°59.92	6.9' 6.7'	20°2.73 20°15.57	12.8' 12.7'	60.2' 60.2'
4	239° 29.95	26.07	288°25.67	6.6'	20°13.37 20°28.28	12.6'	60.2
5	254°29.81	26.05	302°51.29	6.5'	20°40.86	12.5'	60.2
6	269°29.67	N23°26.03	$317^{\circ}16.80$	6.4'	N20°53.32	12.3'	60.2'
7	284° 29.54	26.01	331°42.20	6.3'	21°5.65	12.2'	60.2'
8	299°29.40 314°29.26	25.99	346°7.48 0°32.65	6.2' 6.1'	21°17.86 21°29.92	12.1'	60.2'
9 10	314°29.26 329°29.13	· · 25.97 25.95	0°32.65 14°57.70	5.9'	21°29.92 21°41.86	11.9' 11.8'	60.2' 60.2'
11	344° 28.99	25.93	29°22.64	5.8'	21°53.65	11.7'	60.2
12	359° 28.85	N23°25.90	43°47.46	5.7'	N22°5.31	11.5'	60.2'
13	14°28.72	25.88	58°12.17	5.6'	22°16.82	11.4'	60.3'
14	29°28.58	25.85	72°36.76	5.5'	22°28.20	11.2'	60.3
15 16	44°28.45 59°28.31	· · 25.83 25.80	87°1.25 101°25.62	5.4' 5.3'	22°39.42 22°50.50	11.1' 10.9'	60.3' 60.3'
17	74°28.17	25.77	101 25.02 115°49.88	5.1'	22 30.30 23°1.44	10.9	60.3
18	89° 28.04	N23°25.75	130°14.02	5.0'	N23°12.22	10.6'	60.3
19	104°27.90	25.72	144°38.06	4.9'	23°22.84	10.5'	60.3'
20	119°27.76	25.69	159° 1.99	4.8'	23°33.31	10.3'	60.3'
21 22	134°27.63 149°27.49	· · 25.66 25.63	173°25.81 187°49.52	4.7' 4.6'	23°43.63 23°53.78	10.2' 10.0'	60.3' 60.3'
23	164° 27.35	25.60	202°13.12	4.5'	23°33.78	9.8'	60.3
23	SD = 15.7'	d = -0.0'			D = 16.4'	3.0	00.5
	<u>JD = 13.7</u>	<u>u = -0.0</u>			J = 10.4		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°27.22 194°27.08	N23°25.56 25.53	216°36.62 231°0.01	4.4' 4.3'	N24°13.61 24°23.27	9.7' 9.5'	60.3' 60.3'
2	209° 26.95	25.53 25.50	245°23.30	4.3 4.2'	24 23.27 24°32.77	9.5 9.3'	60.3
3	224°26.81	• • 25.46	259°46.49	4.1'	24°42.10	9.2	60.3
4	239° 26.67	25.43	274°9.58	4.0'	24°51.26	9.0'	60.3'
5	254°26.54	25.39	288°32.56	3.9'	25°0.25	8.8'	60.3'
6 7	269°26.40 284°26.27	N23°25.36 25.32	302°55.45 317°18.25	3.8' 3.7'	N25°9.07 25°17.71	8.6' 8.5'	60.3' 60.3'
8	299° 26.13	25.32	311 10.25 331°40.95	3.6'	25 17.71 25°26.17	8.3'	60.3
9	314° 25.99	• • 25.24	346° 3.55	3.5'	25°34.45	8.1'	60.3'
10	329°25.86	25.20	0°26.07	3.4'	25°42.55	7.9'	60.3'
11	344°25.72	25.16 N23°25.12	14°48.50	3.3'	25°50.47	7.7'	60.3'
12 13	359°25.59 14°25.45	N23°25.12 25.08	29°10.84 43°33.09	3.3' 3.2'	N25°58.20 26°5.75	7.5' 7.4'	60.3' 60.3'
14	29° 25.31	25.04	43 33.09 57°55.26	3.1'	26°13.12	7.4 7.2'	60.3
15	44° 25.18	• • 25.00	72°17.35	3.0'	26°20.29	7.0'	60.3'
16	59°25.04	24.95	86°39.36	2.9'	26°27.28	6.8'	60.3'
17	74°24.91	24.91	101°1.29	2.9'	26°34.07	6.6'	60.3'
18 19	89°24.77 104°24.64	N23°24.86 24.82	115°23.15 129°44.94	2.8' 2.7'	N26°40.67 26°47.08	6.4' 6.2'	60.3' 60.3'
20	104°24.64 119°24.50	24.82 24.77	129°44.94 144°6.66	2.7'	26°47.08 26°53.29	6.2	60.3
21	134°24.36	• • 24.72	158°28.31	2.6'	26°59.30	5.8'	60.2
22	149°24.23	24.68	172°49.89	2.5'	27°5.12	5.6'	60.2'
23	164°24.09	24.63	187°11.42	2.5'	27°10.74	5.4'	60.2'
	SD = 15.7'	d = -0.0'		SI	D = 16.4'		

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

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

		Sun		Moon				
Day	Eqn.of	f Time	Mer.	Mer.	Mer.Pass.			
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	26-9%		
21	01:45	01:51	12:02	08:02	20:29			
22	01:58	02:05	12:02	08:58	21:27			
23	02:11	02:18	12:02	09:58	22:30			

1.		\/a=	,,,,,,,,,	, ,		i	-:+	<b>C</b> .			C+	
h _	Aries	Venus			ars		piter		urn		Stars	
Tue	GHA		Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	272°24.17 287°26.63	225°40.01 N14 240°39.81	4°43.53	116°20.29	N11°10.09	178°53.95	N23°15.52	270°2.00	S01°22.54	Alpheratz	357°34.38	29°13.73
1 2	302°29.10	255° 39.62	44.27 45.00	131°21.41 146°22.54	9.54 8.99	193°55.79 208°57.63	15.51 15.50	285°4.39 300°6.78	22.52 22.50	Ankaa	353°6.79	-42°9.79
3	317°31.56		45.74	161°23.66	• • 8.44	223°59.47	• • 15.49	315°9.16	• • 22.48	Schedar	349°30.69	56°40.37
4	332° 34.02	285°39.22	46.47	176°24.79	7.89	239°1.31	15.48	330°11.55	22.45	Diphda	348°46.96	-17°50.68
5	347°36.49	300°39.03	47.21	191°25.92	7.34	254° 3.15	15.46	345°13.94	22.43	Achernar	335°20.11	-57°6.14 23°34.88
6	2°38.95		4°47.94	206°27.04	N11°6.79	269° 5.00	N23°15.45	0°16.33	S01°22.41	Hamal Polaris	327°50.95 314°10.89	23 34.88 89°22.03
7	17°41.42	330°38.63	48.68	221°28.17	6.23	284°6.84	15.44	15°18.71	22.39	Acamar	315°11.77	-40°11.94
8	32°43.88	345°38.43	49.41	236°29.29	5.68	299°8.68	15.43	30°21.10	22.37	Menkar	314°5.98	4°11.39
9	47° 46.34 62° 48.81	0°38.23 · · · · · · · · · · · · · · · · · · ·	50.14	251°30.42 266°31.54	• • 5.13	314°10.52 329°12.36	15.42	45°23.49 60°25.88	· · 22.35 22.33	Mirfak	$308^{\circ}28.10$	49°56.93
10 11	77°51.27	30° 37.83	50.88 51.61	200 31.54 281°32.67	4.58 4.03	329 12.30 344°14.20	15.40 15.39	75°28.27	22.33	Aldebaran	290°39.51	16°33.61
12	92°53.74		4°52.34	296°33.79	N11°3.48	359°16.05	N23°15.37	90°30.65	S01°22.29	Rigel	281°3.83	-8°10.28
13	107°56.20	60°37.42	53.07	311°34.92	2.93	14°17.89	15.35	105°33.04	22.27	Capella	280°21.80	46°1.35 6°22.38
14	122°58.67	75°37.22	53.80	326°36.04	2.37	29°19.74	15.34	120°35.43	22.25	Bellatrix Elnath	278°22.81 278°1.77	0 22.38 28°37.71
15	138°1.13		• 54.54	341°37.17	• • 1.82	44°21.60	•• 15.32	135°37.82	• • 22.22	Alnilam	275°37.68	-1°11.11
16	153°3.59	105°36.81	55.27	356°38.29	1.27	59°23.45	15.31	150°40.21	22.20	Betelgeuse	270°52.02	7°24.73
17 18	168°6.06 183°8.52	120°36.61 135°36.40 N14	56.00 4°56.73	11°39.42 26°40.54	0.72 N11°0.16	74°25.30 89°27.15	15.31 N23°15.30	165°42.60 180°44.99	22.18 \$01°22.16	Canopus	263°52.79	-52°42.50
19	103 0.52 198° 10.99	150°36.20	57.46	41°41.67	10°59.61	104°28.99	15.30	100 44.99 195°47.38	22.14	Sirius	258°26.26	-16°45.04
20	213° 13.45	165° 35.99	58.19	56° 42.79	59.06	119°30.84	15.29	210°49.77	22.12	Adhara	255°5.95	-29°0.39
21	228° 15.92		58.92	71°43.92	• • 58.51	134°32.68	· · 15.29	225°52.16	22.10	Procyon	244°50.76	5°9.60
22	243°18.38	195°35.58 14	4°59.65	86°45.04	57.95	149°34.52	15.28	240°54.55	22.08	Pollux Avior	243°17.20 234°15.17	27°57.94 -59°35.57
23	258° 20.84	210°35.37	15°0.38	101°46.17	57.40	164°36.36	15.27	255°56.94	22.06	Suhail	234 15.17 222°46.38	-43°32.26
Mer.r	pass. 05:49	ν-0.2' d0.7' n	n-4.19	$\nu 1.1' d-0$	0.6′ m1.45	$\nu 1.8' \ d-0$	0.0′ m-1.89	$\nu^{2.4'} d-0$	0.0′ m0.99	Miaplacidus	221°38.93	-69°49.48
										Alphard	217°47.61	-8°46.17
Wed	GHA	GHA	Dec	GHA	Dee	GHA	Dec	GHA	Dec	Regulus	207°34.22	11°50.62
0	273°23.31		15° 1.10	116° 47.29	<b>Dec</b> N10° 56.85	179°38.20	N23°15.26	270°59.33	501°22.04	Dubhe	193°40.74	61°37.09
1	288° 25.77	240°34.95	1.83	131° 48.41	56.29	194°40.04	15.25	286°1.72	22.02	Denebola	182°24.60	14°25.85
2	303°28.24	255°34.74	2.56	146°49.54	55.74	209°41.89	15.24	301°4.11	22.00	Gienah	175°43.20 172°59.65	-17°41.12 -63°14.73
3	318°30.70		• 3.29	161°50.66	• • 55.19	224°43.73	• • 15.23	316°6.50	• • 21.98		172 59.05 171°51.19	-03 14.73 -57°15.65
4	333°33.17	285°34.32	4.01	$176^{\circ}51.79$	54.63	239°45.57	15.22	331°8.89	21.97	Alioth	166° 12.52	55°49.54
5	348° 35.63	300°34.10	4.74	191°52.91	54.08	254°47.41	15.21	346°11.28	21.95	Spica	158°21.80	-11°17.73
6	3°38.09		15°5.47	206°54.03	N10°53.52	269°49.25	N23°15.20	1°13.67	S01°21.93	Alkaid	152°51.49	49°11.37
7 8	18° 40.56 33° 43.02	330° 33.68 345° 33.46	6.19 6.92	221°55.16 236°56.28	52.97 52.41	284°51.09 299°52.94	15.19 15.18	16°16.06 31°18.45	21.91 21.89	Hadar	148°35.16	-60°30.01
9	48° 45.49		· 7.64	251° 57.41	. 51.86	314°54.78	15.17	46°20.84	21.87		147°56.98	-36°29.90
10	63°47.95	15°33.03	8.37	266°58.53	51.31	329°56.62	15.16	61°23.24	21.85	Arcturus	145°47.38	19°3.06
11	78°50.42	30° 32.82	9.09	281°59.65	50.75	344°58.46	15.15	76°25.63	21.83	Rigil Kent. Kochab	139°39.39 137°19.00	-60°56.68 74°3.22
12	93°52.88	45°32.60 N	15°9.82	297°0.78	N10°50.20	0°0.30	N23°15.14	91°28.02	S01°21.81	Zuben'ubi	136°55.37	-16°8.94
13	108°55.34	60°32.38	10.54	312°1.90	49.64	15°2.15	15.13	106°30.41	21.79	Alphecca	126°3.13	26°37.80
14	123°57.81	75°32.17	11.27	327°3.02	49.09	30°3.99	15.12	121°32.81	21.77	Antares	112° 15.03	-26°29.37
15	139°0.27 154°2.74	90°31.95 · · · · · · · · · · · · · · · · · · ·	11.99	342°4.15 357°5.27	· · 48.53	45° 5.83 60° 7.67	15.10	136°35.20 151°37.59	• • 21.75	Atria	107°8.36	-69°4.48
16 17	169°5.20	105 31.73 120°31.51	12.71 13.44	12°6.39	47.97 47.42	75° 9.52	15.09 15.08	166°39.98	21.74 21.72	Sabik	102°2.01	-15°45.41
18	184°7.67		5°14.16	27°7.52	N10°46.86	90°11.36	N23°15.07	181°42.38	S01°21.70	Shaula	96°9.43	-37°7.35
19	199° 10.13	150°31.07	14.88	42°8.64	46.31	105°13.20	15.06	196°44.77	21.68	Rasalhague	95°57.85	12°32.48 51°29.09
20	$214^{\circ}12.59$	165°30.85	15.60	57°9.76	45.75	120°15.04	15.05	211°47.16	21.66	Eltanin Kaus Aust.	90°41.46 83°31.60	-34°22.32
21	$229^{\circ}15.06$		16.32	$72^{\circ}10.89$	• • 45.19	135°16.89	•• 15.03	226°49.56	• • 21.64	Vega	80°32.53	38°48.38
22	244° 17.52	195°30.40	17.04	87°12.01	44.64	150°18.73	15.02	241°51.95	21.62	Nunki		-26°15.86
23	259°19.99	210°30.18	17.76	102°13.13	44.08	165°20.57	15.01	256°54.34	21.61	Altair	61°59.27	8°56.11
Mer.p	pass. 05:45	u-0.2 $'$ $d$ 0.7 $'$ n	n-4.18	$\nu 1.1' \ d$ -0	0.6′ m1.46	$\nu$ 1.8 $^{\prime}$ d-0	0.0′ m-1.89	$\nu$ 2.4′ d-0	0.0′ m0.99	Peacock	53°4.61	-56°39.00
										Deneb	49°25.17	45°22.11
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°38.22	9°59.47
0	274° 22.45	225°29.96 N15		117° 14.26			N23°15.00		S01°21.59	Al Na'ir Fomalhaut	27°32.17 15°13.97	-46°50.02 -29°29.06
1	$289^{\circ}24.91$	240°29.73	19.20	$132^{\circ}15.38$	42.97	195°24.26	14.99	286°59.13	21.57	Scheat	13°44.73	28°13.13
2	304°27.38	255°29.51	19.92	147° 16.50	42.41	210°26.10	14.98	302°1.53	21.55	Markab	13°29.42	15°20.47
3	319° 29.84		20.64	162°17.62	• • 41.85	225°27.94	• • 14.96	317°3.92	• • 21.53	1 04 T	CIIA	
4 5	334° 32.31 349° 34.77	285°29.06 300°28.83	21.36 22.08	177° 18.75 192° 19.87	41.30 40.74	240°29.78 255°31.63	14.95	332°6.31 347°8.71	21.52	Jun 24 Tue	<b>SHA</b> 313° 15.84	Mer.pass 08:57
6	4° 37.24		5°22.80	207° 20.99	N10°40.18	270°33.47	14.94 N23°14.93	2°11.10	21.50 S01°21.48		203°56.12	16:13
7	19°39.70	330°28.37	23.52	222°22.11	39.63	285°35.31	14.92	17°13.50	21.46		266°29.78	12:03
8	34°42.16	345°28.15	24.23	237°23.24	39.07	300°37.16	14.90	32°15.89	21.44	Saturn	357°37.84	05:59
9	49°44.63	0°27.92 · ·	24.95	252°24.36	• • 38.51	315°39.00	• • 14.89	47°18.29	• • 21.43	Jun 25 Wed	SHA	Mannaa
10	64° 47.09	15°27.69	25.67	267°25.48	37.95	330°40.84	14.88	62°20.69	21.41		312°11.85	Mer.pass 08:58
11	79°49.56	30°27.46	26.38	282°26.60	37.39	345°42.68	14.87	77°23.08	21.39	1	203°23.98	16:12
12 13	94° 52.02 109° 54.49	45°27.23 N15 60°26.99	5°27.10 27.81	297°27.72 312°28.85	N10°36.84 36.28	0°44.53 15°46.37	N23°14.85 14.84	92°25.48	S01°21.38		266° 14.89	12:00
13 14	109 54.49 124° 56.95	75°26.76	28.53	312°28.85 327°29.97	36.28 35.72	30°48.21	14.84	107°27.87 122°30.27	21.36 21.34	Saturn	357°36.02	05:55
15	139° 59.41		29.24	342°31.09	35.16	45°50.05	. 14.82	137°32.66	21.32	Jun 26 Thu	SHA	Mer.pass
16	155°1.88	105°26.30	29.96	357° 32.21	34.60	60°51.90	14.81	152°35.06	21.32	Venus	311°7.51	08:58
17	170°4.34	120°26.06	30.67	12°33.33	34.04	75°53.74	14.79	167°37.46	21.29		202°51.80	16:10
18	185°6.81		5°31.39	27°34.46	N10°33.48	90°55.58	N23°14.78	182°39.85	S01°21.27		265°59.96	11:57
19	200°9.27	150°25.59	32.10	42°35.58	32.93	105°57.43	14.77	197°42.25	21.26	Saturn	357°34.29	05:51
20	215°11.74	165°25.36	32.81	57°36.70	32.37	120°59.27	14.75	212°44.65	21.24	Horizo	ntal parallax	
21 22	230° 14.20 245° 16.66	180°25.12 · · 195°24.88	· 33.53 34.24	72°37.82 87°38.94	· · 31.81 31.25	136° 1.11 151° 2.96	· · 14.74 14.73	227°47.05 242°49.44	· · 21.22 21.21	1101120	Venus:	0.2
23	260° 19.13	210° 24.65	34.24	102° 40.06	30.69	166° 4.80	14.73	242 49.44 257°51.84	21.21		Mars:	0.1
ivier.p	pass. 05:42	ν-0.2′ d0.7′ n	11-4.1/	$\nu$ 1.1' $d$ -0	0.6′ m1.47	ν1.8' <b>d</b> -0	0.0′ m-1.89	ν2.4' d-0	0.0′ m0.98			

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.96	N23°24.58	201°32.88	2.4'	N27°16.15	5.2'	60.2'
1	194°23.82	24.53	215°54.29	2.4'	27°21.37	5.0'	60.2'
2	209°23.69	24.48	230°15.65 244°36.95	2.3'	27°26.39	4.8'	60.2'
3 4	224°23.55 239°23.42	· · 24.42 24.37	244 30.95 258°58.21	2.3' 2.2'	27°31.20 27°35.81	4.6' 4.4'	60.2' 60.2'
5	254°23.28	24.32	273° 19.42	2.2'	27° 40.21	4.2'	60.2
6	269°23.15	N23°24.27	287°40.59	2.1'	N27°44.41	4.0'	60.2'
7	284°23.01	24.21	302°1.72	2.1'	27°48.40	3.8'	60.2'
8	299°22.88	24.16	316°22.82	2.1'	27°52.19	3.6'	60.1'
9 10	314°22.74 329°22.61	· · 24.10 24.04	330°43.88 345°4.91	2.0' 2.0'	27°55.76 27°59.13	3.4' 3.2'	60.1' 60.1'
11	344°22.47	23.99	359°25.92	2.0'	28°2.29	3.0'	60.1
12	359°22.34	N23°23.93	13°46.90	2.0'	N28°5.24	2.7'	60.1'
13	14°22.20	23.87	28°7.86	1.9'	28°7.99	2.5'	60.1'
14	29°22.07	23.81	42°28.81	1.9'	28° 10.52	2.3'	60.1
15 16	44°21.93 59°21.80	· · 23.75 23.69	56°49.74 71°10.66	1.9' 1.9'	28° 12.84 28° 14.95	2.1' 1.9'	60.1' 60.0'
17	74°21.66	23.63	85°31.57	1.9'	28° 16.85	1.7'	60.0'
18	89°21.53	N23°23.57	99°52.48	1.9'	N28° 18.54	1.5'	60.0'
19	104°21.39	23.50	114° 13.40	1.9'	28°20.02	1.3'	60.0'
20	119°21.26	23.44	128°34.31	1.9'	28° 21.29	1.1'	60.0'
21 22	134°21.12 149°20.99	· · 23.37 23.31	142°55.23 157°16.16	1.9' 1.9'	28° 22.35 28° 23.19	0.8' 0.6'	60.0' 59.9'
23	164° 20.86	23.24	171°37.10	2.0'	28° 23.83	0.4	59.9'
	SD = 15.7'	d = -0.1'			D = 16.4'		
	JD = 13.1	u = -0.1		31	J — 10.4°		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°20.72	N23°23.18	185°58.06	2.0'	N28° 24.25	0.2'	59.9'
1 2	194°20.59 209°20.45	23.11 23.04	200°19.04 214°40.04	2.0' 2.0'	28°24.47 28°24.47	0.0' -0.2'	59.9' 59.9'
3	209 20.43 224°20.32	22.97	229°1.07	2.1'	28° 24.47	-0.2 -0.4'	59.9'
4	239°20.18	22.90	243°22.13	2.1'	28° 23.85	-0.6	59.8'
5	254°20.05	22.83	257°43.22	2.1'	28°23.23	-0.8'	59.8'
6	269°19.92	N23°22.76	272°4.35	2.2'	N28° 22.40	-1.0'	59.8'
7 8	284°19.78 299°19.65	22.69 22.62	286°25.52 300°46.73	2.2' 2.3'	28°21.36 28°20.12	-1.2' -1.5'	59.8' 59.8'
9	314° 19.51	•• 22.55	315°7.98	2.3'	28° 18.67	-1.7'	59.7'
10	329°19.38	22.47	329°29.29	2.4'	28° 17.01	-1.9'	59.7'
11	344°19.25	22.40	343°50.64	2.4'	$28^{\circ}15.15$	-2.1'	59.7'
12	359°19.11	N23°22.32	358°12.06	2.5'	N28° 13.09	-2.3'	59.7'
13 14	14°18.98 29°18.85	22.25 22.17	12°33.53 26°55.06	2.5' 2.6'	28° 10.82 28° 8.35	-2.5' -2.7'	59.7' 59.6'
15	44°18.71	22.09	41°16.65	2.7'	28°5.69	-2.1 -2.9'	59.6'
16	59°18.58	22.01	55°38.32	2.7'	28°2.82	-3.1'	59.6'
17	74°18.45	21.94	70°0.05	2.8'	27°59.75	-3.3'	59.6'
18	89°18.31	N23°21.86	84°21.85	2.9'	N27°56.48	-3.5'	59.5'
19 20	104°18.18 119°18.05	21.78 21.70	98°43.74 113°5.70	3.0' 3.0'	27°53.02 27°49.36	-3.7' -3.9'	59.5' 59.5'
21	134°17.91	21.61	113 3.70 127°27.74	3.1'	27°45.51	-3.9 -4.0'	59.5'
22	149°17.78	21.53	141°49.86	3.2'	27°41.47	-4.2'	59.4'
23	164°17.65	21.45	156°12.07	3.3'	27°37.24	-4.4'	59.4'
	SD = 15.7'	d = -0.1'		SI	O = 16.3'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.51	N23°21.37	170°34.37	υ 3.4'	N27°32.81	-4.6'	59.4'
1	194°17.38	21.28	184°56.76	3.5'	27°28.20	-4.8'	59.4'
2	209°17.25	21.20	199°19.24	3.6'	27°23.40	-5.0'	59.3'
3 4	224°17.12 239°16.98	· · 21.11 21.02	213°41.82 228°4.50	3.7' 3.8'	27° 18.41 27° 13.25	-5.2' -5.4'	59.3' 59.3'
4 5	254°16.85	20.94	242°27.27	3.8 3.9'	27 13.25 27°7.89	-5.4 -5.5'	59.3 59.2'
6	269° 16.72	N23°20.85	256°50.15	4.0'	N27°2.36	-5.7'	59.2'
7	284°16.59	20.76	271°13.14	4.1'	26°56.65	-5.9'	59.2'
8	299°16.45	20.67	285°36.23	4.2'	26° 50.76	-6.1'	59.2'
9 10	314°16.32 329°16.19	· · 20.58 20.49	299°59.42 314°22.73	4.3' 4.4'	26°44.70 26°38.46	-6.2' -6.4'	59.1' 59.1'
11	329 16.19 344°16.06	20.49	314 22.73 328°46.15	4.4 4.5'	26°32.05	-6.4 -6.6'	59.1'
12	359°15.92	N23°20.30	343°9.68	4.6'	N26° 25.47	-6.7	59.1'
13	14°15.79	20.21	357°33.33	4.8'	26° 18.72	-6.9'	59.0'
14	29°15.66	20.12	11°57.09	4.9'	26°11.80	-7.1'	59.0'
15 16	44°15.53 59°15.40	· · 20.02 19.93	26°20.97 40°44.97	5.0' 5.1'	26°4.72 25°57.48	-7.2' -7.4'	59.0' 58.9'
17	74°15.27	19.93	40 44.97 55°9.10	5.1 5.2'	25°50.07	-7.4 -7.6'	58.9'
18	89°15.13	N23°19.74	69°33.34	5.4'	N25°42.51	-7.7'	58.9'
19	104°15.00	19.64	83°57.71	5.5'	25°34.78	-7.9'	58.8'
20	119°14.87	19.54	98°22.20	5.6'	25°26.90	-8.0'	58.8'
21 22	134°14.74 149°14.61	· · 19.44 19.34	112°46.81 127°11.56	5.7' 5.9'	25°18.87 25°10.68	-8.2' -8.3'	58.8' 58.7'
23	149 14.01 164°14.48	19.34	141°36.43	6.0'	25°2.35	-o.s -8.5'	58.7'
	SD = 15.7'	d = -0.1'			D = 16.2'		
	JD — 13.1			J1	10.2		

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

Lat.		Moonris	e		Moonset	
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°						
62° 60°	00:24	01.05	01:39	22.05	23:46	23:37
1		01:05	02:33	22:05	22:52	23:08
N 58° 56°	00:55 01:19	01:44 02:11	03:05 03:29	21:26 20:59	22:19 21:55	22:45 22:27
54°	01:19	02:11	03:29	20:59	21:55	22:27
52°	01:56	02:52	04:05	20:36	21:35	21:58
50°	02:08	02:30	04:03	20:20	21:04	21:46
45°	02:36	03:36	04:47	19:34	20:35	21:21
<b>N</b> 40°	02:59	04:00	05:10	19:10	20:12	21:02
35°	03:18	04:19	05:28	18:50	19:53	20:45
30°	03:34	04:36	05:44	18:34	19:37	20:31
20°	04:01	05:05	06:11	18:05	19:09	20:06
N 10°	04:25	05:29	06:34	17:41	18:45	19:45
0°	04:47	05:52	06:56	17:18	18:23	19:24
<b>S</b> 10°	05:09	06:15	07:17	16:55	18:00	19:04
20° 30°	05:33	06:40	07:40	16:31	17:36	18:43
30°	06:01 06:18	07:08 07:25	08:07 08:22	16:02 15:45	17:08 16:51	18:17 18:02
40°	06:18	07:25 07:45	08:22	15:45	16:32	18:02 17:45
45°	07:00	08:09	09:02	15:02	16:08	17:24
<b>S</b> 50°	07:31	08:40	09:30	14:31	15:37	16:57
52°	07:31	08:40	09:30	14:31	15:37	16:44
54°	08:03	09:13	09.43	13:58	15:22	16:29
56°	08:24	09:35	10:17	13:37	14:43	16:11
58°	08:51	10:03	10:39	13:10	14:15	15:50
<b>S</b> 60°	09:29	10:42	11:07	12:31	13:36	15:22

h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
Fri .	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
0	275°21.59	225°24.41 N15°35		181°6.64 N23°14.70	272°54.24 <b>S</b> 01°21.17			
1	290°24.06	240°24.17 36		196° 8.48 14.69	287°56.64 21.16	Alpheratz	357°34.35	29°13.74
2	$305^{\circ}26.52$	255°23.93 37	.08 147° 43.43 29.01	211°10.33 14.68	302°59.03 21.14	Ankaa Schedar	353°6.75 349°30.65	-42° 9.78 56° 40.38
3	$320^{\circ}28.98$	270°23.69 · · 37	.79 162°44.55 · · 28.45	226°12.17 · · 14.67	318°1.43 · · 21.12	Diphda	348° 46.93	-17°50.66
4	335°31.45		.50 177° 45.67 27.89	241°14.01 14.65	333°3.83 21.11	Achernar	335°20.07	-57°6.13
5	350°33.91		21 192°46.79 27.33	256°15.86 14.64	348°6.23 21.09	Hamal	327°50.92	23°34.89
6 7	5°36.38 20°38.84	315°22.97 N15°39 330°22.72 40	92 207°47.91 N10°26.77 63 222°49.03 26.21	271°17.70 N23°14.63 286°19.54 14.61	3°8.63 S01°21.07 18°11.03 21.06	Polaris	$314^{\circ}9.51$	89°22.03
8	35°41.31		.34 237°50.15 25.64	301°21.39 14.60	33°13.43 21.04	Acamar	315° 11.74	-40°11.92
9	50°43.77	0°22.24 · · 42		316°23.23 · · 14.59	48°15.82 · · 21.03	Menkar	314°5.95	4°11.40
10	65°46.23		.75 267°52.39 24.52	331°25.07 14.57	63°18.22 21.01	Mirfak	308°28.07	49°56.93 16°33.62
11	80°48.70	30°21.75 43	.46 282°53.52 23.96	346°26.91 14.56	78°20.62 21.00	Aldebaran Rigel	290°39.48 281°3.82	-8°10.27
12	95°51.16	45°21.50 N15°44		1°28.76 N23°14.55	93°23.02 <b>S</b> 01°20.98	Capella	280°21.78	46°1.35
13	110°53.63	60°21.26 44		16°30.60 14.53	108°25.42 20.96	Bellatrix	278°22.79	6°22.39
14 15	125° 56.09 140° 58.56	75°21.01 45 90°20.76 · · 46		31°32.44 14.52 46°34.29 · · 14.51	123°27.82 20.95 138°30.22 · · 20.93	Elnath	$278^{\circ}1.75$	28°37.71
16	156°1.02	105°20.51 46		61°36.13 14.49	153°32.62 20.92	Alnilam	275°37.66	-1°11.10
17	171°3.48		70 13°0.24 20.59	76°37.97 14.48	168°35.02 20.90	Betelgeuse	270°52.00	7°24.73
18	186°5.95	135°20.02 N15°48		91°39.82 N23°14.47	183°37.42 <b>S</b> 01°20.89	Canopus	263°52.78	-52°42.48 -16°45.03
19	201°8.41		.10 43°2.48 19.47	106°41.66 14.45	198°39.82 20.87	Sirius Adhara	258°26.25 255°5.94	-10 45.05 -29°0.38
20	216° 10.88		.81 58°3.60 18.91	121°43.50 14.44	213°42.22 20.86	Procyon	244°50.75	5°9.61
21	231° 13.34	180°19.26 · · 50		136°45.35 · · 14.43	228°44.63 · · 20.84	Pollux	243°17.19	27°57.94
22	246° 15.80	195°19.01 51		151°47.19 14.41	243°47.03 20.83	Avior	234°15.18	-59°35.56
23	261° 18.27		.92 103°6.96 17.22	166°49.03 14.40	258°49.43 20.81	Suhail	222°46.39	-43°32.25
Mer.	pass. 05:38	$\nu$ -0.2′ $d$ 0.7′ m-4.	$\nu 1.1' \ d$ -0.6' m1.47	$\nu 1.8' \ d$ -0.0' m-1.89	$ u 2.4' \ d$ -0.0' m0.98	Miaplacidus	221°38.96	-69°49.47
						Alphard	217° 47.61	-8°46.17
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus Dubhe	207°34.22 193°40.75	11°50.62 61°37.08
0	$276^{\circ}20.73$	225°18.51 N15°52	.62 118°8.08 N10°16.65	181°50.88 N23°14.38	273°51.83 <b>S</b> 01°20.80	Denebola	193 40.75 182°24.60	14°25.85
1	291°23.20		.32 133°9.20 16.09	196°52.72 14.37	288°54.23 20.78	Gienah	175° 43.20	-17°41.12
2	306° 25.66		.02 148°10.32 15.53	211°54.56 14.36	303°56.63 20.77		172°59.68	-63°14.73
3	321°28.13	270°17.75 · · · 54		226°56.41 · · 14.34	318°59.04 · · 20.75		171°51.21	-57°15.65
4 5	336° 30.59 351° 33.05		42 178°12.56 14.40 12 193°13.68 13.84	241°58.25 14.33 257°0.09 14.32	334°1.44 20.74 349°3.84 20.72	Alioth	$166^{\circ}12.53$	55°49.54
6	6° 35.52	315°16.98 N15°56		272°1.94 N23°14.30	4°6.24 \$01°20.71	Spica	158°21.80	-11°17.73
7	21° 37.98		.52 223°15.91 12.71	287° 3.78 14.29	19°8.64 20.69	Alkaid	152°51.50	49°11.37
8	36° 40.45		.22 238°17.03 12.15	302° 5.62 14.27	34°11.05 20.68	Hadar Menkent	148°35.17 147°56.98	-60°30.02 -36°29.91
9	51°42.91	0°16.21 · · 58	.92 253°18.15 · · 11.58	317°7.47 · · 14.26	49°13.45 · · 20.67		147 50.98 145° 47.38	19° 3.06
10	66° 45.37	15°15.95 15°59		332°9.31 14.24	64°15.85 20.65	Rigil Kent.	139°39.40	-60°56.69
11	81°47.84	30°15.69 16°0		347°11.15 14.23	79°18.26 20.64	Kochab	137°19.04	74°3.23
12	96°50.30	45°15.43 N16°1		2°13.00 N23°14.22	94°20.66 \$01°20.62	Zuben'ubi	$136^{\circ}55.37$	-16°8.94
13 14	111° 52.77 126° 55.23		.71 313°22.63 9.33 .40 328°23.75 8.76	17°14.84 14.20 32°16.68 14.19	109°23.06 20.61 124°25.47 20.60	Alphecca	126°3.12	26°37.81
15	141° 57.69	90°14.65 · · 3		47°18.53 · · 14.17	139°27.87 · · 20.58	Antares	112°15.02	-26°29.38
16	157°0.16		80 358°25.99 7.63	62°20.37 14.16	154°30.27 20.57	Atria	107°8.35 102°2.00	-69°4.49
17	172°2.62	120°14.12 4	.49 13°27.11 7.07	77°22.22 14.14	169°32.68 20.56	Sabik Shaula	96°9.42	-15°45.41 -37°7.36
18	187°5.09	135°13.86 N16°5	.19 28°28.22 N10°6.50	92°24.06 N23°14.13	184°35.08 <b>S</b> 01°20.54	Rasalhague	95° 57.84	12°32.49
19	202°7.55		.88 43°29.34 5.94	107°25.90 14.11	199°37.49 20.53	Eltanin	90°41.46	51°29.11
20	217° 10.02		.57 58°30.46 5.37 .27 73°31.58 • 4.80	122°27.75 14.10 137°29.59 · · 14.09	214°39.89 20.51 229°42.30 · · 20.50	Kaus Aust.	83°31.58	-34°22.33
21 22	232° 12.48 247° 14.94	180°13.06 · · · 7 195°12.80	.27 73°31.58 · · 4.80 .96 88°32.70 4.24	137°29.59 · · 14.09 152°31.43 14.07	229°42.30 · · 20.50 244°44.70 20.49	Vega	80°32.52	38°48.39
23	262° 17.41		.65 103°33.82 3.67	167°33.28 14.06	259°47.11 20.47	Nunki	75°46.90	-26°15.86
						Altair	61°59.26	8°56.12
Wer.	pass. 05:34	$\nu$ -0.3′ $d$ 0.7′ m-4.	$ \frac{16}{100} = \frac{\nu 1.1' \ d - 0.6' \ m1.48}{100} $	$\nu 1.8' \ d$ -0.0' m-1.89	ν2.4' d-0.0' m0.97	Peacock Deneb	53°4.57 49°25.15	-56°39.01 45°22.13
						Enif	33°38.19	9°59.48
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir	27°32.14	-46°50.02
0	277° 19.87	225°12.26 N16°9		182°35.12 N23°14.04	274°49.51 S01°20.46	Fomalhaut	15° 13.93	-29°29.05
1 2	292°22.34 307°24.80	240°11.99 10 255°11.73 10	.04 133°36.05 2.54 .73 148°37.17 1.98	197°36.96 14.03 212°38.81 14.01	289°51.92 20.45 304°54.32 20.44	Scheat	13°44.70	28°13.14
3	322° 27.26	270°11.46 · · 11		227°40.65 · · 14.00	319°56.73 · · 20.42	Markab	13°29.39	15°20.49
4	337° 29.73		.11 178°39.41 0.84	242°42.50 13.98	334°59.13 20.41	Jun 27 Fri	SHA	Mer.pass
5	$352^{\circ}32.19$		.80 193°40.53 10°0.28	257°44.34 13.97	350°1.54 20.40	Venus	310°2.82	08:59
6	7°34.66	315°10.65 N16°13		272°46.18 N23°13.95	5°3.95 <b>S</b> 01°20.38	Mars	202°19.59	16:08
7	22°37.12		.18 223°42.76 59.14	287°48.03 13.94	20°6.35 20.37	Jupiter	265° 45.05	11:54
8	37°39.59	345°10.10 14		302°49.87 13.92	35°8.76 20.36	Saturn	357°32.65	05:47
9 10	52° 42.05 67° 44.51	0°9.83 · · 15 15°9.56	.55 253°45.00 · · 58.01 .24 268°46.12 57.44	317°51.71 · · 13.91 332°53.56 13.89	50°11.17 · · · 20.35 65°13.57 20.33	Jun 28 Sat	SHA	Mer.pass
11	82°46.98		.93 283°47.23 56.87	347°55.40 13.88	80°15.98 20.32	Venus		08:59
12	97° 49.44	45°9.01 N16°17		2°57.25 N23°13.86	95°18.39 S01°20.31		201°47.35	16:06
13	$112^{\circ}51.91$	60°8.73 18	.30 313°49.47 55.74	17°59.09 13.85	110°20.79 20.30	Jupiter Saturn	265°30.14 357°31.10	11:51 05:44
14	127°54.37		.99 328°50.59 55.17	33°0.93 13.83	125°23.20 20.28			03.44
15	142°56.83	90°8.18 · · 19		48° 2.78 · · 13.81	140°25.61 · · 20.27	Jun 29 Sun	SHA	Mer.pass
16 17	157° 59.30		.36 358°52.82 54.04	63° 4.62 13.80	155°28.02 20.26		307°52.39	08:59
17 18	173°1.76 188°4.23	135°7.35 N16°21	.05 13°53.94 53.47 .73 28°55.06 N09°52.90	78° 6.47 13.78 93° 8.31 N23° 13.77	170°30.42 20.25 185°32.83 \$01°20.24	I	201°15.06	16:04
19	203°6.69		.41 43°56.17 52.33	108°10.15 13.75	200°35.24 20.22		265°15.25 357°29.64	11:48 05:40
20	218° 9.15		.10 58°57.29 51.76	123°12.00 13.74	215°37.65 20.21			03.40
21	233° 11.62	180°6.51 · · 23		138°13.84 · · 13.72	230°40.06 · · 20.20	Horizon	tal parallax	
22	248° 14.08		.46 88°59.52 50.63	153°15.69 13.71	245°42.47 20.19		Venus:	0.2
23	263° 16.55	210°5.95 25	.15 104°0.64 50.06	168°17.53 13.69	260°44.88 20.18		Mars:	0.1
Mer.	pass. 05:30	ν-0.3′ d0.7′ m-4.	$\nu 1.1' \ d$ -0.6' m1.48	$\nu 1.8' \ d$ -0.0' m-1.89	ν2.4' d-0.0' m0.97			

, i i –	011-010 =	T0.0403 36C	Δ. –	-011	_   03.1437	300	
h	Su	n			Moon		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.35	N23° 19.14	$156^{\circ}1.43$	6.1'	N24°53.87	-8.6'	58.7'
1	194°14.21	19.04	170°26.55	6.3'	24°45.24	-8.8'	58.6'
2	209°14.08 224°13.95	18.94 •• 18.84	184°51.81 199°17.20	6.4' 6.5'	24°36.46 24°27.55	-8.9' -9.1'	58.6' 58.6'
4	239°13.82	18.73	213°42.72	6.7'	24° 18.49	-9.1 -9.2'	58.6'
5	254°13.69	18.63	228°8.37	6.8'	24°9.30	-9.3'	58.5'
6	269°13.56	$N23^{\circ}18.52$	$242^{\circ}34.15$	6.9'	$N23^{\circ}59.97$	-9.5'	58.5'
7	284°13.43	18.42	257°0.07	7.0'	23°50.51	-9.6'	58.5'
8	299°13.30 314°13.17	18.31	271°26.11	7.2'	23°40.91	-9.7'	58.4'
9 10	314°13.17 329°13.04	· · 18.20 18.09	285°52.30 300°18.61	7.3' 7.4'	23°31.18 23°21.33	-9.9' -10.0'	58.4' 58.4'
11	344°12.91	17.99	314°45.06	7.6'	23°11.35	-10.0	58.3
12	359°12.78	N23° 17.88	329°11.64	7.7'	N23°1.24	-10.2'	58.3'
13	14°12.65	17.77	343°38.35	7.8'	22°51.02	-10.3'	58.3'
14	29°12.52	17.66	358°5.20	8.0'	22°40.67	-10.5'	58.2'
15 16	44°12.39 59°12.26	· · 17.54 17.43	12°32.19 26°59.30	8.1' 8.3'	22°30.20 22°19.62	-10.6' -10.7'	58.2' 58.1'
17	74°12.13	17.32	41°26.55	8.4	22° 8.92	-10.7	58.1
18	89°12.00	N23°17.21	55°53.94	8.5'	N21°58.11	-10.9'	58.1'
19	104°11.87	17.09	$70^{\circ}21.45$	8.6'	$21^{\circ}47.19$	-11.0'	58.0'
20	119°11.74	16.98	84°49.10	8.8'	21°36.17	-11.1'	58.0'
21	134°11.61	• • 16.86	99°16.88	8.9'	21°25.03	-11.2'	58.0'
22 23	149°11.48 164°11.35	16.74 16.63	113°44.80 128°12.84	9.0' 9.2'	21°13.79 21°2.45	-11.3' -11.4'	57.9' 57.9'
23			120 12.04			11.4	31.3
	SD = 15.7'	d = -0.1'		SI	D = 16.0'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°11.22	N23°16.51	142°41.02	9.3'	$N20^{\circ}51.01$	-11.5'	57.9'
1	194°11.09	16.39	157°9.33	9.4'	20°39.46	-11.6'	57.8'
2	209°10.96 224°10.83	16.27	171°37.77 186°6.34	9.6'	20°27.82 20°16.09	-11.7'	57.8'
3 4	224 10.83 239°10.71	· · 16.15 16.03	200°35.03	9.7' 9.8'	20 16.09 20°4.26	-11.8' -11.9'	57.8' 57.7'
5	254°10.58	15.91	215°3.86	10.0'	19°52.34	-12.0'	57.7'
6	269°10.45	N23° 15.79	229°32.81	10.1'	N19°40.33	-12.1'	57.7'
7	284°10.32	15.66	244°1.89	10.2'	19°28.23	-12.2'	57.6'
8	299°10.19	15.54	258°31.10	10.3'	19°16.05	-12.3'	57.6'
9 10	314°10.06 329°9.93	· · 15.42 15.29	273°0.43 287°29.89	10.5' 10.6'	19°3.78 18°51.43	-12.4' -12.4'	57.6' 57.5'
11	344°9.81	15.16	301°59.47	10.7	18° 39.00	-12.5'	57.5'
12	359°9.68	N23°15.04	316°29.18	10.8'	N18°26.49	-12.6'	57.5'
13	14°9.55	14.91	$330^{\circ}59.00$	10.9'	$18^{\circ}13.90$	-12.7'	57.4'
14	29°9.42	14.78	345°28.95	11.1'	18°1.24	-12.7'	57.4'
15 16	44°9.29 59°9.17	· · 14.66 14.53	359°59.02 14°29.21	11.2' 11.3'	17°48.50 17°35.69	-12.8' -12.9'	57.3' 57.3'
17	74°9.04	14.40	28° 59.51	11.4'	17° 22.81	-12.9'	57.3'
18	89°8.91	N23°14.27	43°29.93	11.5'	N17°9.86	-13.0'	57.2'
19	104°8.78	14.13	58°0.47		$16^{\circ}56.85$	-0	57.2'
20	119°8.66	14.00	72°31.13	11.8'	16°43.76	-13.1'	57.2'
21 22	134°8.53 149°8.40	· · 13.87 13.74	87°1.90 101°32.78	11.9' 12.0'	16°30.62 16°17.41	-13.2' -13.3'	57.1' 57.1'
23	164°8.28	13.60	116° 3.77	12.1'	16°4.14	-13.3'	57.1
_5	SD = 15.7'	d = -0.1'			D = 15.8'	_5.5	
	JD = 13.1	u — -U.1		اد	J — 13.0°		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°8.15	N23° 13.47	130°34.88	12.2'	N15°50.81	-13.4'	57.0'
1 2	194°8.02 209°7.90	13.33 13.19	145°6.09 159°37.42	12.3' 12.4'	15°37.42 15°23.98	-13.4' -13.5'	57.0' 57.0'
3	209 7.90 224°7.77	13.19	159 37.42 174°8.85	12.4	15 23.98 15°10.48	-13.5' -13.6'	57.0 56.9'
4	239°7.64	12.92	188°40.39	12.6'	14°56.93	-13.6'	56.9'
5	254°7.52	12.78	203°12.03	12.7'	14°43.33	-13.7'	56.9'
6	269°7.39	N23°12.64	217° 43.77	12.8'	N14°29.68	-13.7'	56.8'
7 8	284°7.26 299°7.14	12.50 12.36	232°15.62 246°47.57	12.9' 13.1'	14°15.97 14°2.22	-13.8' -13.8'	56.8' 56.8'
9	299°7.14 314°7.01	12.36	246° 47.57 261° 19.62	13.1'	14° 2.22 13° 48.43	-13.8'	56.7
10	329°6.89	12.08	275°51.77	13.2'	13°34.59	-13.9'	56.7'
11	344°6.76	11.94	290°24.02	13.3'	13°20.70	-13.9'	56.7'
12	359°6.63	N23°11.79	304°56.36	13.4'	N13°6.77	-14.0'	56.6'
13 14	14°6.51 29°6.38	11.65 11.50	319°28.80 334°1.33	13.5' 13.6'	12°52.81 12°38.80	-14.0' -14.0'	56.6' 56.6'
14 15	29°6.38 44°6.26	11.50	334°1.33 348°33.96	13.6'	12°38.80 12°24.76	-14.0° -14.1'	56.5
16	59°6.13	11.21	3°6.67	13.8'	12°10.68	-14.1	56.5
17	74°6.01	11.06	$17^{\circ}39.48$	13.9'	$11^{\circ}56.56$	-14.2'	56.5'
18	89°5.88	N23° 10.92	32°12.37	14.0'	N11°42.41	-14.2'	56.4'
19 20	104°5.76 119°5.63	10.77 10.62	46°45.35 61°18.42	14.1' 14.2'	11°28.22 11°14.01	-14.2' -14.2'	56.4' 56.4'
20	119°5.63 134°5.51	10.62	61° 18.42 75° 51.57	14.2'	11° 14.01 10° 59.76	-14.2' -14.3'	56.4
22	149°5.38	10.32	90°24.80	14.3'	10° 45.49	-14.3'	56.3
23	164°5.26	10.17	104°58.12	14.4'	10°31.18	-14.3'	56.3'
	SD = 15.7'	d = -0.1'		SI	D = 15.6'		
	<u> </u>			JI			

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

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

		Sun			Moon		
Day		Eqn.of Time		Mer.	Mer.Pass.		Age
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	2-4	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-15%
	27	03:03	03:09	12:03	14:08	01:40	
	28	03:15	03:21	12:03	15:00	02:35	
	29	03:27	03:33	12:04	15:47	03:24	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	278° 19.01	225°5.67 N16°25.8		183°19.37 N23°13.67	275°47.28 S01°20.17	
1	293°21.47	240°5.39 26.5		198°21.22 13.66	290°49.69 20.16	Alpheratz 357°34.32 29°13.75
2	308°23.94	255°5.11 27.1		213°23.06 13.64	305°52.10 20.14	Ankaa 353°6.72 -42°9.77
3	323°26.40	270°4.82 · · 27.8		228°24.91 · · 13.63	320°54.51 · · 20.13	Schedar 349°30.62 56°40.38
4	338°28.87	285°4.54 28.5	5 179°6.23 47.21	243°26.75 13.61	335°56.92 20.12	Diphda 348°46.91 -17°50.65 Achernar 335°20.04 -57°6.12
5	353°31.33	300°4.25 29.2		258°28.60 13.60	350°59.33 20.11	Achernar 335°20.04 -57°6.12 Hamal 327°50.89 23°34.90
6	8°33.80	315°3.97 N16°29.9		273°30.44 N23°13.58	6°1.74 S01°20.10	Polaris 314°8.34 89°22.02
7	23°36.26	330°3.68 30.5		288°32.28 13.56	21°4.15 20.09	Acamar 315°11.72 -40°11.91
8 9	38°38.72 53°41.19	345°3.40 31.2 0°3.11 · · 31.9		303°34.13 13.55 318°35.97 · · 13.53	36°6.56 20.08 51°8.97 · · 20.07	Menkar 314°5.93 4°11.41
10	68° 43.65	15°2.82 32.6		333°37.82 13.51	66°11.38 20.06	Mirfak 308°28.04 49°56.93
11	83°46.12	30°2.53 33.3		348°39.66 13.50	81°13.79 20.04	Aldebaran 290°39.47 16°33.62
12	98° 48.58	45°2.24 N16°33.9		3°41.51 N23°13.48	96°16.21	Rigel 281°3.81 -8°10.26
13	113°51.04	60°1.96 34.6	5 314°16.27 42.08	18°43.35 13.47	111°18.62 20.02	Capella 280°21.76 46°1.34 Bellatrix 278°22.78 6°22.40
14	128°53.51	75°1.67 35.3		33°45.19 13.45	126°21.03 20.01	Elnath 278°1.73 28°37.71
15	143°55.97	90°1.38 · · 36.0		48°47.04 · · 13.43	141°23.44 · · 20.00	Alnilam 275°37.65 -1°11.09
16	158° 58.44	105°1.08 36.6		63°48.88 13.42	156°25.85 19.99	Betelgeuse 270°51.99 7°24.74
17	174°0.90 189°3.36	120°0.79 37.3		78°50.73 13.40	171°28.26 19.98 186°30.67 \$01°19.97	Canopus 263°52.78 -52°42.46
18 19	204° 5.83	135°0.50 N16°38.0 150°0.21 38.6		93°52.57 N23°13.38 108°54.42 13.37	201°33.09 19.96	Sirius 258°26.24 -16°45.02
20	219°8.29	164°59.91 39.3		123°56.26 13.35	216°35.50 19.95	Adhara 255° 5.94 -29° 0.36
21	234° 10.76	179°59.62 · · 40.0		138°58.11 · · 13.33	231°37.91 · · 19.94	Procyon 244°50.75 5°9.62
22	249° 13.22	194°59.32 40.7	1 89°26.32 36.94	153°59.95 13.32	246°40.32 19.93	Pollux 243°17.18 27°57.94
23	264° 15.68	209°59.03 41.3	8 104°27.43 36.37	169° 1.79 13.30	261°42.74 19.92	Avior 234°15.19 -59°35.54 Suhail 222°46.40 -43°32.23
Merr	pass. 05:26	$\nu$ -0.3' d0.7' m-4.1!	$\nu 1.1' \ d$ -0.6' m1.49	ν1.8' d-0.0' m-1.89	ν2.4' d-0.0' m0.96	Miaplacidus 221°38.99 -69°49.46
14101.6		ν σ.σ ασ.τ III-4.1.		ν 1.0 α 0.0 HI-1.09		Alphard 217°47.62 -8°46.16
_				<b></b>		Regulus 207°34.22 11°50.62
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.77 61°37.08
0 1	279° 18.15 294° 20.61	224°58.73 N16°42.0 239°58.44 42.7		184°3.64 N23°13.28 199°5.48 13.27	276°45.15 S01°19.91 291°47.56 19.90	Denebola 182°24.61 14°25.86
2	309° 23.08	254°58.14 43.3		214° 7.33 13.25	306°49.97 19.89	Gienah 175°43.21 -17°41.11
3	324°25.54	269°57.84 · · 44.0		229° 9.17 · · 13.23	321°52.39 · · 19.88	Acrux 172°59.71 -63°14.73
4	339°28.01	284°57.54 44.7		244°11.02 13.22	336°54.80 19.87	Gacrux 171°51.23 -57°15.65
5	354°30.47	299° 57.24 45.4	0 194°34.12 32.93	259°12.86 13.20	351°57.22 19.86	Alioth 166°12.55 55°49.55 Spica 158°21.81 -11°17.73
6	9°32.93	314°56.95 N16°46.0	7 209°35.24 N09°32.36	274°14.71 N23°13.18	6°59.63 S01°19.85	Alkaid 152°51.51 49°11.37
7	24°35.40	329°56.64 46.7		289°16.55 13.17	22°2.04 19.85	Hadar 148°35.19 -60°30.03
8	39° 37.86	344°56.34 47.4		304°18.40 13.15	37°4.46 19.84	Menkent 147°56.99 -36°29.91
9	54° 40.33	359°56.04 · · 48.0		319°20.24 · · 13.13	52°6.87 · · 19.83	Arcturus 145°47.39 19°3.06
10 11	69° 42.79 84° 45.25	14°55.74 48.7 29°55.44 49.4		334°22.09 13.11 349°23.93 13.10	67°9.29 19.82 82°11.70 19.81	Rigil Kent. 139°39.42 -60°56.70
12	99° 47.72	44°55.14 N16°50.0		4°25.78 N23°13.08	97°14.11 S01°19.80	Kochab 137°19.09 74°3.24
13	114°50.18	59°54.83 50.7		19°27.62 13.06	112°16.53 19.79	Zuben'ubi 136°55.38 -16°8.94
14	129°52.65	74°54.53 51.3		34°29.47 13.05	127°18.94 19.78	Alphecca 126°3.13 26°37.81
15	144°55.11	89°54.22 · · 52.0	6 344°45.27 · · 27.20	49°31.31 ·· 13.03	142°21.36 · · 19.77	Antares 112°15.02 -26°29.38 Atria 107°8.36 -69°4.51
16	159° 57.57	104°53.92 52.7	2 359°46.39 26.63	64°33.16 13.01	157°23.78 19.76	Sabik 102°2.00 -15°45.41
17	175°0.04	119°53.61 53.3		79°35.00 12.99	172°26.19 19.76	Shaula 96°9.42 -37°7.37
18	190°2.50	134°53.30 N16°54.0		94°36.85 N23°12.98	187°28.61 S01°19.75	Rasalhague 95°57.84 12°32.50
19	205°4.97	149°53.00 54.7		109°38.69 12.96	202°31.02 19.74	Eltanin 90°41.46 51°29.12
20 21	220°7.43 235°9.89	164°52.69 55.3 179°52.38 • • 56.0	_	124°40.54 12.94 139°42.38 •• 12.92	217°33.44 19.73 232°35.85 · · 19.72	Kaus Aust. 83°31.57 -34°22.33
22	250° 12.36	194°52.07 56.6	_	154°44.23 12.91	247°38.27 19.71	Vega 80°32.52 38°48.40
23	265°14.82	209°51.76 57.3		169°46.07 12.89	262°40.69 19.71	Nunki 75°46.89 -26°15.86
Man		ν-0.3' d0.7' m-4.14		ν1.8′ d-0.0′ m-1.89	ν2.4' d-0.0' m0.96	Altair 61°59.25 8°56.13 Peacock 53°4.54 -56°39.02
ivier.p	pass. 05:22	ν-0.3 d0.1 m-4.14	- V1.1 a-0.0 m1.49	ν1.6 α-0.0 m-1.69	V2.4 a-0.0 m0.90	Deneb 49°25.13 45°22.14
						Enif 33°38.18 9°59.49
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.11 -46°50.02
0	280° 17.29	224°51.45 N16°58.0		184°47.92 N23°12.87	277°43.10 S01°19.70	Fomalhaut 15°13.91 -29°29.04
1 2	295° 19.75 310° 22.21	239°51.14 58.6 254°50.83 16°59.3		199°49.76 12.85 214°51.61 12.83	292°45.52 19.69 307°47.94 19.68	Scheat 13°44.68 28°13.15
3	310 22.21 325°24.68	269°50.52 16°59.9		214 51.01 12.83 229°53.45 · · 12.82	307 47.94 19.68 322°50.35 · · 19.67	Markab 13°29.37 15°20.50
4	340°27.14	284°50.20 0.6	_	244°55.30 12.80	337°52.77 19.67	Jun 30 Mon SHA Mer.pass
5	355° 29.61	299°49.89 1.3		259°57.14 12.78	352°55.19 19.66	Venus 306°46.66 09:00
6	10°32.07	314°49.58 N17°1.9		274°58.99 N23°12.76	7°57.61 <b>S</b> 01°19.65	Mars 200°42.75 16:03
7	25° 34.54	329°49.26 2.6		290° 0.83 12.74	23°0.02 19.64	Jupiter 265° 0.36 11:45
8	40°37.00	344°48.95 3.2		305°2.68 12.73	38°2.44 19.64	Saturn 357°28.27 05:36
9	55° 39.46	359°48.63 · · 3.9		320°4.52 · · 12.71	53°4.86 · · 19.63	Jul 01 Tue SHA Mer.pass
10 11	70°41.93 85°44.39	14°48.32 4.5 29°48.00 5.2		335°6.37 12.69 350°8.21 12.67	68°7.28 19.62 83°9.70 19.61	Venus 305°40.58 09:00
11	85°44.39 100°46.86	29°48.00 5.2 44°47.68 N17°5.8		5°10.06 N23°12.65	83°9.70 19.61 98°12.12 S01°19.61	Mars 200°10.40 16:01
13	100 40.80 115°49.32	59°47.36 N17 5.6		20°11.91 12.64	113°14.53 19.60	Jupiter 264°45.49 11:42
14	130°51.78	74°47.05 7.1		35°13.75 12.62	128°16.95 19.59	Saturn 357°27.00 05:32
15	145° 54.25	89°46.73 · · 7.8		50°15.60 · · 12.60	143°19.37 · · 19.58	Jul 02 Wed SHA Mer.pass
16	$160^{\circ}56.71$	104°46.41 8.4	9 0°13.12 12.82	65°17.44 12.58	158°21.79 19.58	Venus 304°34.16 09:01
17	175° 59.18	119°46.09 9.1		80°19.29 12.56	173°24.21 19.57	Mars 199°38.02 15:59
18	191°1.64	134°45.77 N17°9.7		95°21.13 N23°12.54	188°26.63 S01°19.56	Jupiter 264°30.63 11:39
19	206°4.10	149°45.44 10.4		110°22.98 12.53	203°29.05 19.56	Saturn 357°25.82 05:28
20	221°6.57 236°9.03	164°45.12 11.0 179°44.80 · · 11.7		125°24.82 12.51 140°26.67 · 12.49	218°31.47 19.55 233°33.89 •• 19.54	Horizontal parallax
21 22	236 9.03 251° 11.50	179°44.80 · · 11.7 194°44.48 12.3	_	155°28.52 12.47	248°36.31 19.54	Venus: 0.2
23	266° 13.96	209°44.15 13.0		170°30.36 12.45	263°38.73 19.53	Mars: 0.1
ivier.p	bass. 05:18	$\nu$ -0.3′ $d$ 0.7′ $m$ -4.13	$\nu 1.1' \ d$ -0.6' m1.50	$\nu 1.8' \; d\text{-}0.0' \; \text{m-}1.89$	$ u 2.4' \ d$ -0.0' m0.95	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°5.13	$N23^{\circ}10.02$	119°31.52	14.5'	$N10^{\circ}16.85$	-14.4'	56.2'
1	194°5.01	9.86	134°4.99	14.6'	10°2.49	-14.4'	56.2'
2 3	209°4.89 224°4.76	9.71 •• 9.56	148°38.55 163°12.18	14.6' 14.7'	09°48.11 09°33.71	-14.4' -14.4'	56.2' 56.1'
4	239°4.64	9.40	177° 45.89	14.8'	09° 19.28	-14.4'	56.1
5	254°4.51	9.25	192° 19.67	14.9'	09°4.83	-14.5'	56.1'
6	269°4.39	N23°9.09	206°53.52	14.9'	N08°50.36	-14.5'	56.0'
7	284°4.27 299°4.14	8.93	221°27.44 236°1.44	15.0'	08°35.87 08°21.37	-14.5'	56.0'
8 9	299°4.14 314°4.02	8.78 •• 8.62	250°35.50	15.1' 15.1'	08° 21.37	-14.5' -14.5'	56.0' 55.9'
10	329°3.90	8.46	265°9.63	15.2'	07°52.30	-14.6'	55.9'
11	344°3.77	8.30	279°43.82	15.3'	$07^{\circ}37.75$	-14.6'	55.9'
12	359°3.65	N23°8.14	294° 18.08	15.3'	N07°23.18	-14.6'	55.8'
13 14	14°3.53 29°3.40	7.98 7.82	308°52.40 323°26.79	15.4' 15.4'	07°8.60 06°54.00	-14.6' -14.6'	55.8' 55.8'
15	44°3.28	· · 7.65	338°1.23	15.4	06°39.40	-14.6'	55.8'
16	59°3.16	7.49	352°35.74	15.6'	06°24.78	-14.6'	55.7'
17	74°3.04	7.33	7° 10.30	15.6'	06°10.16	-14.6'	55.7'
18	89°2.91	N23°7.16	21°44.91	15.7'	N05°55.53 05°40.89	-14.6'	55.7'
19 20	104°2.79 119°2.67	7.00 6.83	36° 19.59 50° 54.31	15.7' 15.8'	05°40.89 05°26.24	-14.6' -14.7'	55.6' 55.6'
21	134°2.55	• • 6.66	65°29.09	15.8'	05° 20.24 05° 11.59	-14.7'	55.6'
22	149°2.43	6.50	$80^{\circ}3.92$	15.9'	$04^{\circ}56.93$	-14.7'	55.6'
23	164°2.31	6.33	94°38.80	15.9'	04°42.27	-14.7'	55.5'
	SD = 15.7'	d = -0.2'		SI	D = 15.3'		
_							
Tue 0	<b>GHA</b> 179°2.18	<b>Dec</b> N23°6.16	<b>GHA</b> 109°13.73	u 16.0'	<b>Dec</b> N04° 27.61	d -14.7'	<b>HP</b> 55.5'
1	194°2.06	5.99	109 13.73 123°48.70	16.0'	04° 12.95	-14.7'	55.5'
2	209°1.94	5.82	138°23.72	16.1'	03°58.28	-14.7'	55.4'
3	224°1.82	. 5.65	152°58.79	16.1'	03°43.62	-14.7'	55.4'
4	239°1.70 254°1.58	5.48 5.31	167°33.90 182°9.04	16.1' 16.2'	03°28.95 03°14.29	-14.7' -14.7'	55.4' 55.4'
5 6	254 1.58 269°1.46	5.31 N23°5.13	182 9.04 196°44.23	16.2'	N02°59.62	-14.7'	55.3'
7	284°1.34	4.96	211° 19.46	16.3'	02°44.97	-14.7'	55.3'
8	299°1.22	4.79	225° 54.73	16.3'	$02^{\circ}30.31$	-14.6'	55.3'
9	314°1.09	• • 4.61	240°30.03	16.3'	02°15.66	-14.6'	55.3'
10 11	329°0.97 344°0.85	4.43 4.26	255°5.37 269°40.74	16.4' 16.4'	02°1.02 01°46.38	-14.6' -14.6'	55.2' 55.2'
12	359°0.73	N23°4.08	284° 16.15	16.4	N01°31.75	-14.6'	55.2'
13	14°0.61	3.90	298°51.59	16.5'	$01^{\circ}17.13$	-14.6'	55.2'
14	29°0.49	3.72	313°27.05	16.5'	01°2.51	-14.6'	55.1'
15 16	44°0.37 59°0.25	· · 3.55 3.37	328°2.55 342°38.07	16.5' 16.5'	00°47.91 00°33.31	-14.6' -14.6'	55.1' 55.1'
17	74°0.14	3.19	357° 13.62	16.6'	00° 33.31	-14.6'	55.1'
18	89°0.02	N23°3.00	11°49.19	16.6'	N00°4.15	-14.6'	55.0'
19	103°59.90	2.82	26°24.79	16.6'	500° 10.41	14.5'	55.0'
20 21	118°59.78 133°59.66	2.64 •• 2.46	41°0.41 55°36.05	16.6' 16.7'	00°24.96 00°39.49	14.5' 14.5'	55.0' 55.0'
22	133 59.00 148°59.54	2.27	70°11.71	16.7'	00°54.01	14.5	55.0'
23	163°59.42	2.09	84°47.39	16.7'	01°8.51	14.5'	54.9'
	SD = 15.7'	d = -0.2'		SI	D = 15.1'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178°59.30	N23°1.90	99°23.09	16.7'	501°23.00	14.5'	54.9'
1	193°59.18	1.71	113°58.80	16.7'	$01^{\circ}37.47$	14.5'	54.9'
2	208°59.07	1.53	128° 34.53	16.7'	01°51.93 02°6.36	14.4'	54.9'
3 4	223°58.95 238°58.83	· · 1.34 1.15	143°10.27 157°46.02	16.8' 16.8'	02°6.36 02°20.78	14.4' 14.4'	54.9' 54.8'
5	253°58.71	0.96	172°21.79	16.8'	02° 35.18	14.4	54.8'
6	268°58.59	N23°0.77	186°57.56	16.8'	S02°49.56	14.4'	54.8'
7	283°58.48	0.58	201°33.35	16.8'	03°3.91	14.3'	54.8'
8	298°58.36 313°58.24	0.39 · · 0.20	216°9.14 230°44.94	16.8' 16.8'	03°18.25 03°32.56	14.3' 14.3'	54.8' 54.7'
9 10	313°58.24 328°58.12	23°0.01	245°20.74	16.8	03° 32.56	14.3'	54.7'
11	343°58.01	22°59.81	259° 56.54	16.8'	04°1.12	14.2'	54.7'
12	358°57.89	N22°59.62	274°32.35	16.8'	S04° 15.36	14.2'	54.7'
13	13°57.77 28°57.66	59.43	289°8.16	16.8'	04°29.58 04°43.77	14.2'	54.7'
14 15	28°57.66 43°57.54	59.23 •• 59.03	303°43.97 318°19.78	16.8' 16.8'	04°43.77 04°57.94	14.2' 14.1'	54.6' 54.6'
16	58°57.42	58.84	332°55.59	16.8'	05°12.08	14.1'	54.6'
17	73°57.31	58.64	347°31.40	16.8'	$05^{\circ}26.19$	14.1'	54.6'
18	88°57.19	N22°58.44	2°7.20	16.8'	S05°40.28	14.1'	54.6'
19 20	103°57.07 118°56.96	58.24 58.04	16° 42.99 31° 18.78	16.8' 16.8'	05°54.33 06°8.36	14.0' 14.0'	54.6' 54.5'
20	118 56.96 133°56.84	58.04	45°54.56	16.8'	06°22.36	14.0'	54.5'
22	148°56.73	57.64	60°30.33	16.8'	06°36.32	13.9'	54.5'
23	163°56.61	57.44	75°6.09	16.7'	06°50.25	13.9'	54.5'
	SD = 15.7'	d = -0.2'	-	SI	D = 15.0'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	5-7		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	24-42%		
30	03:39	03:45	12:04	16:30	04:09			
01	03:51	03:57	12:04	17:11	04:51			
02	04:03	04:08	12:04	17:51	05:31			

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	281°16.42	224°43.83 N17°13.69	120°22.02 N09°8.20	185°32.21 N23°12.43	278°41.15 S01°19.52	Alpheratz 357°34.30 29°13.76
1	296° 18.89	239°43.50 14.33	135°23.14 7.62	200°34.05 12.41	293°43.57 19.52	Ankaa 353°6.70 -42°9.77
2	311°21.35	254°43.18 14.98	150°24.25 7.05	215°35.90 12.39	308°45.99 19.51	Schedar 349°30.59 56°40.39
3	326°23.82	269°42.85 · · 15.63	165°25.36 · · 6.47	230°37.74 · · 12.38	323°48.41 · · 19.50	Diphda 348°46.89 -17°50.65
4	341°26.28	284°42.52 16.27	$180^{\circ}26.47$ 5.89	245°39.59 12.36	338°50.83 19.50	Achernar 335°20.01 -57°6.11
5	356°28.75	299°42.20 16.92	195°27.59 5.31	260°41.44 12.34	353°53.26 19.49	Hamal 327°50.87 23°34.90
6	11°31.21	314°41.87 N17°17.56	210°28.70 N09°4.73	275°43.28 N23°12.32	8°55.68 S01°19.49	Polaris 314°7.03 89°22.01
7	26°33.67	329°41.54 18.20	225°29.81 4.15	290°45.13 12.30	23°58.10 19.48	Acamar 315°11.70 -40°11.90
8	41°36.14	344°41.21 18.85	240°30.92 3.58	305°46.97 12.28	39°0.52 19.47	Menkar 314°5.92 4°11.42
9	56°38.60	359°40.88 · · 19.49	255°32.04 · · 3.00	320°48.82 · · 12.26	54°2.94 · · 19.47	Mirfak 308°28.02 49°56.93
10	71°41.07	14°40.55 20.13	270°33.15 2.42	335°50.67 12.24	69°5.36 19.46	Aldebaran 290°39.46 16°33.62
11	86° 43.53	29°40.22 20.77 44°39.89 N17°21.41	285°34.26 1.84	350°52.51 12.22 5°54.36 N23°12.20	84°7.79 19.46 99°10.21 S01°19.45	Rigel 281°3.80 -8°10.25
12	101°45.99		300°35.37 N09°1.26			Capella 280°21.75 46°1.34
13 14	116° 48.46 131° 50.92	59°39.55 22.06 74°39.22 22.70	315°36.48 0.68 330°37.60 09°0.10	20°56.20 12.19 35°58.05 12.17	114°12.63 19.45 129°15.05 19.44	Bellatrix 278°22.77 6°22.40
15	146°53.39	89°38.89 · · 23.34	345°38.71 08°59.52	50°59.90 · · 12.15	144°17.48 · · 19.43	Elnath 278°1.72 28°37.71
16	161°55.85	104°38.55 23.97	0°39.82 58.94	66° 1.74 12.13	159°19.90 19.43	Alnilam 275°37.64 -1°11.08
17	176° 58.31	119°38.22 24.61	15°40.93 58.36	81°3.59 12.11	174°22.32 19.42	Betelgeuse 270°51.98 7°24.74
18	192°0.78	134°37.88 N17°25.25	30°42.04 N08°57.78	96°5.43 N23°12.09	189°24.75 S01°19.42	Canopus 263°52.77 -52°42.45
19	207°3.24	149°37.55 25.89	45°43.15 57.20	111°7.28 12.07	204°27.17 19.41	Sirius 258°26.24 -16°45.01
20	222°5.71	164°37.21 26.53	60°44.27 56.62	126° 9.13 12.05	219°29.59 19.41	Adhara 255°5.94 -29°0.35
21	237°8.17	179°36.87 · · 27.16	75°45.38 · · 56.04	141°10.97 · · 12.03	234°32.02 · · 19.40	Procyon 244°50.75 5°9.62
22	252° 10.63	194°36.54 27.80	90°46.49 55.46	156°12.82 12.01	249°34.44 19.40	Pollux 243°17.18 27°57.93
23	$267^{\circ}13.10$	209°36.20 28.43	105° 47.60 54.88	171°14.67 11.99	264°36.87 19.39	Avior 234°15.20 -59°35.53 Suhail 222°46.41 -43°32.22
1/104	DE:14	ν-0.3' d0.6' m-4.13	ν1.1' d-0.6' m1.50	ν1.8' d-0.0' m-1.89	ν2.4' d-0.0' m0.95	Suhail 222°46.41 -43°32.22   Miaplacidus 221°39.02 -69°49.45
ivier.	pass. 05:14	ν-0.3 d0.0 m-4.13	V1.1 d-0.0 m1.50	ν1.6 <i>a</i> -0.0 m-1.69	ν2.4 <i>a</i> -0.0 m0.95	Alphard 217°47.62 -8°46.15
						Regulus 207°34.23 11°50.63
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.80 61°37.07
0	282° 15.56	224°35.86 N17°29.07	120°48.71 N08°54.30	186°16.51 N23°11.97	279°39.29 <b>S</b> 01°19.39	Denebola 182°24.62 14°25.86
1	297° 18.03	239°35.52 29.70	135°49.82 53.72	201°18.36 11.95	294°41.71 19.38	Gienah 175°43.22 -17°41.11
2	312°20.49	254°35.18 30.34	150°50.93 53.14	216°20.20 11.93	309°44.14 19.38	Acrux 172°59.74 -63°14.73
3	327°22.96	269° 34.84 · · 30.97	165°52.05 · · 52.56	231°22.05 ·· 11.91	324°46.56 · · 19.37	Gacrux 171°51.26 -57°15.65
4	342°25.42	284°34.50 31.60	180°53.16 51.98	246°23.90 11.89	339°48.99 19.37	Alioth 166°12.57 55°49.55
5	357°27.88	299°34.16 32.24	195°54.27 51.40	261°25.74 11.87	354°51.41 19.37	Spica 158°21.82 -11°17.73
6	12°30.35	314°33.81 N17°32.87	210°55.38 N08°50.82	276°27.59 N23°11.85	9°53.84 S01°19.36	Alkaid 152°51.53 49°11.38
7	27°32.81	329°33.47 33.50	225°56.49 50.24	291°29.44 11.83	24°56.26 19.36	Hadar 148°35.22 -60°30.03
8	42°35.28	344°33.13 34.13	240°57.60 49.65	306°31.28 11.81	39°58.69 19.35	Menkent 147°57.00 -36°29.91
9	57° 37.74	359°32.78 · · 34.76	255°58.71 · · 49.07	321°33.13 ·· 11.79 336°34.98 11.77	55°1.12 · · 19.35	Arcturus 145°47.40 19°3.07
10	72° 40.20 87° 42.67	14°32.44 35.39 29°32.09 36.02	270°59.82 48.49 286°0.93 47.91	336°34.98 11.77 351°36.82 11.75	70°3.54 19.34 85°5.97 19.34	Rigil Kent. 139°39.44 -60°56.70
11 12	102°45.13	44°31.75 N17°36.65	301°2.04 N08°47.33	6°38.67 N23°11.73	100°8.39 S01°19.34	Kochab 137°19.14 74°3.24
13	102 45.15 117°47.60	59°31.40 37.27	316°3.15 46.75	21°40.52 11.71	115°10.82 19.33	Zuben'ubi 136°55.39 -16°8.94
14	132°50.06	74°31.05 37.90	331°4.27 46.16	36°42.36 11.69	130°13.25 19.33	Alphecca 126°3.14 26°37.82
15	147°52.52	89°30.71 · · 38.53	346°5.38 · · 45.58	51°44.21 · · 11.67	145°15.67 · · 19.32	Antares 112°15.03 -26°29.38
16	162°54.99	104°30.36 39.16	1°6.49 45.00	66°46.06 11.65	160°18.10 19.32	Atria 107°8.38 -69°4.52
17	177° 57.45	119°30.01 39.78	16°7.60 44.42	81°47.90 11.63	175°20.53 19.32	Sabik 102°2.00 -15°45.41
18	192°59.92	134°29.66 N17°40.41	31°8.71 N08°43.83	96°49.75 N23°11.61	190°22.95 <b>S</b> 01°19.31	Shaula 96°9.42 -37°7.37
19	208°2.38	149°29.31 41.03	46°9.82 43.25	111°51.60 11.59	205°25.38 19.31	Rasalhague 95°57.84 12°32.51   Eltanin 90°41.46 51°29.14
20	223°4.85	164°28.96 41.66	61°10.93 42.67	126°53.44 11.57	220°27.81 19.31	Eltanin 90°41.46 51°29.14   Kaus Aust. 83°31.57 -34°22.33
21	238°7.31	179°28.61 · · 42.28	76°12.04 · · 42.09	141°55.29 · · 11.55	235°30.24 · · 19.30	Vega 80°32.52 38°48.42
22	253°9.77	194°28.26 42.90	91°13.15 41.50	156°57.14 11.53	250°32.66 19.30	Nunki 75°46.88 -26°15.86
23	$268^{\circ}12.24$	209°27.90 43.52	106°14.26 40.92	171°58.99 11.51	265°35.09 19.30	Altair 61°59.24 8°56.14
Mar	pass. 05:10	ν-0.3' d0.6' m-4.12	ν1.1' d-0.6' m1.51	ν1.8' d-0.0' m-1.89	$\nu$ 2.4' d-0.0' m0.94	Peacock 53°4.53 -56°39.02
- IVICI.	pass. 05.10	ν-0.5 do.0 iii-4.12		ν1:0 d-0:0 III-1:09		Deneb 49°25.12 45°22.16
						Enif 33°38.16 9°59.50
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.09 -46°50.02
0	283°14.70	224°27.55 N17°44.15	121°15.37 N08°40.34	187° 0.83 N23° 11.49	280°37.52 S01°19.29	Fomalhaut 15°13.89 -29°29.04
1	298° 17.17	239° 27.20 44.77	136°16.48 39.75	202°2.68 11.47	295°39.95 19.29	Scheat 13°44.66 28°13.16
2	313°19.63	254°26.84 45.39	151°17.59 39.17	217° 4.53 11.45	310°42.38 19.29	Markab 13°29.35 15°20.51
3 4	328°22.09	269°26.49 · · 46.01	166°18.70 · · 38.59	232°6.37 · · 11.43	325°44.81 · · 19.28	Jul 03 Thu SHA Mer.pass
4 5	343°24.56 358°27.02	284°26.13 46.63 299°25.78 47.25	181° 19.81 38.00 196° 20.92 37.42	247°8.22 11.40 262°10.07 11.38	340°47.23 19.28 355°49.66 19.28	Venus 303°27.40 09:01
6	13°29.49	314°25.42 N17°47.87	211°22.03 N08°36.83	262°10.07 11.38 277°11.92 N23°11.36	10°52.09 S01°19.28	Mars 199°5.60 15:57
7	28°31.95	329°25.06 48.48	226°23.14 36.25	292°13.76 11.34	25°54.52 19.27	Jupiter 264° 15.78 11:36
8	43°34.41	344°24.71 49.10	241°24.25 35.67	307°15.61 11.32	40°56.95 19.27	Saturn 357°24.73 05:24
9	58° 36.88	359°24.35 · · 49.72	256°25.35 · · 35.08	322°17.46 · · 11.30	55°59.38 · · 19.27	
10	73°39.34	14°23.99 50.34	271°26.46 34.50	337°19.30 11.28	71°1.81 19.27	Jul 04 Fri SHA Mer.pass
11	88°41.81	29°23.63 50.95	286°27.57 33.91	352°21.15 11.26	86°4.24 19.26	Venus 302°20.30 09:02
12	103°44.27	44°23.27 N17°51.57	301°28.68 N08°33.33	7°23.00 N23°11.24	101°6.67 S01°19.26	Mars 198° 33.15 15:56
13	118° 46.74	59°22.91 52.18	316°29.79 32.74	22°24.85 11.22	116°9.10 19.26	Jupiter 264°0.95 11:33
14	133°49.20	74°22.55 52.80	331°30.90 32.16	37°26.69 11.19	131°11.53 19.26	Saturn 357°23.73 05:21
15	148°51.66	89°22.19 · · 53.41	346°32.01 · · 31.57	52°28.54 · · 11.17	146°13.96 · · 19.25	Jul 05 Sat SHA Mer.pass
16	163°54.13	104°21.82 54.02	1°33.12 30.99	67°30.39 11.15	161°16.39 19.25	Venus 301°12.85 09:02
17	178° 56.59	119°21.46 54.63	16°34.23 30.40	82°32.24 11.13	176°18.82 19.25	Mars 198° 0.67 15:54
18	193°59.06	134°21.10 N17°55.25	31°35.34 N08°29.82	97°34.08 N23°11.11	191°21.25 <b>S</b> 01°19.25	Jupiter 263°46.13 11:31
19	$209^{\circ}1.52$	149°20.73 55.86	46°36.45 29.23	112°35.93 11.09	206°23.68 19.25	Saturn 357°22.82 05:17
20	224°3.98	164°20.37 56.47	61°37.55 28.65	127°37.78 11.07	221°26.12 19.25	
21	239°6.45	179°20.00 · · 57.08	76°38.66 · · 28.06	142°39.63 · · 11.05	236°28.55 · · 19.24	Horizontal parallax
22	254°8.91	194°19.64 57.69	91°39.77 27.48	157°41.47 11.02	251°30.98 19.24	Venus: 0.2
23	269° 11.38	209°19.27 58.30	106°40.88 26.89	172°43.32 11.00	266°33.41 19.24	Mars: 0.1
Mer.	pass. 05:06	ν-0.4' d0.6' m-4.12	ν1.1' d-0.6' m1.51	ν1.8' d-0.0' m-1.89	ν2.4' d-0.0' m0.94	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178° 56.50	N22°57.24	89°41.83	16.7'	S07°4.16	13.9'	54.5'
1	193°56.38	57.04	104°17.57	16.7'	07°18.02	13.8'	54.5'
2	208° 56.27 223° 56.15	56.83 •• 56.63	118°53.29 133°29.00	16.7' 16.7'	07°31.86 07°45.66	13.8' 13.8'	54.5' 54.4'
4	238° 56.04	56.42	148° 4.69	16.7	07°59.43	13.7'	54.4'
5	253°55.92	56.22	162°40.36	16.7'	$08^{\circ}13.16$	13.7'	54.4'
6	268° 55.81	N22°56.01	177°16.02	16.6'	S08°26.86	13.7'	54.4'
7	283°55.69	55.80	191°51.66 206°27.27	16.6'	08°40.51	13.6'	54.4'
8 9	298° 55.58 313° 55.46	55.60 • • 55.39	206°27.27 221°2.86	16.6' 16.6'	08°54.14 09°7.72	13.6' 13.5'	54.4' 54.4'
10	328° 55.35	55.18	235°38.44	16.5	09°21.26	13.5'	54.4'
11	343°55.24	54.97	$250^{\circ}13.98$	16.5'	09°34.77	13.5'	54.3'
12	358° 55.12	N22°54.76	264°49.50	16.5'	509°48.24	13.4'	54.3'
13 14	13°55.01 28°54.90	54.55 54.33	279°25.00 294°0.47	16.5' 16.4'	10°1.66 10°15.04	13.4' 13.3'	54.3' 54.3'
14 15	43° 54.90	54.33 • • 54.12	294 0.47 308°35.91	16.4	10 15.04 10°28.38	13.3'	54.3'
16	58° 54.67	53.91	323°11.32	16.4'	10°41.68	13.3'	54.3'
17	73°54.56	53.69	337°46.70	16.3'	$10^{\circ}54.94$	13.2'	54.3'
18	88° 54.44	N22°53.48	352°22.05	16.3'	\$11°8.15 11°21.32	13.2'	54.3'
19 20	103°54.33 118°54.22	53.26 53.05	6°57.37 21°32.65	16.3' 16.2'	11°21.32 11°34.44	13.1' 13.1'	54.3' 54.3'
21	133°54.11	• • 52.83	36°7.90	16.2'	11°47.51	13.1	54.3'
22	148° 53.99	52.61	50°43.11	16.2'	12°0.54	13.0'	54.2'
23	163°53.88	52.40	65°18.29	16.1'	$12^{\circ}13.52$	12.9'	54.2'
	SD = 15.7'	d = -0.2'		SE	0 = 14.9'		
Fri 0	<b>GHA</b> 178° 53.77	<b>Dec</b> N22°52.18	<b>GHA</b> 79°53.43	u  16.1'	Dec \$12°26.45	d 12.9'	<b>HP</b> 54.2'
1	178 53.77 193°53.66	51.96	79 53.43 94°28.53	16.1	12°39.33	12.9	54.2'
2	208° 53.55	51.74	109°3.59	16.0'	12°52.17	12.8'	54.2'
3	223°53.44	• • 51.52	123°38.61	16.0'	13° 4.95	12.7'	54.2'
4	238° 53.32	51.29	138°13.59	15.9'	13°17.68	12.7'	54.2'
5 6	253° 53.21 268° 53.10	51.07 N22°50.85	152°48.52 167°23.41	15.9' 15.8'	13°30.36 \$13°42.99	12.6' 12.6'	54.2' 54.2'
7	283°52.99	50.63	181°58.26	15.8'	13°55.56	12.5'	54.2'
8	298° 52.88	50.40	196°33.06	15.8'	14°8.08	12.5'	54.2'
9	313°52.77	• • 50.18	$211^{\circ}7.81$	15.7'	$14^{\circ}20.55$	12.4'	54.2'
10 11	328° 52.66 343° 52.55	49.95 49.72	225°42.52 240°17.18	15.7' 15.6'	14°32.96 14°45.31	12.4' 12.3'	54.2' 54.2'
12	358° 52.44	N22°49.50	254° 51.79	15.6'	S14°57.61	12.3	54.1
13	13° 52.33	49.27	269°26.34	15.5'	15°9.85	12.2'	54.1'
14	28°52.22	49.04	284°0.85	15.5'	$15^{\circ}22.03$	12.1'	54.1'
15	43°52.11	• • 48.81	298°35.31	15.4'	15°34.15	12.1'	54.1'
16 17	58° 52.00 73° 51.89	48.58 48.35	313°9.71 327°44.05	15.3' 15.3'	15°46.21 15°58.21	12.0' 11.9'	54.1' 54.1'
18	88°51.78	N22°48.12	342°18.34	15.2'	\$16°10.15	11.9'	54.1'
19	103°51.67	47.89	356°52.58	15.2'	$16^{\circ}22.03$	11.8'	54.1'
20	118°51.56	47.66	11°26.76		16°33.84		54.1'
21 22	133°51.46 148°51.35	· · 47.42 47.19	26°0.88 40°34.94	15.1' 15.0'	16°45.59 16°57.28	11.7' 11.6'	54.1' 54.1'
23	163°51.24	46.95	55° 8.95	14.9'	10 57.26 17°8.90	11.6'	54.1'
	SD = 15.7'	d = -0.2'			0 = 14.8'		-
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°51.13 193°51.02	N22°46.72 46.48	69°42.89 84°16.78	14.9' 14.8'	\$17°20.45 17°31.94	11.5' 11.4'	54.1' 54.1'
2	208° 50.91	46.24	98°50.60	14.8'	17°43.35	11.4	54.1
3	223°50.81	• • 46.01	113°24.36	14.7'	17°54.70	11.3'	54.1'
4	238°50.70	45.77	127°58.05	14.6'	18° 5.98	11.2'	54.1'
5 6	253°50.59 268°50.48	45.53 N22°45.29	142°31.68 157°5.25	14.6' 14.5'	18°17.19 \$18°28.33	11.1' 11.1'	54.1' 54.1'
7	283°50.38	45.05	171°38.75	14.4'	18°39.39	11.1	54.1
8	298°50.27	44.81	$186^{\circ}12.19$	14.4'	18°50.38	10.9'	54.1'
9	313°50.16	• • 44.57	200°45.56	14.3'	19°1.30	10.8'	54.1'
10 11	328° 50.06 343° 49.95	44.33 44.08	215°18.86 229°52.09	14.2' 14.2'	19°12.15 19°22.91	10.8' 10.7'	54.1' 54.1'
11	343°49.95 358°49.84	44.08 N22°43.84	229°52.09 244°25.25	14.1'	\$19° 33.60	10.7	54.1'
13	13°49.74	43.60	258°58.35	14.0'	19°44.22	10.5	54.1'
14	28°49.63	43.35	273°31.37	14.0'	19°54.75	10.5'	54.1'
15	43°49.52	• • 43.10	288°4.32	13.9'	20°5.21	10.4'	54.1'
16 17	58° 49.42 73° 49.31	42.86 42.61	302°37.20 317°10.01	13.8' 13.7'	20°15.59 20°25.88	10.3' 10.2'	54.1' 54.1'
18	73 49.31 88°49.21	42.01 N22°42.36	317 10.01 331°42.75	13.7'	20 25.88 \$20°36.10	10.2	54.1
19	103°49.10	42.12	346°15.42	13.6'	$20^{\circ}46.23$	10.0'	54.2'
20	118°49.00	41.87	0°48.01	13.5'	20°56.27	10.0'	54.2'
21	133° 48.89 148° 48.79	• • 41.62	15°20.52 29°52.96	13.4'	21°6.24 21°16.11	9.9'	54.2'
22 23	148°48.79 163°48.68	41.37 41.11	29°52.96 44°25.33	13.4' 13.3'	21°16.11 21°25.91	9.8' 9.7'	54.2' 54.2'
	SD = 15.7'	d = -0.2'			0 = 14.8'	5.1	
	<u> </u>	<u>u — -0.2</u>		JL	- 17.0		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	8-10		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	52-70%		
03	04:14	04:20	12:04	18:31	06:11			
04	04:25	04:30	12:05	19:13	06:52			
05	04:35	04:41	12:05	19:57	07:34			

Section   Color	h	Aries	Venu	us	Ma	ars	Jup	oiter	Sat	urn		Stars	
1 991 1530 2991 153 179 571 151 171 151 151 151 151 151 151 151	Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0												00010.77
2 3 1471377 24471817 187017 1974427 2033 21744877 1034 31744971 1034 2471377 1152 2471478 207138 207139 1034 217439 207139 1034 207139 10	1	299° 16.30	239°18.54	$17^{\circ}59.51$	136°43.10	25.72	202°47.02	10.96	296°38.27	19.24			
1.0   1.0	2			18°0.12	151°44.21	25.13	217°48.87	10.94	311°40.71	19.24	1		
8 197-201	3	$329^{\circ}21.23$	269°17.80	• • 0.73	$166^{\circ}45.31$	• • 24.54	$232^{\circ}50.71$	• • 10.92		• • 19.23			I
1.	4	344°23.70	284°17.43	1.33	181°46.42	23.96	247°52.56	10.89	341°45.57	19.23			
1. 1													
18													
19													
13   1974/36.46   2471/36.20   4.66   2771/57.07   2044   3357/36.60   10.76   2771/1   19.22   10.77   10.7													
11 90°4006 20°1483 5.56 20°5416 1065 33°550 10.74 30°200 10.22 10.25 10.07 10.22 10.25 10.07 10.22 10.25 10.											Mirfak	308°27.99	49°56.93
12 1074-541 44 1445 1426 1426 1636 1252 1636 1266 1267 127 127 127 127 127 127 127 127 127 12											Aldebaran	290°39.44	16°33.63
13 119"4-98" 59"14-08 6.77 316"5-50 18:09 22"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.70 117"7-77 19:23 6.86 12"9-19 10.81 117"1-71 19:23 6.8													
14   134" 6334   74" 1371   7.37   31" 57.50   18.09   33" 11.00   10.57   132" 931   19.22   18.00													
15 1 149*5080													
18 1949 820 1 34*1220 1 1919 96 32*138 1 1820 1 182	15	149°50.80	89°13.33	• • 7.97	346°58.61	• • 17.50	53°12.89	· · 10.65	147°12.34				
18   1967   1968   1967   1968   1967   1968   1968   1968   1968   1969   1968   1969   19	16	$164^{\circ}53.27$	104°12.95	8.56	1°59.72	16.91	$68^{\circ}14.74$	10.63	162°14.77	19.22			I
19   19   19   19   19   19   19   19	17			9.16		16.32		10.61	$177^{\circ}17.21$		-		
22   200°150   100°111   120°1   100°1   110													
20													
23   20   20   20   20   20   20   20													
Mer. pass. 05:02													
More   GHA   Dec   CHA   Dec   Dec   CHA   Dec   Dec   CHA   Dec											Avior	234°15.21	-59°35.52
CHA	23	270 10.52	209 10.30	12.74				_	207 31.82	19.22	Suhail	222°46.41	-43°32.21
GHA	Mer. <sub>I</sub>	pass. 05:02	$\nu$ -0.4′ d0.6	o' m-4.11	$\nu$ 1.1′ d-0	.6′ m1.52	$\nu$ 1.8′ <i>d</i> -0	.0′ m-1.89	$\nu$ 2.4′ d-0	.0′ m0.93			
Mon   GHA   CHA   Dec   GHA   Dec   GHA   Dec   GHA   Dec   GHA   Dec   GHA   Dec   Dubble   193*408 ≥ 61*370   192*56   13 00*15.52   22*94.92   181*3.31   12*96.98   11.02   188*293.31   12*96.98   12*12   188*293.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   12*96.98   13.02*12.31   13*96.98   13.02*12.3		_											
285°12.98   224°9.92   N18°11.34   122°8.58   N08°12.21   188°29.55   N22°10.45   282°9.14.5   50°19.22   10°19.22   10°19.22   13°19.79   11°19.22   11°19.23   11°19.23   11°29.33   11°20.23   11°29.33   11°	Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
1 300°15.44 239°9.94 13.93 137°9.69 11.62 237°3.13°7 1.043 297°3.60 19.22 13.15°1.07 12.05 21.05°2.07 11.05 218°3.22 10.41 31.2°9.13 1.03°9.13 1.02°9.13 1.02°9.13 1.03°9.13 1.0	0	$285^{\circ}12.98$	224°9.92	N18°13.34	122°8.58	N08°12.21	188°29.53	N23°10.45	282°34.26	S01°19.22			
2 315-17-01 296-91-01 14-53 152-91-07 9 11.03 218-33-22 10-41 312-39-13 19-22 31-44 313-32-32 296-91-01 29	1	$300^{\circ}15.44$				11.62		10.43	297°36.69	19.22			
3 30°.20.37					152° 10.79						1		
6 15°277 314°76°26 18°16.99   19°214 11 9.26					167°11.90								
15 15°27.77 314°7.62 N18'16.89 212"15.22 N08"8.67 278'40.62 N28"10.32 12"48.87 501"19.23 Spired 18"35.32 40"11.52 18"35.24 17.48 22"16.03 8.08 293"24.77 10.02 27"5.37 19.23 Hadai 12"5.15.9 49"5.11.59 84 45"32.69 344"6.85 11.02 24"17.43 7.49 308"44.32 11.0.27 42"53.75 19.23 Hadai 12"5.15.9 49"5.11.59 19.03 10 75"37.62 14"6.08 19.25 272"19.05 6.31 38"48.01 10.22 72"58.62 19.23 11.00 400.0 20"5.69 19.84 287"20.75 5.72 353"49.86 10.02 88"1.06 19.23 11.00 400.0 20"5.69 19.84 287"20.75 5.72 353"49.86 10.02 88"1.06 19.23 11.00 40.00 20"5.69 19.84 287"20.75 5.72 353"49.86 10.02 88"1.06 19.23 11.00 40.00 20"5.00 19.23 11.00 40.00 20"5.00 19.24 11.00 40.00 20"5.00 11.											Alioth	$166^{\circ}12.60$	55°49.55
8 4513269 344-68 58 18.07 242**Ir.43 1.09.29 27**61.31 19.23											Spica	158°21.83	-11°17.72
8 45°32.69 344°6.65 1.800° 22°11′4.3 7.49 308°4.43.2 10.27 42°13.75 19.23													
9 60°35,16 399°647 . 18.66 257°18.54							308°44.32						
11 90°40.09 29°5.69 19.45 2872°19.65 6.31 388°48.01 10.22 88°10.69 19.23 Rigit Kent. 139°39.46 -00°56.79 19.10°42.55 44°5.30 N18°20.43 30°22.186 N08°5.13 8°51.71 N23°10.18 103°3.50 S01°19.23 Kochab 137°19.19 74°5.25 13 100°42.55 44°5.30 N18°20.43 30°22.186 N08°5.13 8°51.71 N23°10.18 103°3.50 S01°19.23 Kochab 137°19.19 74°5.25 11 130°42.55 44°5.20 59°4.09 1 20.10 131°22.97 4.54 23°5.56 10.16 118°3.50 19.23 Alrace 112°15.03 26°5.24 11 135°47.48 74°4.52 21.60 332°24.07 3.05 38°55.11 10.13 133°8.37 19.23 Alrace 112°15.03 26°5.24 11 11.48°1.04 11.20°1.04 11.20°1.05 11.1 148°1.01 19.23 Alrace 112°15.03 26°5.24 11 11.18°1.05 11.1 148°1.01 19.23 Alrace 112°15.03 26°5.03 11.1 148°1.01 19.23 Sabik 102°2.00 15°15.01 19.24 Sabik 100°2.00 15°15.00 19.25 Sabik 100°2.00 15°15.00 15											1		
11 90°40.09 29°5.66 19.84 28°720.75 5.72 383°40.86 10.00 88°1.06 19.23 Kochab 137°19.19 74°3.35 12 10.16 10.50°3.35 50°19.23 13 100°45.02 59°4.91 21.01 31°72.297 4.54 23°5.55 6 10.16 118′5.94 19.23 14.136°47.48 74′4.52 21.66 0332°4.07 3.95 38°55.41 10.13 133°8.37 19.23 Alpheca 12°5.315 26°3.18 150°46.94 80°4.14 2.219 34°725.18 3.36 53°57.26 10.11 148°10.81 19.23 Alpheca 12°5.315 26°3.18 15 150°46.94 80°4.14 2.219 34°725.18 3.36 53°57.26 10.10 118°15.94 19.23 Akria 100°2.200 11°54.54 17 180°54.87 119°3.35 23.35 17°27.39 2.18 84°0.96 10.00 178°15.69 19.24 Sability 100°2.00 138°3.10 193°3.10 1	10												
12 105*42.52											"		
13 120°45,02 59°49,1 39°45,12 1.01 317°22,97 4.54 23°35,56 1.01.6 118°5,99 19.23 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.0											1		
15   150°49 94   89°4.14   22.19   347°25.18   3.36   53°57.26   10.11   148°10.81   19.23   Atria   10°8.38   66°4.85   17   180°54.87   119°3.35   23.35   17°27.39   218   84°0.96   10.00   178°15.69   19.24   180°54.87   119°3.35   23.35   17°27.39   218   84°0.96   10.00   178°15.69   19.24   180°55.74   14°2.96   180°3.39   32°2.50   10.00   114°4.66   10.00   1818.13   19.24   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13   1818.13											Alphecca		
16 165°S2.41 104°3.74 22.77 2°26.29 2.77 68°59.11 10.09 163°13.25 19.23 Am John Shall 178°15.69 19.24 19.24 19.26 19.24 19.26 19.24 19.26 19.26 19.24 19.26 19.25 19.26											Antares	$112^{\circ}15.03$	
180   54.687   119   3.35   23.35   17   27.739   2.18   84   0.06   1.06   18   18   15   0.05   19.24     18   19   57.34   134   29.6   118   23.51   30.68   21.08   21.09   21.													I
18 19s°57.34 134°2.96 N18°23.94 22°2.85 0 N08°1.59 99°2.81 N23°10.04 103°18.13 S01°19.24 Rashlague 99°57.84 123′7.53′ 19.24 120°59.80 149°2.57 24.52 47°2.96 1.00 114°4.66 10.02 208°2.05 7 19.24 124°4.73 179°1.78 · 25.09 77°31.62 07°59.82 144°8.35 · 9.97 238°2.54 · 19.24 122°2.56°7.19 194°1.39 26.27 92°3.29 59.23 159°10.20 9.95 253°27.88 19.24 Nam's 75°4.68 7 .26°18.86 12.22 256°7.19 194°1.39 26.27 92°3.29 59.23 159°10.20 9.95 253°27.88 19.24 Nam's 75°4.68 7 .26°18.86 12.22 25°2.78 100°4.06 m.4.11													
19 210°59.80 149°2.57 24.52 10 62°30.71 880.41 129°6.50 9.99 228°32.01 19.24 21 241°4.73 179°1.78 2.569 77°31.82 07°59.82 144°8.35 9.97 238°2.54 19.24 22 256°7.19 194°1.39 26.27 92°32.92 59.23 159°10.20 9.95 255°27.88 19.24 22 27°4.60 209°1.00 26.85 107°34.03 58.64 174°12.05 9.92 268°30.32 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°24.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°35.20 19.25 268°30.32 19°36.06 55.09 264°25.15 9.88 268°30.20 19°36.06 16°36.00 138°56.02 256°45.00 19.26 19.26 268°30.32 19°36.06 16°36.00 138°56.02 19°36.00 138°													
20 226°2.26 164°2.18 25.10 62°30.71 08°0.41 129°6.50 9.99 223°23.01 19.24   21 24'4.73 179°1.78 \cdot 25.69 77°31.82 07°59.82 144'8.35 \cdot 9.99 238°254.4 \cdot 19.24   22 256°7.19 194°1.39 26.27 92°32.92 59.23 159°10.20 9.95 253°27.88 19.24   Vega 80°3.52 38°48.44 4 19.24   Vega 80°3.52 238°48.44 4 19.25   Vega 80°3.52 238°48.44 4	19	$210^{\circ}59.80$	149°2.57	24.52	47°29.60	1.00	114° 4.66	10.02	208°20.57	19.24	_		
21 241*4.73 179*1.78 · · · · · · · · · · · · · · · · · · ·	20		164°2.18	25.10	$62^{\circ}30.71$		$129^{\circ}6.50$	9.99	223°23.01	19.24			
22 256°7.19 194°1.39 26.27 92°32.92 59.23 159°10.20 9.95 268°30.32 19.25  Mer.pass. 04:58										• • 19.24			I
Mer.pass. 04:58   \( \begin{array}{c c c c c c c c c c c c c c c c c c c													
Tue CHA CHA CHA Dec CH	23	271°9.66	209°1.00	26.85	107°34.03	58.64	174°12.05	9.92	268°30.32	19.25			
Tue GHA GHA Dec GHA GHA Dec GHA	Mer.	pass. 04:58	$\nu$ -0.4' d0.6	o' m-4.11	$\nu 1.1' \ d-0$	.6′ m1.52	$\nu 1.8' \ d-0$	.0′ m-1.89	$\nu 2.4' \ d0$	0′ m0.93	Peacock	53°4.51	-56°39.03
Tue GHA GHA Dec GHA Dec CHA DE		·											I
0 286°12.12 224°0.60 N18°27 43 122°35.13 N07°58.05 180°13.90 N23°9.90 283°32.76 S01°19.25 1 301°14.59 239°0.21 28.01 137°36.24 57.45 204°15.75 9.88 298°35.20 19.25 2316°17.05 253°59.81 28.99 152°37.34 56.86 219°17.60 9.85 313°37.64 19.25 24.00 19	т	CIIA	CIIA	D	CIIA	D	CIIA	D	CIIA	D	1		
1 301°14.59 239°0.21 28.01 137°36.24 57.45 204°15.75 9.88 298°35.20 19.25 23°35.95 132°37.64 19.25 23°15.75 25°35.98.1 28.59 152°37.34 56.86 219°17.60 9.85 313°37.64 19.25 23°35.98.1 29.26 2331°19.51 268°59.41 · · · · · · · · · · · · · · · · · · ·													
2 316°17.05 253°59.81 28.59 152°37.34 56.86 219°17.60 9.85 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.25 313°37.64 19.26 313°37.64 19.26 313°37.64 19.26 31.													
3 331°19,51 268°59,41 · · · · · · · · · · · · · · · · · · ·											1		
4 346°21.98 283°59.02 29.74 182°39.56 55.68 249°21.30 9.81 343°42.52 19.26 19.26 1°24.44 298°58.62 30.32 197°40.66 55.09 264°23.15 9.78 358°44.96 19.26 1°26.91 313°58.22 N18°30.90 212°41.77 N07°54.50 279°25.00 N23°9.76 13°47.40 501°19.26 187°28.15 15.52 19.26 18 46°31.83 343°57.42 32.05 242°43.98 53.31 309°28.70 9.71 43°52.29 19.26 19											iviarkab	10 29.33	10 20.52
6 16°26.91 313°58.22 N18°30.90 212°41.77 N07°54.50 279°25.00 N23°9.76 13°47.40 S01°19.26 7 31°29.37 328°57.82 31.47 227°42.87 53.90 294°26.85 9.74 28°49.85 19.26 8 46°31.83 343°57.42 32.05 242°43.98 53.31 309°28.70 9.71 43°52.29 19.26 9 61°34.30 358°57.02 · 32.62 257°45.08 · 52.72 324°30.55 · 9.69 58°54.73 · 19.27 10 76°36.76 13°56.62 33.20 272°46.19 52.13 339°32.40 9.66 73°57.17 19.27 10 19°39.23 28°56.22 33.77 287°47.29 51.54 354°34.25 9.64 88°59.61 19.27 12 106°41.69 43°55.82 N18°34.44 302°48.40 N07°50.94 9°36.10 N23°9.62 104°2.05 S01°19.27 13 121°44.16 58°55.41 34.91 317°49.50 50.35 24°37.95 9.59 119°4.49 19.28 11°655.60 15:50 11°25 11°49.08 88°54.61 · 36.06 347°51.71 · 49.16 54°41.65 · 9.54 149°9.38 · 19.28 16 166°51.55 103°54.20 36.63 2°52.82 48.57 69°43.50 9.52 164°11.82 19.29 17 181°54.01 118°53.80 37.20 17°53.92 47.98 84°45.35 9.50 179°14.26 19.29 19.29 11°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 200°19.15 19.29 11°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 200°19.15 19.29 11°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 200°19.15 19.29 11°58.94 148°52.17 · 39.47 77°58.34 · 45.61 144°52.75 · 9.40 239°24.03 · 19.30 19.			283°59.02							19.26			
7 31°29.37 328°57.82 31.47 227°42.87 53.90 294°26.85 9.74 28°49.85 19.26 8 46°31.83 343°57.42 32.05 242°43.98 53.31 309°28.70 9.71 43°52.29 19.26 9 61°34.30 358°57.02 ·· 32.62 257°45.08 ·· 52.72 324°30.55 ·· 9.69 58°54.73 ·· 19.27 10 76°36.76 13°56.62 33.20 272°46.19 52.13 339°32.40 9.66 73°57.17 19.27 11 91°39.23 28°56.22 33.77 287°47.29 51.54 354°34.25 9.64 88°59.61 19.27 12 106°41.69 43°55.82 N18°34.34 302°48.40 N07°50.94 9°36.10 N23°9.62 104°2.05 S01°19.27 13 121°44.16 58°55.41 34.91 317°49.50 50.35 24°37.95 9.59 119°4.49 19.28 14 136°46.62 73°55.01 35.49 332°50.61 49.76 39°38.00 9.57 134°6.93 19.28 15 151°49.08 88°54.61 ·· 36.06 347°51.71 ·· 49.16 54°41.65 ·· 9.54 149°9.38 ·· 19.28 16 166°51.55 103°54.20 36.63 2°52.82 48.57 69°43.50 9.52 164°11.82 19.29 17 181°54.01 118°53.80 37.20 17°53.92 47.98 84°45.35 9.50 179°14.26 19.29 19 211°58.94 148°52.99 38.33 47°55.13 46.79 114°49.05 9.45 209°19.15 19.29 20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 ·· 39.47 77°58.34 ·· 45.61 144°52.75 ·· 9.40 239°24.03 ·· 19.30 21 242°3.87 178°52.17 ·· 39.47 77°58.34 ·· 45.61 144°52.75 ·· 9.40 239°24.03 ·· 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31				30.32		55.09	$264^{\circ}23.15$	9.78		19.26			I
8 46°31.83 343°57.42 32.05 242°43.98 53.31 309°28.70 9.71 43°52.29 19.26 9 61°34.30 358°57.02 · 32.62 257°45.08 · 52.72 324°30.55 · 9.69 58°54.73 · 19.27 10 76°36.76 13°56.62 33.20 272°46.19 52.13 339°32.40 9.66 73°57.17 19.27 11 91°39.23 28°56.22 33.77 287°47.29 51.54 354°34.25 9.64 88°59.61 19.27 12 106°41.69 43°55.82 N18°34.34 302°48.40 N07°50.94 9°36.10 N23°9.62 104°2.05 501°19.27 13 121°44.16 58°55.41 34.91 317°49.50 50.35 24°37.95 9.59 119°4.49 19.28 14 136°46.62 73°55.01 35.49 332°50.61 49.76 39°39.80 9.57 134°6.93 19.28 15 151°49.08 88°54.61 · 36.06 347°51.71 · 49.16 54°41.65 · 9.54 149°9.38 · 19.28 16 166°51.55 103°54.20 36.63 2°52.82 48.57 69°43.50 9.52 164°11.82 19.29 17 181°54.01 118°53.80 37.20 17°53.92 47.98 84°45.35 9.50 179°14.26 19.29 18 196°56.48 133°53.39 N18°37.77 32°55.03 N07°47.39 99°47.20 N23°9.47 194°16.70 501°12.92 19 211°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · 39.47 77°58.34 · 45.61 144°52.75 · 9.40 239°24.03 · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31													
9 61°34.30 358°57.02 · · 32.62 257°45.08 · · 52.72 324°30.55 · · 9.69 58°54.73 · · 19.27 10 76°36.76 13°56.62 33.20 272°46.19 52.13 339°32.40 9.66 73°57.17 19.27 11 91°39.23 28°56.22 33.77 287°47.29 51.54 354°34.25 9.64 88°59.61 19.27 12 106°41.69 43°55.82 N18°34.34 302°48.40 N07°50.94 9°36.10 N23°9.62 104°2.05 S01°19.27 13 121°44.16 58°55.41 34.91 317°49.50 50.35 24°37.95 9.59 119°4.49 19.28 14 136°46.62 73°55.01 35.49 332°50.61 49.76 39°39.80 9.57 134°6.93 19.28 15 151°49.08 88°54.61 · · 36.06 347°51.71 · · · 49.16 54°41.65 · · · 9.54 149°9.38 · · 19.28 16 166°51.55 103°54.20 36.63 2°52.82 48.57 69°43.50 9.52 164°11.82 19.29 17 181°54.01 118°53.80 37.20 17°53.92 47.98 84°45.35 9.50 179°14.26 19.29 19 211°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · · 39.47 77°58.34 · · 45.61 144°52.75 · · 9.40 239°24.03 · · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31													
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10 76 36.76											Jul 07 Mon	SHA	Mer.pass
12 106°41.69													
13 121°44.16 58°55.41 34.91 317°49.50 50.35 24°37.95 9.59 119°4.49 19.28 14 136°46.62 73°55.01 35.49 332°50.61 49.76 39°39.80 9.57 134°6.93 19.28 151°49.08 88°54.61 · · 36.06 347°51.71 · · · 49.16 54°41.65 · · · 9.54 149°9.38 · · 19.28 16 166°51.55 103°54.20 36.63 2°52.82 48.57 69°43.50 9.52 164°11.82 19.29 18 196°56.48 133°53.80 N18°37.77 32°55.03 N07°47.39 99°47.20 N23°9.47 194°16.70 501°19.29 19 211°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 212°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 212°58.94 148°52.93 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · · 39.47 77°58.34 · · 45.61 144°52.75 · · 9.40 239°24.03 · · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 Nars: 0.1 Mars: 0.1													
14 136°46.62 73°55.01 35.49 332°50.61 49.76 39°39.80 9.57 134°6.93 19.28 15 151°49.08 88°54.61 · · · 36.06 347°51.71 · · · 49.16 54°41.65 · · · 9.54 149°9.38 · · 19.28 16 166°51.55 103°54.20 36.63 2°52.82 48.57 69°43.50 9.52 164°11.82 19.29 17 181°54.01 118°53.80 37.20 17°53.92 47.98 84°45.35 9.50 179°14.26 19.29 18 196°56.48 133°53.39 N18°37.77 32°55.03 N07°47.39 99°47.20 N23°9.47 194°16.70 501°19.29 19 211°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · · 39.47 77°58.34 · · 45.61 144°52.75 · · 9.40 239°24.03 · · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31													I
16       166°51.55       103°54.20       36.63       2°52.82       48.57       69°43.50       9.52       164°11.82       19.29       Venus       297°48.48       09:04         17       181°54.01       118°53.80       37.20       17°53.92       47.98       84°45.35       9.50       179°14.26       19.29       Mars       196°23.01       15:48         18       196°56.48       133°53.39       N18°37.77       32°55.03       N07°47.39       99°47.20       N23°9.47       194°16.70       S01°19.29       Jupiter       263°1.78       11:22         19       211°58.94       148°52.99       38.33       47°56.13       46.79       114°49.05       9.45       209°19.15       19.29       Saturn       357°20.64       05:05         20       227°1.41       163°52.58       38.90       62°57.24       46.20       129°50.90       9.42       224°21.59       19.30         21       242°3.87       178°52.17       39.47       77°58.34       45.61       144°52.75       9.40       239°24.03       19.30       19.30         22       257°6.33       193°51.77       40.04       92°59.45       45.01       159°54.60       9.38       254°26.48       19.30       19.30       Venus<											Saturn	351 - 21.28	05:09
17 181°54.01 118°53.80 37.20 17°53.92 47.98 84°45.35 9.50 179°14.26 19.29 18 196°56.48 133°53.39 N18°37.77 32°55.03 N07°47.39 99°47.20 N23°9.47 194°16.70 S01°19.29 19 211°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · 39.47 77°58.34 · 45.61 144°52.75 · 9.40 239°24.03 · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31  Mars 196°23.01 15:48  Jupiter 263°1.78 11:22  Saturn 357°20.64 05:05													
18													
19 211°58.94 148°52.99 38.33 47°56.13 46.79 114°49.05 9.45 209°19.15 19.29 20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · 39.47 77°58.34 · 45.61 144°52.75 · 9.40 239°24.03 · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31  Saturn 357°20.64 05:05  Horizontal parallax Venus: 0.1 Mars: 0.1													
20 227°1.41 163°52.58 38.90 62°57.24 46.20 129°50.90 9.42 224°21.59 19.30 21 242°3.87 178°52.17 · · 39.47 77°58.34 · · 45.61 144°52.75 · · 9.40 239°24.03 · · 19.30 22 257°6.33 193°51.77 40.04 92°59.45 45.01 159°54.60 9.38 254°26.48 19.30 23 272°8.80 208°51.36 40.60 108°0.55 44.42 174°56.45 9.35 269°28.92 19.31  Horizontal parallax Venus: 0.1 Mars: 0.1													
21       242°3.87       178°52.17       · · 39.47       77°58.34       · · 45.61       144°52.75       · · 9.40       239°24.03       · · 19.30       Horizontal parallax         22       257°6.33       193°51.77       40.04       92°59.45       45.01       159°54.60       9.38       254°26.48       19.30       Venus:       0.1         23       272°8.80       208°51.36       40.60       108°0.55       44.42       174°56.45       9.35       269°28.92       19.31       Mars:       0.1											Saturn	331 20.04	U5:U5
22       257°6.33       193°51.77       40.04       92°59.45       45.01       159°54.60       9.38       254°26.48       19.30       Venus:       0.1         23       272°8.80       208°51.36       40.60       108°0.55       44.42       174°56.45       9.35       269°28.92       19.31       Mars:       0.1											Horizon	ıtal parallax	
25 272 0.00 20 57.50 10.00 10.00 17.12 17.1 50.15 5.55 20 20.52 15.51	22	257°6.33			92°59.45								
Mer.pass. 04:54 $\nu$ -0.4′ $d$ 0.6′ m-4.10 $\nu$ 1.1′ $d$ -0.6′ m1.53 $\nu$ 1.8′ $d$ -0.0′ m-1.89 $\nu$ 2.4′ $d$ 0.0′ m0.92	23	272°8.80	208°51.36	40.60	108°0.55	44.42	174°56.45	9.35	269°28.92	19.31		Mars:	0.1
	Mer.	pass. 04:54	ν-0.4' d0.6	o' m-4.10	$\nu$ 1.1' d-0	.6′ m1.53	$\nu 1.8' \ d-0$	.0′ m-1.89	$\nu$ 2.4′ d0	.0′ m0.92			

h	Su	n		ı	Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.58	N22°40.86	58° 57.62	13.2'	S21°35.61	9.6'	54.2'
1	193°48.47	40.61	73°29.84	13.1'	$21^{\circ}45.22$	9.5'	54.2'
2	208°48.37	40.36	88°1.98	13.1'	21°54.75	9.4'	54.2'
3	223°48.27	• • 40.10	102°34.04	13.0'	22°4.19	9.3'	54.2'
4 5	238°48.16 253°48.06	39.85 39.59	117°6.02 131°37.93	12.9' 12.8'	22°13.53 22°22.78	9.3' 9.2'	54.2' 54.2'
6	268°47.96	N22°39.34	146°9.76	12.8'	S22°31.94	9.2	54.2'
7	283°47.85	39.08	160°41.51	12.7'	22°41.01	9.0'	54.2'
8	298°47.75	38.82	$175^{\circ}13.18$	12.6'	$22^{\circ}49.98$	8.9'	54.2'
9	313°47.65	• • 38.57	189° 44.78	12.5'	22°58.85	8.8'	54.2'
10 11	328°47.54 343°47.44	38.31 38.05	204° 16.29 218° 47.73	12.4' 12.4'	23°7.63 23°16.31	8.7' 8.6'	54.3' 54.3'
12	358°47.34	N22°37.79	233°19.09	12.3'	523°24.89	8.5'	54.3
13	13°47.24	37.53	247° 50.37	12.2'	23°33.37	8.4'	54.3'
14	28°47.13	37.27	$262^{\circ}21.57$	12.1'	$23^{\circ}41.75$	8.3'	54.3'
15	43°47.03	• • 37.00	276° 52.69	12.0'	23°50.03	8.2'	54.3'
16 17	58°46.93 73°46.83	36.74 36.48	291°23.72 305°54.68	12.0' 11.9'	23°58.21 24°6.28	8.1' 8.0'	54.3' 54.3'
18	88°46.73	N22°36.21	320° 25.56	11.8'	\$24° 14.25	7.9'	54.3'
19	103°46.63	35.95	334°56.36	11.7'	24°22.11	7.8'	54.3'
20	118°46.52	35.68	349° 27.09	11.6'	24°29.87	7.6'	54.3'
21	133°46.42	• • 35.42	3°57.73	11.6'	24° 37.52	7.5'	54.4'
22 23	148°46.32 163°46.22	35.15 34.88	18°28.29 32°58.77	11.5' 11.4'	24° 45.05 24° 52.48	7.4' 7.3'	54.4' 54.4'
23			JZ J0.11			1.3	J4.4
	SD = 15.7'	d = -0.3'		SD	= 14.8′		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.12	N22°34.62 34.35	47°29.17	11.3'	\$24°59.80	7.2'	54.4'
1 2	193°46.02 208°45.92	34.35 34.08	61°59.49 76°29.74	11.2' 11.2'	25°7.01 25°14.11	7.1' 7.0'	54.4' 54.4'
3	223°45.82	• • 33.81	90°59.90	11.1'	25°21.09	6.9	54.4'
4	238°45.72	33.54	105°29.99	11.0'	25°27.96	6.8'	54.4'
5	253°45.62	33.26	120°0.00	10.9'	25°34.71	6.6'	54.4'
6	268°45.52	N22°32.99	134°29.93	10.9'	\$25°41.34	6.5'	54.5'
7 8	283°45.42 298°45.32	32.72 32.45	148°59.79 163°29.56	10.8' 10.7'	25° 47.86 25° 54.26	6.4' 6.3'	54.5' 54.5'
9	313°45.22	32.17	177° 59.26	10.6'	26°0.54	6.2	54.5'
10	328°45.13	31.90	192°28.89	10.5'	26°6.71	6.0'	54.5'
11	343°45.03	31.62	206°58.43	10.5'	$26^{\circ}12.75$	5.9'	54.5'
12	358°44.93	N22°31.35	221°27.91	10.4'	S26°18.66	5.8'	54.5'
13 14	13°44.83 28°44.73	31.07 30.79	235°57.30 250°26.63	10.3' 10.3'	26°24.46 26°30.13	5.7' 5.5'	54.5' 54.6'
15	43°44.63	30.51	264°55.88	10.3	26°35.67	5.4'	54.6'
16	58°44.54	30.23	279°25.05	10.1'	26°41.09	5.3'	54.6'
17	73°44.44	29.95	293°54.16	10.0'	26°46.39	5.2'	54.6'
18	88°44.34 103°44.24	N22°29.67	308°23.19 322°52.16	10.0'	\$26°51.55 26°56.59	5.0'	54.6'
19 20	103 44.24 118°44.15	29.39 29.11	322 52.10 337°21.05	9.9' 9.8'	20 50.59 27°1.50	4.9' 4.8'	54.6' 54.6'
21	133°44.05	• • 28.83	351°49.87	9.8'	27° 6.27	4.6'	54.7
22	148°43.95	28.55	6° 18.63	9.7'	27° 10.92	4.5'	54.7'
23	163°43.86	28.26	20°47.31	9.6'	$27^{\circ}15.44$	4.4'	54.7'
	SD = 15.7'	d = -0.3'		SD	= 14.8'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	178°43.76	N22°27.98	$35^{\circ}15.93$	9.6'	S27°19.82	4.2'	54.7'
1	193°43.67	27.69	49°44.49	9.5'	27°24.06	4.1'	54.7'
2	208°43.57 223°43.47	27.41 •• 27.12	64° 12.98 78° 41.40	9.4' 9.4'	27°28.18 27°32.16	4.0' 3.8'	54.7' 54.8'
3 4	223°43.47 238°43.38	26.83	78°41.40 93°9.76	9.4	27° 32.16 27° 36.00	3.8	54.8° 54.8°
5	253°43.28	26.55	107°38.06	9.2'	27°39.70	3.6'	54.8'
6	268°43.19	N22°26.26	122°6.30	9.2'	S27°43.27	3.4'	54.8'
7	283°43.09	25.97	136° 34.48	9.1'	27°46.70	3.3'	54.8'
8 9	298°43.00 313°42.90	25.68 •• 25.39	151°2.60 165°30.67	9.1' 9.0'	27°49.99 27°53.14	3.1' 3.0'	54.8' 54.9'
10	313 42.90 328°42.81	25.10	105 30.07 179°58.68	9.0' 9.0'	27°56.14	3.0 2.9'	54.9'
11	343°42.71	24.81	194°26.63	8.9'	27°59.01	2.7'	54.9'
12	358°42.62	N22°24.51	208° 54.53	8.8'	\$28°1.73	2.6'	54.9'
13	13°42.53	24.22	223°22.37	8.8'	28°4.32	2.4'	54.9'
14 15	28°42.43 43°42.34	23.93 •• 23.63	237°50.17 252°17.91	8.7' 8.7'	28° 6.75 28° 9.05	2.3' 2.1'	54.9' 55.0'
16	58°42.24	23.34	266° 45.61	8.6'	28° 11.20	2.1	55.0'
17	73°42.15	23.04	281° 13.25	8.6'	28° 13.20	1.9'	55.0'
18	88°42.06	N22°22.75	295° 40.85	8.6'	S28° 15.06	1.7'	55.0'
19	103°41.97	22.45	310°8.41	8.5'	28° 16.77 28° 18.33	1.6'	55.0'
20 21	118°41.87 133°41.78	22.15 •• 21.85	324°35.93 339°3.40	8.5' 8.4'	28° 18.33 28° 19.75	1.4' 1.3'	55.1' 55.1'
22	133 41.76 148°41.69	21.55	353° 30.83	8.4'	28°21.02	1.1'	55.1'
23	163°41.60	21.25	7°58.22	8.4'	28°22.14	1.0'	55.1'
	SD = 15.7'	d = -0.3'		SD	= 14.9'		

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

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

h	Aries	Venus	ŕ	M	ars	Jup	iter	Sat	urn		Stars	
Wed	GHA	GHA De		GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	287°11.26	223°50.95 N18°		3°1.66	N07°43.82	189°58.30	N23°9.33	284°31.36	S01°19.31			
1	302° 13.73			8°2.76	43.23	205° 0.15	9.30	299°33.81	19.31	Alpheratz	357°34.25	29°13.78
2	$317^{\circ}16.19$	253°50.13	2.29 15	3°3.86	42.64	220°2.00	9.28	$314^{\circ}36.25$	19.32	Ankaa Schedar	353° 6.64 349° 30.51	-42°9.75 56°40.41
3	$332^{\circ}18.65$			8°4.97	• • 42.04	235° 3.85	• • 9.25	329°38.69	•• 19.32	Diphda	348°46.84	-17°50.63
4	347°21.12			3°6.07	41.45	250° 5.70	9.23	344°41.14	19.33	Achernar	335°19.94	-57° 6.09
5 6	2°23.58 17°26.05	298°48.90 313°48.48 N18°4		8°7.18 3°8.28	40.85 N07°40.26	265°7.55 280°9.40	9.20 N23°9.18	359°43.58 14°46.03	19.33 S01°19.33	Hamal	$327^{\circ}50.82$	23°34.92
7	32°28.51			8°9.38	39.66	295°11.25	9.16	29° 48.47	19.34	Polaris	314°3.83	89°22.00
8	47°30.98			° 10.49	39.07	310°13.10	9.13	44°50.92	19.34	Acamar	315°11.65	-40°11.87
9	62°33.44			° 11.59	• • 38.48	325°14.95	• • 9.11	59°53.36	•• 19.35	Menkar Mirfak	314°5.87 308°27.95	4°11.44 49°56.93
10	77°35.90			° 12.70	37.88	340°16.80	9.08	74°55.81	19.35	Aldebaran	290°39.41	16°33.63
11	92°38.37			°13.80	37.29	355°18.65	9.06	89° 58.25	19.35	Rigel	281°3.76	-8°10.24
12 13	107° 40.83 122° 43.30	43°46.00 N18°4 58°45.58		° 14.90 ° 16.01	N07°36.69 36.10	10°20.50 25°22.35	N23°9.03 9.01	105°0.70 120°3.14	\$01°19.36 19.36	Capella	$280^{\circ}21.70$	46°1.33
14	137° 45.76			°17.11	35.50	40°24.21	8.98	135°5.59	19.37	Bellatrix	278°22.73	6°22.41
15	152° 48.23	88°44.75 · · ·		° 18.21	• • 34.90	55°26.06	• • 8.96	150°8.03	• • 19.37	Elnath	278°1.68	28°37.70 -1°11.07
16	$167^{\circ}50.69$			°19.32	34.31	70°27.91	8.93	$165^{\circ}10.48$	19.38	Alnilam Betelgeuse	275°37.61 270°51.95	7°24.75
17	182°53.15			°20.42	33.71	85°29.76	8.91	180°12.93	19.38	Canopus	263°52.76	-52°42.42
18	197°55.62	133°43.49 N18°! 148°43.07		°21.52	N07°33.12 32.52	100°31.61 115°33.46	N23°8.88	195° 15.37	S01°19.38	Sirius	$258^{\circ}26.22$	-16°44.99
19 20	212°58.08 228°0.55			°22.63 °23.73	31.93	130°35.31	8.86 8.83	210° 17.82 225° 20.27	19.39 19.39	Adhara	$255^{\circ}5.92$	-29°0.33
21	243°3.01	178°42.23 · · !		°24.83	• • 31.33	145°37.16	• 8.81	240°22.71	• 19.40	Procyon	244°50.73	5°9.62
22	258°5.47			°25.94	30.73	160°39.01	8.78	255° 25.16	19.40	Pollux	243°17.17 234°15.21	27°57.93 -59°35.50
23	273°7.94	208°41.39	3.99 108	°27.04	30.14	175°40.86	8.76	270°27.61	19.41	Avior Suhail	234 15.21 222°46.41	-59°35.50 -43°32.20
Mer.	pass. 04:50	ν-0.4' d0.6' m-4	$1.09  \nu$	.1′ <i>d</i> -0	.6′ m1.53	$\nu$ 1.9′ d-0.	0' m-1.89	$\nu$ 2.4′ d0.	0′ m0.92	Miaplacidus	221°39.06	-69°49.43
						-				Alphard	$217^{\circ}47.62$	-8°46.14
Thu	GHA	GHA De	c (	SHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°34.23	11°50.63
0	288° 10.40	223°40.97 N18°		°28.14	N07°29.54	190°42.72	N23°8.73	285°30.05	S01°19.41	Dubhe Denebola	193°40.83 182°24.63	61°37.06 14°25.86
1	$303^{\circ}12.87$			° 29.25	28.94	205°44.57	8.71	300°32.50	19.42	Gienah	175°43.23	-17°41.10
2	318° 15.33			°30.35	28.35	220°46.42	8.68	315°34.95	19.42	1	172°59.78	-63°14.73
3	333° 17.80	268°39.69 · · !		°31.45	• • 27.75	235°48.27	• • 8.66	330°37.40	19.43		$171^{\circ}51.29$	-57°15.64
4 5	348°20.26 3°22.72			°32.55	27.15 26.56	250°50.12 265°51.97	8.63 8.60	345°39.84 0°42.29	19.44 19.44	Alioth	166°12.61	55°49.55
6	18°25.19	313°38.42 N18°		°34.76	N07°25.96	280°53.82	N23°8.58	15° 44.74	S01°19.45	Spica	158°21.83	-11°17.72
7	$33^{\circ}27.65$			°35.86	25.36	295°55.68	8.55	$30^{\circ}47.19$	19.45	Alkaid Hadar	152°51.57 148°35.25	49°11.39 -60°30.04
8	48°30.12			°36.96	24.77	310°57.53	8.53	45°49.64	19.46	I	147°57.02	-36°29.91
9	63°32.58			°38.07	• • 24.17	325°59.38	• • 8.50	60°52.09	• 19.46	Arcturus	$145^{\circ}47.42$	19°3.08
10 11	78°35.05 93°37.51	13°36.71 19° 28°36.28		°39.17 °40.27	23.57 22.98	341°1.23 356°3.08	8.48 8.45	75°54.54 90°56.98	19.47 19.48	Rigil Kent.	139°39.47	-60°56.71
12	108°39.97	43°35.85 N19°		°41.37	N07°22.38	11°4.93	N23°8.43	105°59.43	S01°19.48	Kochab	137°19.24 136°55.40	74°3.26
13	123° 42.44	58°35.42	1.63 318	°42.48	21.78	26° 6.79	8.40	121°1.88	19.49	Alphecca	130 55.40 126°3.15	-16°8.94 26°37.84
14	138° 44.90	73°34.99		°43.58	21.18	41°8.64	8.37	136°4.33	19.49	Antares	112° 15.03	-26°29.38
15	153° 47.37			°44.68	• • 20.58	56°10.49	• • 8.35	151°6.78	• • 19.50	Atria	107°8.38	-69° 4.54
16 17	168° 49.83 183° 52.29	103°34.13 118°33.70		° 45.78 ° 46.88	19.99 19.39	71°12.34 86°14.19	8.32 8.30	166°9.23 181°11.68	19.51 19.51	Sabik	102°1.99	-15°45.40
18	198°54.76	133°33.26 N19°		°47.99	N07°18.79	101°16.04	N23°8.27	196° 14.13	S01°19.52	Shaula	96° 9.41 95° 57.84	-37°7.38 12°32.53
19	213°57.22	148°32.83	4.86 48	°49.09	18.19	$116^{\circ}17.90$	8.24	$211^{\circ}16.58$	19.52	Rasalhague Eltanin	90°41.47	51°29.17
20	228°59.69	163°32.40		°50.19	17.59	131°19.75	8.22	226°19.03	19.53	Kaus Aust.		-34°22.34
21	244°2.15			°51.29	16.99	146°21.60	• • 8.19	241°21.48	19.54	Vega	$80^{\circ}32.51$	38°48.45
22 23	259°4.62 274°7.08	193°31.53 208°31.09		°52.39 °53.49	16.40 15.80	161°23.45 176°25.30	8.17 8.14	256°23.93 271°26.39	19.54 19.55	Nunki	75°46.86	-26°15.86
										Altair	61°59.21	8°56.16
Mer.p	pass. 04:47	ν-0.4' d0.5' m-	$\begin{array}{ccc} 1.09 & \nu \end{array}$	1.1' <i>d</i> -0	.6′ m1.53	$\nu$ 1.9′ <i>d</i> -0.	0′ m-1.90	$\nu$ 2.4′ d0.	0′ m0.91	Peacock Deneb	53°4.48 49°25.09	-56°39.03 45°22.19
										Enif	33°38.12	9°59.53
Fri	GHA	GHA De		GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°32.03	-46°50.02
0 1	289°9.54 304°12.01	223°30.65 N19° 238°30.22		°54.60 °55.70	N07°15.20 14.60	191°27.16 206°29.01	N23°8.11 8.09	286°28.84 301°31.29	S01°19.56 19.56	Fomalhaut	15°13.84	-29°29.03
2	304 12.01 319°14.47	253° 29.78		°56.80	14.00	206 29.01 221°30.86	8.09 8.06	301 31.29 316°33.74	19.50	Scheat	13°44.61	28°13.19
3	334° 16.94			°57.90	• • 13.40	236°32.71	• • 8.04	331° 36.19	• • 19.58	Markab	13°29.30	15°20.53
4	349° 19.40	283°28.90		°59.00	12.80	251°34.57	8.01	346°38.64	19.59	Jul 09 Wed	SHA	Mer.pass
5	4°21.87			9°0.10	12.20	266°36.42	7.98	1°41.10	19.59		296°39.69	09:05
6 7	19°24.33 34°26.79	313°28.03 N19°3 328°27.59			N07°11.60 11.00	281°38.27 296°40.12	N23°7.96 7.93	16°43.55 31°46.00	S01°19.60	1	195°50.39 262°47.04	15:47 11:19
8	34°26.79 49°29.26			9°2.30 4°3.41	11.00	296°40.12 311°41.98	7.93 7.90	46°48.45	19.61 19.61		357°20.10	05:01
9	64°31.72			9°4.51	9.81	326°43.83	• • 7.88	61°50.90	• 19.62			
10	79°34.19	13°26.26	.2.84 27	4°5.61	9.21	341°45.68	7.85	$76^{\circ}53.36$	19.63	Jul 10 Thu	<b>SHA</b> 295°30.56	Mer.pass 09:06
11	94°36.65			9°6.71	8.61	356°47.53	7.82	91°55.81	19.64		195°17.74	15:45
12 13	109°39.11 124°41.58	43°25.38 N19°: 58°24.93		4°7.81 9°8.91	N07°8.01 7.41	11°49.39 26°51.24	N23°7.80 7.77	106°58.26 122°0.72	S01°19.64 19.65		262°32.31	11:16
13 14	124 41.58 139°44.04			° 10.01	6.81	20 51.24 41°53.09	7.77 7.74	122 0.72 137°3.17	19.65	Saturn	357°19.65	04:57
15	154° 46.51			°11.11	. 6.21	56°54.94	• • 7.72	152°5.62	• • 19.67	Jul 11 Fri	SHA	Mer.pass
16	$169^{\circ}48.97$	103°23.60	.5.99 4	° 12.21	5.60	71°56.80	7.69	167°8.08	19.68		294°21.11	09:06
17	184°51.44			°13.31	5.00	86°58.65	7.66	182°10.53	19.68		194°45.05	15:43
18 19	199°53.90 214°56.36	133°22.71 N19°: 148°22.26		° 14.41 ° 15.51	N07° 4.40 3.80	102° 0.50 117° 2.36	N23°7.64 7.61	197° 12.99 212° 15.44	\$01°19.69 19.70		262°17.61	11:13
20	214 50.30 229°58.83			° 16.61	3.20	117 2.30 132° 4.21	7.58	212 15.44 227° 17.89	19.70	Saturn	357°19.29	04:53
21	245°1.29	178°21.37 · ·		° 17.71	2.60	147° 6.06	7.56	242°20.35	• • 19.72	Horizor	ıtal parallax	
22	260°3.76			° 18.81	2.00	162°7.92	7.53	257°22.80	19.72		Venus:	0.1
23	275°6.22	208°20.47	.9.63 109	° 19.91	1.40	177° 9.77	7.50	272°25.26	19.73		Mars:	0.1
Mer.p	pass. 04:43	u-0.4′ $d$ 0.5′ m-4	$1.08   \nu$ 1	L.1′ <i>d</i> -0	.6′ m1.54	$\nu$ 1.9′ d-0.	0′ m-1.90	$\nu$ 2.5′ d0.	0′ m0.91			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.50	$N22^{\circ}20.95$	22°25.58	8.3'	S28°23.11	0.8'	55.1'
1	193°41.41	20.65	36°52.90	8.3'	28°23.92	0.7'	55.1'
2	208°41.32 223°41.23	20.35	51°20.18 65°47.44	8.3' 8.2'	28°24.59 28°25.11	0.5' 0.4'	55.2' 55.2'
4	238°41.14	19.75	80°14.66	8.2'	28°25.48	0.4	55.2'
5	253°41.05	19.44	94°41.85	8.2'	28°25.70	0.1'	55.2'
6	268°40.96	$N22^{\circ}19.14$	109°9.01	8.1'	\$28°25.76	-0.1'	55.2'
7	283°40.86 298°40.77	18.83	123°36.15 138°3.26	8.1' 8.1'	28°25.67 28°25.43	-0.2' -0.4'	55.3' 55.3'
8 9	298 40.77 313°40.68	18.53 •• 18.22	150 3.20 152°30.35	8.1'	28°25.04	-0.4 -0.5'	55.3'
10	328°40.59	17.91	166°57.42	8.0'	28°24.49	-0.7	55.3'
11	343°40.50	17.61	181°24.46	8.0'	28°23.79	-0.9'	55.3'
12	358°40.41	N22° 17.30	195°51.49	8.0'	S28°22.94	-1.0'	55.4'
13 14	13°40.32 28°40.24	16.99 16.68	210° 18.50 224° 45.50	8.0' 8.0'	28°21.93 28°20.77	-1.2' -1.3'	55.4' 55.4'
15	43°40.15	. 16.37	239°12.48	8.0'	28° 19.45	-1.5'	55.4'
16	58°40.06	16.06	253°39.45	8.0'	28°17.98	-1.6'	55.4'
17	73°39.97	15.75	268°6.41	8.0'	28°16.35	-1.8'	55.5'
18	88°39.88 103°39.79	N22° 15.43	282°33.37 297°0.31	7.9'	\$28°14.57 28°12.64	-1.9'	55.5'
19 20	103°39.79 118°39.70	15.12 14.81	311°27.25	7.9' 7.9'	28°12.64 28°10.55	-2.1' -2.2'	55.5' 55.5'
21	133°39.61	. 14.49	325°54.19	7.9'	28°8.30	-2.4	55.5'
22	148°39.53	14.18	$340^{\circ}21.12$	7.9'	28°5.90	-2.6'	55.6'
23	163°39.44	13.86	354°48.06	7.9'	28° 3.35	-2.7'	55.6'
	SD = 15.7'	d = -0.3'		SI	O = 15.0'		
TL	GHA	Das			Dec	ر.	ЫD
Thu 0	GHA 178°39.35	Dec N22° 13.55	<b>GHA</b> 9°14.99	u 7.9'	<b>Dec</b> \$28° 0.64	d -2.9'	<b>HP</b> 55.6'
1	193°39.26	13.23	23°41.93	7.9'	27°57.78	-3.0'	55.6'
2	208°39.18	12.91	38°8.88	7.9'	27°54.76	-3.2'	55.6'
3	223°39.09 238°39.00	· · 12.59 12.27	52°35.83 67°2.78	8.0'	27°51.58 27°48.26	-3.3'	55.7'
4 5	253°38.92	12.27	81°29.75	8.0' 8.0'	27 48.20 27°44.77	-3.5' -3.6'	55.7' 55.7'
6	268°38.83	N22°11.63	95° 56.73	8.0'	S27°41.14	-3.8'	55.7'
7	283°38.74	11.31	110°23.72	8.0'	27°37.35	-3.9'	55.8'
8	298°38.66	10.99	124°50.72	8.0'	27°33.40	-4.1'	55.8'
9 10	313°38.57 328°38.49	· · 10.67 10.35	139°17.74 153°44.78	8.0' 8.1'	27°29.31 27°25.06	-4.3' -4.4'	55.8' 55.8'
11	343°38.40	10.02	168°11.84	8.1	27°20.65	-4.6'	55.8'
12	358°38.32	N22°9.70	182°38.91	8.1'	S27°16.10	-4.7'	55.9'
13	13°38.23	9.37	197°6.01	8.1'	27°11.39	-4.9'	55.9'
14 15	28°38.15 43°38.06	9.05 •• 8.72	211°33.13 226°0.28	8.1' 8.2'	27° 6.53 27° 1.52	-5.0' -5.2'	55.9' 55.9'
16	58°37.98	8.39	240°27.45	8.2'	26°56.35	-5.3	55.9'
17	73°37.89	8.07	254°54.64	8.2'	$26^{\circ}51.04$	-5.5'	56.0'
18	88°37.81	N22°7.74	269°21.87	8.3'	S26°45.58	-5.6'	56.0'
19 20	103°37.72 118°37.64	7.41 7.08	283°49.13 298°16.42	8.3' 8.3'	26°39.96 26°34.20	-5.8' -5.9'	56.0' 56.0'
21	133°37.56	. 6.75	312°43.74	8.4	26°28.29	-6.1'	56.1
22	148°37.47	6.42	327°11.09	8.4'	26°22.23	-6.2'	56.1'
23	163°37.39	6.09	341°38.48	8.4'	26°16.02	-6.4'	56.1'
	SD = 15.7'	d = -0.3'		SI	O = 15.2'		
Fri	GHA	Dec	GHA	ν	Dec	d	НР
0	178°37.31	N22°5.76	356°5.90	8.5'	\$26° 9.67	-6.5'	56.1'
1	193°37.22	5.42	10°33.37	8.5'	$26^{\circ}3.16$	-6.6'	56.1'
2	208°37.14	5.09	25°0.87	8.5'	25°56.52	-6.8'	56.2'
3 4	223°37.06 238°36.98	· · 4.76 4.42	39°28.41 53°55.99	8.6' 8.6'	25°49.73 25°42.79	-6.9' -7.1'	56.2' 56.2'
5	253°36.90	4.42	68°23.61	8.7'	25°35.71	-7.1 -7.2'	56.2
6	268°36.81	N22°3.75	82°51.28	8.7'	S25°28.48	-7.4'	56.3'
7	283°36.73	3.41	97°18.99	8.8'	25°21.12	-7.5'	56.3'
8 9	298°36.65 313°36.57	3.07 •• 2.74	111°46.74 126°14.54	8.8' 8.8'	25°13.61 25°5.96	-7.6' -7.8'	56.3' 56.3'
10	313 36.57 328°36.49	2.40	120 14.54 140°42.39	8.9'	25 5.90 24°58.17	-7.8 -7.9'	56.3'
11	343°36.41	2.06	155° 10.29	8.9'	24°50.24	-8.1'	56.4
12	358°36.33	N22°1.72	169°38.23	9.0'	\$24°42.17	-8.2'	56.4
13 14	13°36.25 28°36.17	1.38 1.04	184°6.22 198°34.27	9.0' 9.1'	24°33.96 24°25.62	-8.3' -8.5'	56.4' 56.4'
14 15	43°36.09	. 0.69	213°2.36	9.1 9.1'	24 25.02 24°17.14	-8.6'	56.5'
16	58°36.01	0.35	227°30.50	9.2'	24°8.53	-8.7	56.5
17	73°35.93	22°0.01	241°58.70	9.2'	23°59.78	-8.9'	56.5'
18	88°35.85 103°35.77	N21°59.66 59.32	256°26.95 270°55.25	9.3' 9.4'	\$23°50.89 23°41.88	-9.0' -9.1'	56.5' 56.5'
19 20	103°35.77 118°35.69	59.32 58.97	270°55.25 285°23.61	9.4'	23°41.88 23°32.73	-9.1' -9.3'	56.6'
21	133°35.61	58.63	299°52.02	9.5'	23°23.45	-9.4'	56.6'
22	148°35.53	58.28	314°20.49	9.5'	23°14.04	-9.5'	56.6'
23	163°35.45	57.93	328°49.01	9.6'	23°4.51	-9.7'	56.6'
	SD = 15.7'	d = -0.3'		SI	O = 15.3'		

Lat.	<b>Twi</b> Naut.	<b>light</b> Civil	Sunrise	Sunset	<b>Twilight</b> Civil Naut.		
N 72°							
<b>N</b> 70°							
68°							
66°	////	////	01:14	22:53	////	////	
64°	////	////	02:02	22:07	////	////	
62°	////	////	02:32	21:37	////	////	
60°	////	01:30	02:55	21:15	22:39	////	
N 58°	////	02:05	03:13	20:57	22:04	////	
56° 54°	//// 01:22	02:30	03:28 03:41	20:42 20:29	21:40 21:20	//// 22:46	
52°	01:22	02:50 03:06	03:41	20:29	21:20	22:40	
50°	02:19	03:20	04:03	20:08	20:51	21:51	
45°	02:59	03:47	04:23	19:47	20:23	21:11	
<b>N</b> 40°	03:28	04:08	04:40	19:30	20:02	20:43	
35°	03:49	04:25	04:54	19:16	19:45	20:21	
30°	04:07	04:40	05:07	19:04	19:31	20:04	
20°	04:34	05:03	05:27	18:43	19:08	19:36	
N 10° 0°	04:56 05:14	05:22 05:39	05:45 06:02	18:26 18:09	18:48 18:31	19:15 18:57	
<b>S</b> 10°	05:14	05:56	06:02	17:53	18:15	18:41	
20°	05:30	06:12	06:16	17:35	17:59	18:26	
30°	06:00	06:30	06:56	17:15	17:41	18:11	
35°	06:08	06:39	07:07	17:04	17:32	18:03	
40°	06:17	06:50	07:20	16:51	17:21	17:54	
45°	06:26	07:03	07:36	16:35	17:08	17:45	
<b>S</b> 50°	06:37	07:18	07:55	16:16	16:53	17:34	
52° 54°	06:42	07:25	08:04	16:07	16:47	17:30	
56°	06:47 06:52	07:32 07:40	08:15 08:26	15:57 15:45	16:39 16:31	17:24 17:19	
58°	06:58	07:50	08:40	15:32	16:22	17:13	
<b>S</b> 60°	07:05	08:00	08:55	15:16	16:11	17:06	
Lat.		Moonris	e		Moonse	t	
	Wed	Thu	Fri	Wed	Thu	Fri	
N 72°							
<b>N</b> 70° 68°							
66°			23:58				
64°			23:10				
62°		22:49	22:40			01:52	
60°	21:52	22:10	22:16		00:55	02:30	
N 58°	21:14	21:43	21:58	00:30	01:32	02:57	
56°	20:47	21:21	21:42	00:58	01:59	03:18	
54° 52°	20:26	21:03 20:48	21:28	01:20 01:38	02:20 02:37	03:36	
52° 50°	20:09 19:54	20:48	21:16 21:06	01:38	02:37 02:52	03:51 04:03	
45°	19:23	20:08	20:44	02:24	03:22	04:03	
N 40°	19:00	19:46	20:26	02:48	03:45	04:50	
35°	18:40	19:29	20:10	03:07	04:05	05:08	
30°	18:23	19:13	19:57	03:24	04:21	05:23	
20°	17:55	18:47	19:35	03:53	04:49	05:48	
N 10°	17:31	18:24	19:15	04:17	05:13	06:09	
0°	17:08	18:03	18:57	04:40	05:35	06:29	
<b>S</b> 10° 20°	16:46	17:42	18:38	05:03	05:57	06:49	
30°	16:21 15:53	17:19 16:53	18:18 17:55	05:27 05:56	06:20 06:48	07:10 07:35	
35°	15:37	16:37	17:55	06:12	00:48	07:35	
	15:17	16:19	17:26	06:32	07:23	08:05	
40°					07.45	00.05	
40° 45°	14:53	15:57	17:08	06:56	07:45	08:25	
	!	15:57 15:29	17:08 16:44	06:56 07:26	07:45	08:25	
45° <b>S</b> 50° 52°	14:53 14:23 14:08	15:29 15:15	16:44 16:33	07:26 07:41	08:14 08:28	08:50 09:01	
45° <b>S</b> 50° 52° 54°	14:53 14:23 14:08 13:50	15:29 15:15 14:59	16:44 16:33 16:20	07:26 07:41 07:59	08:14 08:28 08:44	08:50 09:01 09:15	
45° <b>S</b> 50° 52°	14:53 14:23 14:08	15:29 15:15	16:44 16:33	07:26 07:41	08:14 08:28	08:50 09:01	

34	13.30	14.39	10.20	07.59	00.44	09.13
56°	13:29	14:40	16:05	08:21	09:03	09:30
58°	13:01	14:16	15:47	08:48	09:27	09:48
<b>S</b> 60°	12:23	13:45	15:26	09:27	09:59	10:11
		Sun				
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	14-16
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	96-100%
09	05:14	05:18	12:05	23:22	10:54	
10	05:23	05:27	12:05	-:-	11:49	
11	05:31	05:35	12:06	00:16	12:43	

July 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	290°8.68	223°20.02 N19°20.15	124°21.01 N07°0.80	192°11.62 N23°7.48	287°27.71 <b>S</b> 01°19.74	
1	$305^{\circ}11.15$	238° 19.57 20.67	139°22.11 07°0.20	207°13.47 7.45	302°30.17 19.75	Alpheratz 357°34.22 29°13.79 Ankaa 353°6.61 -42°9.75
2	320° 13.61	253°19.12 21.18	154°23.21 06°59.60	222°15.33 7.42	317°32.62 19.76	Schedar 349°30.47 56°40.42
3	335° 16.08	268°18.67 · · 21.70	169°24.31 · · 58.99	237°17.18 · · 7.39	332°35.08 · · 19.77	Diphda 348°46.81 -17°50.62
4 5	350° 18.54 5° 21.01	283°18.22 22.21 298°17.76 22.73	184°25.41 58.39 199°26.51 57.79	252°19.03 7.37 267°20.89 7.34	347° 37.53 19.78 2° 39.99 19.78	Achernar 335°19.90 -57°6.08
6	5 21.01 20°23.47	313°17.31 N19°23.24	214°27.61 N06°57.19	282°22.74 N23°7.31	17°42.45 \$01°19.79	Hamal 327°50.79 23°34.93
7	35°25.93	328°16.86 23.75	229°28.71 56.59	297°24.60 7.29	32°44.90 19.80	Polaris 314°2.38 89°22.00
8	50°28.40	343°16.40 24.27	244° 29.81 55.99	312°26.45 7.26	47°47.36 19.81	Acamar 315°11.62 -40°11.86 Menkar 314°5.84 4°11.45
9	65°30.86	358° 15.95 · · 24.78	259°30.91 · · 55.38	327°28.30 · · 7.23	62°49.82 · · 19.82	Menkar 314°5.84 4°11.45 Mirfak 308°27.91 49°56.93
10	80°33.33	13°15.49 25.29	274° 32.01 54.78	342°30.16 7.20	77°52.27 19.83	Aldebaran 290°39.39 16°33.64
11	95°35.79 110°38.25	28°15.04 25.80 43°14.58 N19°26.31	289°33.11 54.18 304°34.21 N06°53.58	357°32.01 7.18 12°33.86 N23°7.15	92°54.73 19.84 107°57.19 \$01°19.85	Rigel 281°3.74 -8°10.22
12 13	110 36.23 125°40.72	58°14.13 26.81	319° 35.31 52.97	27°35.72 7.12	122°59.64 19.86	Capella 280°21.67 46°1.32
14	140°43.18	73°13.67 27.32	334°36.41 52.37	42°37.57 7.09	138°2.10 19.87	Bellatrix 278°22.71 6°22.42
15	$155^{\circ}45.65$	88°13.21 · · 27.83	349°37.51 · · 51.77	57°39.42 · · 7.07	153°4.56 · · 19.88	Elnath 278°1.66 28°37.71 Alnilam 275°37.59 -1°11.06
16	170°48.11	103°12.75 28.34	4°38.60 51.17	72°41.28 7.04	168°7.02 19.89	Betelgeuse 270°51.93 7°24.76
17	185° 50.58	118°12.29 28.84	19°39.70 50.56	87°43.13 7.01	183°9.47 19.89	Canopus 263°52.74 -52°42.40
18 19	200°53.04 215°55.50	133°11.83 N19°29.35 148°11.37 29.85	34°40.80 N06°49.96 49°41.90 49.36	102°44.99 N23°6.98 117°46.84 6.96	198°11.93 S01°19.90 213°14.39 19.91	Sirius 258°26.20 -16°44.98
20	230°57.97	163°10.91 30.35	64°43.00 48.75	132°48.69 6.93	228° 16.85 19.92	Adhara 255°5.91 -29°0.31
21	246°0.43	178°10.45 · · 30.86	79°44.10 · · 48.15	147°50.55 · · 6.90	243°19.31 · · 19.93	Procyon 244°50.72 5°9.63
22	261°2.90	193°9.99 31.36	94°45.20 47.55	162°52.40 6.87	258°21.76 19.94	Pollux 243°17.16 27°57.92 Avior 234°15.22 -59°35.49
23	276°5.36	208°9.53 31.86	109°46.30 46.94	177°54.26 6.84	273°24.22 19.95	Suhail 222°46.42 -43°32.19
Mer.	pass. 04:39	ν-0.5' d0.5' m-4.08	$\nu 1.1' \ d$ -0.6' m1.54	ν1.9' d-0.0' m-1.90	ν2.5' d0.0' m0.90	Miaplacidus 221°39.08 -69°49.41
	-					Alphard 217°47.62 -8°46.14
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.23 11°50.63
0	291°7.82	223°9.07 N19°32.36	124°47.39 N06°46.34	192°56.11 N23°6.82	288°26.68 <b>S</b> 01°19.96	Dubhe 193°40.84 61°37.05 Denebola 182°24.64 14°25.86
1	$306^{\circ}10.29$	238°8.60 32.86	139°48.49 45.74	207°57.97 6.79	303°29.14 19.97	Gienah 175°43.24 -17°41.10
2	321°12.75	253°8.14 33.36	154°49.59 45.13	222°59.82 6.76	318° 31.60 19.98	Acrux 172°59.81 -63°14.73
3 4	336° 15.22 351° 17.68	268°7.67 · · · 33.86 283°7.21	169°50.69 · · 44.53 184°51.79 43.93	238° 1.67 · · · 6.73 253° 3.53 6.70	333°34.06 · · 19.99 348°36.52 20.01	Gacrux 171°51.31 -57°15.64
5	6°20.15	298°6.74 34.86	199°52.89 43.32	268° 5.38 6.68	3°38.98 20.02	Alioth 166°12.63 55°49.54
6	21°22.61	313°6.28 N19°35.35	214°53.98 N06°42.72	283°7.24 N23°6.65	18°41.44 <b>S</b> 01°20.03	Spica 158°21.84 -11°17.72 Alkaid 152°51.58 49°11.39
7	$36^{\circ}25.07$	328°5.81 35.85	229°55.08 42.11	298° 9.09 6.62	33°43.90 20.04	Hadar 148°35.27 -60°30.04
8	51°27.54	343°5.34 36.34	244°56.18 41.51	313°10.95 6.59	48°46.36 20.05	Menkent 147°57.03 -36°29.91
9 10	66°30.00 81°32.47	358°4.88 · · 36.84 13°4.41 37.33	259°57.28 · · 40.90 274°58.38 40.30	328°12.80 · · 6.56 343°14.66 6.54	63°48.82 · · 20.06 78°51.28 20.07	Arcturus 145°47.42 19°3.08
11	96°34.93	28°3.94 37.82	289°59.47 39.69	358°16.51 6.51	93°53.74 20.08	Rigil Kent. 139°39.49 -60°56.72
12	111°37.39	43°3.47 N19°38.32	305°0.57 N06°39.09	13°18.37 N23°6.48	108°56.20 S01°20.09	Kochab 137°19.29 74°3.26 Zuben'ubi 136°55.40 -16°8.94
13	$126^{\circ}39.86$	58°3.00 38.81	320°1.67 38.49	28°20.22 6.45	123°58.66 20.10	Alphecca 126°3.16 26°37.84
14	141°42.32	73°2.53 39.30	335°2.77 37.88	43°22.08 6.42	139°1.12 20.11	Antares 112°15.03 -26°29.38
15	156° 44.79 171° 47.25	88°2.06 · · 39.79 103°1.59 40.28	350°3.86 · · 37.28 5°4.96 36.67	58°23.93 · · 6.39 73°25.79 6.36	154°3.58 · · 20.12 169°6.05 20.13	Atria 107°8.39 -69°4.55
16 17	171 47.25 186° 49.71	118°1.11 40.77	20°6.06 36.07	88°27.64 6.34	169°6.05 20.13 184°8.51 20.15	Sabik 102°1.99 -15°45.40
18	201°52.18	133°0.64 N19°41.25	35°7.16 N06°35.46	103°29.50 N23°6.31	199°10.97 S01°20.16	Shaula 96°9.40 -37°7.38 Rasalhague 95°57.84 12°32.53
19	$216^{\circ}54.64$	148°0.17 41.74	50°8.25 34.85	118°31.35 6.28	214° 13.43 20.17	Eltanin 90°41.47 51°29.18
20	231°57.11	162°59.69 42.23	65°9.35 34.25	133°33.21 6.25	229°15.89 20.18	Kaus Aust. 83°31.54 -34°22.34
21 22	246°59.57 262°2.04	177°59.22 · · 42.71 192°58.75 43.20	80°10.45 · · 33.64 95°11.54	148°35.06 · · 6.22 163°36.92 6.19	244°18.36 · · 20.19 259°20.82 20.20	Vega 80°32.51 38°48.47
23	202 2.04 277°4.50	207°58.27 43.68	110°12.64 32.43	178°38.77 6.16	274°23.28 20.22	Nunki 75°46.85 -26°15.86
		-				Altair 61°59.20 8°56.17 Peacock 53°4.45 -56°39.04
Wier.p	pass. 04:35	ν-0.5′ d0.5′ m-4.07	$\nu 1.1' \ d$ -0.6' m1.55	ν1.9' d-0.0' m-1.90	$\nu 2.5' \ d0.0' \ m0.90$	Deneb 49°25.07 45°22.21
						Enif 33°38.10 9°59.54
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.00 -46°50.02
0 1	292°6.96 307°9.43	222°57.79 N19°44.16 237°57.32 44.65	125°13.74 N06°31.83 140°14.84 31.22	193°40.63 N23°6.14 208°42.48 6.11	289°25.74 S01°20.23 304°28.21 20.24	Fomalhaut 15°13.81 -29°29.02
2	322° 11.89	252°56.84 45.13	155°15.93 30.61	223°44.34 6.08	319°30.67 20.25	Scheat 13°44.58 28°13.20 Markab 13°29.28 15°20.55
3	$337^{\circ}14.36$	267°56.36 · · 45.61	170°17.03 · · 30.01	238°46.19 · · 6.05	334°33.13 · · 20.26	
4	352°16.82	282°55.89 46.09	185°18.13 29.40	253°48.05 6.02	349°35.60 20.27	Jul 12 Sat SHA Mer.pass
5	7°19.28	297°55.41 46.57	200°19.22 28.80	268°49.91 5.99	4°38.06 20.29	Venus 293°11.34 09:07 Mars 194°12.33 15:41
6 7	22°21.75 37°24.21	312°54.93 N19°47.05 327°54.45 47.53	215°20.32 N06°28.19 230°21.42 27.58	283°51.76 N23°5.96 298°53.62 5.93	19°40.52 S01°20.30 34°42.99 20.31	Mars 194 12.33 15:41 Jupiter 262°2.94 11:10
8	52° 26.68	342°53.97 48.01	245°22.51 26.98	313°55.47 5.90	49° 45.45 20.32	Saturn 357°19.03 04:49
9	67°29.14	357°53.49 · · 48.48	260°23.61 · · 26.37	328°57.33 · · 5.87	64°47.92 · · 20.34	
10	82°31.60	12°53.01 48.96	275°24.70 25.76	343°59.18 5.85	79°50.38 20.35	Jul 13 Sun         SHA         Mer.pass           Venus         292°1.24         09:08
11	97°34.07	27°52.52 49.43	290°25.80 25.16	359°1.04 5.82	94°52.84 20.36	Mars 193°39.57 15:40
12 13	112°36.53 127°39.00	42°52.04 N19°49.91 57°51.56 50.38	305°26.90 N06°24.55 320°27.99 23.94	14°2.90 N23°5.79 29°4.75 5.76	109°55.31 S01°20.37 124°57.77 20.39	Jupiter 261°48.29 11:07
14	142° 41.46	72°51.08 50.86	335°29.09 23.33	44°6.61 5.73	140°0.24 20.40	Saturn 357°18.86 04:45
15	157°43.92	87°50.59 · · 51.33	350°30.18 · · 22.73	59°8.46 · · 5.70	155°2.70 · · 20.41	Jul 14 Mon SHA Mer.pass
16	172°46.39	102°50.11 51.80	5°31.28 22.12	74°10.32 5.67	170°5.17 20.42	Venus 290°50.83 09:08
17	187° 48.85	117°49.62 52.27	20°32.38 21.51	89°12.18 5.64	185°7.63 20.44	Mars 193°6.77 15:38
18 19	202°51.32 217°53.78	132°49.14 N19°52.74 147°48.65 53.21	35°33.47 N06°20.90 50°34.57 20.30	104°14.03 N23°5.61 119°15.89 5.58	200°10.10 S01°20.45 215°12.57 20.46	Jupiter 261°33.66 11:04   Saturn 357°18.78 04:42
20	232° 56.25	162°48.16 53.68	65°35.66 19.69	134°17.75 5.55	230°15.03 20.48	
21	247°58.71	177° 47.68 · · 54.15	80°36.76 · · 19.08	149°19.60 · · 5.52	245°17.50 · · 20.49	Horizontal parallax
22	263°1.17	192°47.19 54.61	95°37.85 18.47	164°21.46 5.49	260° 19.96 20.50	Venus: 0.1 Mars: 0.1
23	278°3.64	207°46.70 55.08	110°38.95 17.86	179°23.32 5.46	275°22.43 20.52	Iviais: U.1
Mer.	pass. 04:31	ν-0.5′ d0.5′ m-4.07	$ u 1.1' \ d$ -0.6 $' \ m 1.55$	$\nu 1.9' \; d\text{-}0.0' \; \text{m-}1.90$	$\nu 2.5' \ d0.0' \ m0.89$	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.38	N21°57.59	343°17.59	9.6'	\$22°54.84	-9.8'	56.6'
1	193°35.30	57.24	357°46.22	9.7'	22°45.05	-9.9'	56.7'
2	208°35.22	56.89	12° 14.91	9.7'	22°35.13	-10.0'	56.7'
3 4	223°35.14 238°35.06	· · 56.54 56.19	26° 43.66 41° 12.47	9.8' 9.9'	22°25.09 22°14.92	-10.2' -10.3'	56.7' 56.7'
5	253°34.99	55.84	55°41.33	9.9'	22°4.63	-10.4	56.8'
6	268°34.91	N21°55.49	70° 10.25	10.0'	S21°54.21	-10.5'	56.8'
7	283°34.83	55.13	84°39.23	10.0'	21°43.68	-10.7'	56.8'
8	298°34.76	54.78	99°8.27	10.1'	21°33.03	-10.8'	56.8'
9 10	313°34.68 328°34.60	• • 54.43 54.07	113°37.37 128°6.53	10.2' 10.2'	21°22.26 21°11.37	-10.9' -11.0'	56.8' 56.9'
11	343°34.53	53.72	142° 35.74	10.2	21 11.37 21°0.36	-11.0	56.9'
12	358°34.45	N21°53.36	157°5.01	10.3'	S20°49.24	-11.2'	56.9'
13	13°34.38	53.01	171°34.35	10.4'	$20^{\circ}38.00$	-11.3'	56.9'
14	28°34.30	52.65	186°3.74	10.5	20°26.65	-11.5'	56.9'
15 16	43°34.23 58°34.15	· · 52.29 51.93	200°33.19 215°2.70	10.5' 10.6'	20° 15.19 20° 3.62	-11.6' -11.7'	57.0' 57.0'
17	73°34.08	51.57	213° 2.70 229° 32.27	10.6'	19°51.93	-11.8'	57.0'
18	88°34.00	N21°51.21	244°1.89	10.7'	S19°40.14	-11.9'	57.0'
19	103°33.93	50.85	258°31.58	10.7'	19°28.24	-12.0'	57.1'
20	118°33.85	50.49	273°1.32	10.8'	19° 16.24	-12.1'	57.1'
21 22	133°33.78 148°33.70	· · 50.13 49.77	287°31.12 302°0.98	10.9' 10.9'	19°4.12 18°51.91	-12.2' -12.3'	57.1' 57.1'
23	163°33.63	49.77 49.41	302 0.98 316°30.90	10.9	18° 39.59	-12.3 -12.4'	57.1'
	SD = 15.7'	d = -0.3'			D = 15.4'		
	3D = 15.1'	u = -0.5		51	J — 15.4°		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°33.56	N21°49.04	331°0.88	11.0'	\$18°27.17	-12.5'	57.2'
1 2	193°33.48 208°33.41	48.68 48.31	345°30.91 0°1.00	11.1' 11.1'	18° 14.65 18° 2.03	-12.6' -12.7'	57.2' 57.2'
3	206 33.41 223°33.34	46.31 • • 47.95	14°31.14	11.1	16 2.03 17°49.31	-12.7 -12.8'	57.2'
4	238°33.27	47.58	29°1.34	11.3'	17°36.49	-12.9'	57.2'
5	253°33.19	47.22	43°31.60	11.3'	$17^{\circ}23.58$	-13.0'	57.3'
6	268°33.12	N21°46.85	58°1.91	11.4'	\$17° 10.57	-13.1'	57.3'
7 8	283°33.05 298°32.98	46.48 46.11	72°32.27 87°2.70	11.4' 11.5'	16° 57.47 16° 44.28	-13.2' -13.3'	57.3' 57.3'
9	313°32.91	40.11 • • 45.74	101°33.17	11.5'	16°31.00	-13.4'	57.3'
10	328°32.84	45.37	116°3.70	11.6'	16° 17.62	-13.5'	57.4'
11	343°32.76	45.00	$130^{\circ}34.28$	11.6'	$16^{\circ}4.16$	-13.5'	57.4'
12	358°32.69	N21°44.63	145°4.91	11.7'	\$15°50.61	-13.6'	57.4'
13 14	13°32.62 28°32.55	44.26 43.89	159°35.59 174°6.32	11.7' 11.8'	15° 36.98 15° 23.26	-13.7' -13.8'	57.4' 57.4'
15	43°32.48	· · 43.51	174 0.32 188°37 11	11.8	15 23.20 15°9.45	-13.0 -13.9'	57.4 57.5'
16	58°32.41	43.14	203°7.94	11.9'	14°55.57	-14.0'	57.5'
17	73°32.34	42.76	$217^{\circ}38.82$	11.9'	$14^{\circ}41.60$	-14.0'	57.5'
18	88°32.27	N21°42.39	232°9.75	12.0'	\$14°27.55	-14.1'	57.5'
19 20	103°32.20 118°32.13	42.01 41.64	246° 40.73 261° 11.75	12.0' 12.1'	14°13.42 13°59.22	-14.2' -14.3'	57.5'
21	133°32.06	• • 41.26	201 11.75 275°42.82	12.1	13 59.22 13°44.94	-14.3 -14.4'	57.6' 57.6'
22	148°31.99	40.88	290° 13.94	12.2'	13° 30.58	-14.4'	57.6'
23	163°31.93	40.50	304°45.09	12.2'	$13^{\circ}16.15$	-14.5'	57.6'
	SD = 15.7'	d = -0.4'		SI	O = 15.6'		
N4	GHA	D	GHA		D	d	НР
Mon 0	178°31.86	<b>Dec</b> N21° 40.13	319° 16.30	u 12.2'	Dec \$13°1.65	-14.6'	57.6'
1	193°31.79	39.75	333° 47.54	12.3'	12°47.07	-14.6'	57.7'
2	208°31.72	39.37	348° 18.83	12.3'	12°32.43	-14.7'	57.7'
3	223°31.65	38.99	2°50.15	12.4	12°17.72	-14.8'	57.7'
4 5	238°31.59 253°31.52	38.60 38.22	17°21.52 31°52.93	12.4' 12.4'	12°2.94 11°48.09	-14.8' -14.9'	57.7' 57.7'
6	268°31.45	N21°37.84	46°24.37	12.4	\$11°33.18	-14.9	57.8'
7	283°31.38	37.46	$60^{\circ}55.85$	12.5'	11°18.20	-15.0'	57.8'
8	298°31.32	37.07	75°27.37	12.6'	11°3.17	-15.1'	57.8'
9	313°31.25 328°31.18	36.69	89°58.92 104°30.51	12.6'	10°48.07 10°32.91	-15.2'	57.8'
10 11	328°31.18 343°31.12	36.30 35.92	104°30.51 119°2.13	12.6' 12.7'	10°32.91 10°17.69	-15.2' -15.3'	57.8' 57.8'
12	358°31.05	N21°35.53	133°33.78	12.7'	S10°2.41	-15.3'	57.9
13	13°30.99	35.14	$148^{\circ}5.46$	12.7'	09°47.08	-15.4'	57.9'
14	28°30.92	34.75	162°37.18	12.7'	09°31.69	-15.4'	57.9'
15 16	43°30.86 58°30.79	· · 34.36 33.98	177°8.92 191°40.69	12.8' 12.8'	09°16.25 09°0.76	-15.5'	57.9'
16 17	58°30.79 73°30.73	33.98 33.59	191° 40.69 206° 12.49	12.8' 12.8'	09°0.76 08°45.22	-15.5' -15.6'	57.9' 58.0'
18	88°30.66	N21°33.20	220° 44.31	12.8'	S08° 29.62	-15.6'	58.0'
19	103°30.60	32.80	$235^{\circ}16.16$	12.9'	$08^{\circ}13.98$	-15.7'	58.0'
20	118°30.53	32.41	249°48.03	12.9'	07°58.29	-15.7'	58.0'
21 22	133°30.47 148°30.40	· · 32.02 31.63	264° 19.93 278° 51.84	12.9' 12.9'	07°42.55 07°26.77	-15.8' -15.8'	58.0' 58.1'
22	148°30.40 163°30.34	31.63 31.23	278°51.84 293°23.78	13.0'	07°26.77 07°10.94	-15.8° -15.9'	58.1' 58.1'
	SD = 15.7'	d = -0.4'	255 25.10		D = 15.7'	20.0	
	<u> </u>	u — -0.4		اد	J — 1J.1		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
5	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-89%	
12	05:38	05:42	12:06	01:09	13:35		
13	05:46	05:49	12:06	02:00	14:24		
14	05:53	05:56	12:06	02:48	15:12		

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

Fig.   GiA   Color	h	Aries	Ver	nus	Ma	ars	Jup	iter	Sat	urn		Stars	
	Tue	GHΔ	GHA	Dec	GHA	Dec	GHA	Dec	GHV	Dec			Dec
1 200°1637 207°4624 0.00°4625 0.00°4626 0.00°4													
2 32811.138											Alpheratz		I
3 \$35   13.69   \$267   47.75   \$5.94   \$107   \$1.05   \$1.05   \$207   \$1.05   \$											1		
4   ST1-15-86													I
27 2 301													
2	5	8° 18.42	297°43.76	57.86	200°45.52	14.21	269°34.46	5.28	5°37.23	20.60	I		I
9 687328 337 47.78 38.8 38.74 47.8 38.9 38.74 47.8 38.9 39.74 47.8 38.9 39.74 47.8 38.9 39.74 47.8 38.9 39.74 47.8 38.9 39.74 47.8 38.9 39.74 47.8 39.74 39.	6	23°20.89	312°43.27	N19°58.32	215°46.62	N06°13.61	284°36.31	N23°5.25	20°39.70	S01°20.61	1		
10 87 30 2 30 30 30 30 30 30 30 30 30 30 30 30 30	7	38° 23.35	327°42.78	58.78	230°47.71	13.00	299°38.17	5.22	35°42.17	20.63			
11 967322 272.06 0.06 2971.0 11 9574													I
11 pr 97 11 1											1		1
13   128   133   578   81   133   337   437   834   734											1		
19   19   19   19   19   19   19   19											1		
141 141 9600 97 303 2 - 244 350 565 37 8.73 44 91 17 5.01 140 96.45 20.74 161 151 151 151 151 151 151 151 151 151													
15   1587 43.06   377 34.02   2.24   3507 56.47   3.12   507 53.03   4.40   3167 1.02   2.20 7.1   1887 47.99   177 34.03   2.00 7.1											Bellatrix	278°22.70	6°22.43
10 173749.53 10073832 2.89 5797.50 7.51 747988 4.99 11743.82 20.77 171 1887479 1177372 8070330 35750.76 1006-6.20 10478.60 10374.60 10374.00 10.											Elnath	278°1.64	
18											I		I
19   2019   50   60   147   368   359   97   5000   629   104   586   122   488   221   92   2018   2018   2019   2018   2019													
19   128   167   203   203   167   203													
20 239°55.88   162°36.83   470   66°1.04   5.07   135°2.31   4.88   231°1.42   20.21   21.22   22.24   22.24   23.25   3.35   5.06   90°4.12   3.25   100°7.89   4.77   20°1.190   20.24   24.25   23.22   23.											1		
Per	20	233°55.38		4.70	66°1.94	5.07	135°2.31	4.83	231°14.26	20.81	1		
22 29-91-98 2079-8-8 6.05 1115-22 3.32 1807-8-9 4.74 2071-92.05 20.84   Mor. pass. 04:27	21	248°57.85	177°35.83	• • 5.15	81°3.03	• • 4.46	$150^{\circ}4.17$	• • 4.80	246°16.73	• • 20.83	,		I
Mer. pass. 0.47	22		192°35.33	5.60	96°4.12	3.85	$165^{\circ}6.03$	4.77	261°19.20	20.84	1		
Med   GHA	23	279°2.78	207°34.83	6.05	111°5.22	3.24	180°7.89	4.74	276°21.67	20.86	I		
Wed CHA	Merr	pass 04·27	ν-0.5' d0	5′ m-4 07	ν1 1' d-0	6′ m1 55	ν1 9' d-0	0′ m-1 90	$\nu^{2} 5' d0$	0′ m0 89	1		
CHA	14161.6	Juss. 07.21	ν σ.σ ασ.	J III -T.U1	ν 1.1 u-0		ν 1.9 G-0.	- III 1.30	- V 2.5 UO.	- 1110.03			
0 949*524 222*34.32 N20*650 126*63.1 N06*2.63 155*04* N23*471 291*24.4 S01*20.87 No6*66.1 200.2 201*1.0 4.68 30*26.61 20.90 1.00 1.00 2.33*1.10 17*25*23 22 6.94 141*7.41 2.02 201*1.0 4.68 30*26.61 2.09 2.00 2.00 2.00 2.00 2.00 2.00 2.00				_		_		_		_			
2 334*10.17 292*33.2											Dubhe	193°40.86	61°37.04
2 334*10.17 225*33.2 7.39 150*8.50 1.41 225*13.46 4.65 321*29.09 20.90 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 2											Denebola		
3 39°1263 26°732.82 . 7.78 171°9.99 . 0.80 240°15.32 . 4.62 336°3.16 2.029. 4 336°1510 282°3.31 8.28 186°10.69 06°19 52°7.18 4.59 51°3.40 30°9.93 5 9°17.56 29°73.81 8.72 201°11.78 06°59.58 270°19.03 4.56 6°56.50 20.99 6 240°20.00 312°3.13 1×20°9.16 21°12.87 10.60°19.25°17.18 4.59 21°12.98 07 30°120.56 8 54°24.96 342°30.29 10.05 26°15.56 5°5.97 288°28.99 182°36.25 21°38.97 30°120.56 8 54°24.96 342°30.29 10.05 26°15.56 5°5.77 315°24.61 4.46 6°51.46 39 1.21.00 9 69°27.42 35°7.29.79 10.09 261°15.15 . 57.13 330°26.47 4.43 66°46.39 2.10.01 18 41°29.88 112°29.22 10.03 27°17.25 5.53 40°22.38 4.40 86°46.39 2.10.01 18 41°29.88 112°29.22 10.03 27°17.25 5.53 40°22.38 4.40 86°46.39 2.10.01 18 41°29.88 112°29.22 10.03 27°17.25 5.50 40 30°19.14 112°50.20 40°12.00 40°11.39 40°19.14 112°10.00 40°11.39 40°19.14 112°10.00 40°11.39 40°19.14 112°10.00 40°11.39 40°19.14 112°10.00 40°11.39 40°19.14 112°10.00 40°11.39 40°19.14 112°10.00 40°11.39 40°19.14 112°10.00 40°19.15 112°10.00 40°19.15											1		
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8 54°24.95 34°30.29 10.05 246'15.06 57.75 315°24.61 4.46 51'43.91 2.100   9 69°27.42 35°29.97 0.104 201'16.15 0.7513 330°26.47 .43 60'49.30 2.100   11 99°32.84 12°29.28 10.93 276'17.25 56.52 345°28.33 4.40 81'48.86 21.03   11 99°32.84 27°28.77 10.37 291'18.34 5591 0.90 30.18 4.37 96'51.33 21.04   Kochab 131 199°32.75 75'7.76 12.24 321'20.52 54.69 30'33.90 4.31 126'56.27 21.06   13 129°37.27 57'27.75 12.08 336'21.62 54.09 45'35.76 4.28 11'5'58.0 50'27 21.09   15 159°42.20 87'26.74 13.11' 35.25 54.69 30'33.90 4.31 126'56.27 21.09   15 159°42.20 87'26.74 13.11' 35.25 54.69 30'33.90 4.25 11'72'3.69 21.12   15 159°42.20 87'26.74 13.11' 35.25 52'22 11.09   17 189°47.13 117' 25.72 13.08 21'24.89 52.24 09'41.34 4.18 187'67.70 21.14   18 204°45.95 132'25.21 N20'14.42 36'25.99 N05'51.63 105'43.19 N23'4.15 202'8.64 50'21.16   19 219°50.64 147'24.70 14.65 51'27.08 51.02 104'4.50 54.12 217'11.11 21.17   21 249°50.98 177' 25.66 61.57 50.49 79 10'48.77 4.06 247'16.06 21.21   22 260°594.55 10'2'24.19 15.28 66'28.17 50.40 135'46.91 4.09 232'13.59 21.19   22 260°594.55 10'2'24.19 15.28 66'28.17 50.40 135'46.91 4.09 232'13.59 21.19   22 260°594.55 10'2'24.19 15.28 66'28.17 50.40 135'46.91 4.09 232'13.59 21.19   22 260°594.55 10'2'23.16 16.14 66'30.36 49.18 165'50.63 4.03 20'18.53 11.22   23 280°19.1 00"72256 16.57 11'31.45 48.57 180'5'47.95 195'54.55 N23'3.96 222'23.48 50'21.06   23 280°19.1 00"72256 16.57 11'31.45 48.57 180'5'47.95 195'54.55 N23'3.95 222'23.48 50'21.06   25 101.60 00.22 1.17 18.18 18.65 1.17 18.48 48.57 180'5'4.95 180'5'2.10 00' 21.21   24 45'50.44 227 21.02 17.43 11'35.63 18.45 18.55 18.33'3.96 21.25   25 280'0.31 200'0.00 18.71 18.65	7	39°22.49	327°30.80	9.61	231°13.97	58.36	300°22.75	4.49	36°41.44	20.98			
9 69°27.42 357°2979 10.49 261°16.15 · 77.13 330°26.47 · 4.43 60°48.39 · 1.210   10 84°98 12°29.28 10.93 276°17.25 5652 362°2.046   11 99°32.34 27°28.77 11.37 291°18.34 5591 0°30.18 4.37 96°55.33 21.04   12 114°48.11 42°28.77 N20°11.0 300°19.43 N05°55.30 1°30.18 4.37 96°55.33 21.04   13 129°37.27 57°27.76 12.24 321°20.52 54.69 30°33.90 4.31 126°56.27 21.08   14 144°39.74 72°27.25 12.68 336°21.05 54.08 48°38.76 4.28 141°58.75 21.09   15 159°42.20 87°26.74 13.11 351°22.71 53.46 60°37.62 · 4.25 157°1.22 · 21.11   16 174°4.66 102°26.23 13.55 6°23.80 52.85 75°39.48 4.21 172°3.09 21.12   18 204°49.59 132°25.21 N20°14.42 36°25.99 N05°51.63 108°3.31 N23°31.5 N23°4.15 202°6.45 S01°21.16   18 204°49.59 132°25.21 N20°14.42 36°25.99 N05°51.63 108°3.31 N23°4.15 202°6.45 S01°21.16   18 204°49.59 132°25.21 N20°14.42 36°25.99 N05°51.63 108°3.31 N23°4.15 202°6.45 S01°21.16   19 204°45.45 162°24.10 15.28 66°28.17 50.40 138°4.69 14.00 232°13.59 21.19   20 234°54.85 162°24.10 15.28 66°28.17 50.40 138°4.69 14.00 232°13.59 21.19   21 249°56.98 177°23.68 15.71 81°29.26 49.79 150°48.77 4.06 247°16.06 21.21   22 246°56.98 172°23.16 16.14 06°30.36 49.18 165°50.63 4.03 262°13.59 21.19   22 246°59.48 22°22.21 N20°14.4 06°30.36 49.18 165°50.63 4.03 262°13.59 21.19   22 246°59.48 22°22.21 10.20°14.05 11°31.45 48.57 180°52.49 4.00 277°21.01 21.24   23 25°9.11 22°20.00 8 18.71 18°33.63 47.34 210°56.21 3.93 307°25.96 21.21   24 25°9.48 22°22.14 N20°17.00 126°3.25 N.09°47.99 150°48.77 4.00 277°21.01 21.24   24 25°9.48 22°22.14 N20°17.00 80°47.99 150°48.77 4.00 277°21.01 21.24   24 25°9.49 30°2.19 20°2.20 81.82 17°3.81 4.46 16°3.20 3.00 4.89 16°50.33 4.33 30°2.34 8 S0°2.22 6 N20°4.20 80°4.20 126°3.20 80°4.20 126°4.20 80°4.20 126°		54°24.95	342°30.29	10.05	246° 15.06	57.75	315°24.61	4.46	51°43.91	21.00			I
10 84*29.88 12*29.28 10.93 276*17.25 56.52 346*28.33 4.40 81*48.66 21.03   11 99*32.4 27*287 77 11.37 291*18.34 55.91 0*93.18 4.37 96*51.33 21.04   Kochab 13*21.00   Kochab 13*21.00   Kochab 13*21.00   Kochab 13*21.00   Zubenubi 13.6*53.1 1.6*9.3.2   Zubenubi 13.6*53.1 1.6*9.3.3   Zubenubi 13.6*55.1 1.6*9.4 1.6*9.3   Zubenubi 13.6*55.1 1.6*9.3   Zubenubi 13.6*55.1 1.6*9.4 1.6*											1		
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1329°37.27 57°27.76 12.24 321°20.52 54.69 30°33.90 4.31 126°56.72 21.08 14 14°39.76 72°27.5 12.68 336°21.62 54.08 36°37.62 4.28 141°8.875 21.09 159°42.20 87°26.74 13.11 35.0°22.71 53.46 60°37.62 4.25 157°1.22 21.11 170°3.60 21.11 150°3.15 150°42.70 13.55 6°33.80 52.85 78°39.48 4.21 17°3.60 21.11 536°3.77 130°4.11 17°25.72 13.98 21°24.89 52.24 90°4.13 4.18 187°6.17 21.14 5361k 100°8.14 12 12°1.07 11.11 21.17 150°3.00 11.10 150°4.57 110°3.44 11 10°3.44 11 12°2.17 11.11 21.17 150°3.00 11.10 150°4.57 110°3.44 11 10°3.45 11.10											Kochab	$137^{\circ}19.34$	74° 3.26
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16 174°44.66 102°26.23 13.55 6°23.80 52.85 75°39.48 4.21 172°3.69 21.12 17 189°47.13 117°25.72 1398 21°24.89 52.24 09°41.34 4.18 187°6.17 21.14 18 204°49.59 132°25.21 N20°14.42 36°25.99 N05°51.63 105°43.19 N23°4.15 202°6.64 501°21.16 19 219°52.06 147°24.70 14.85 51°27.08 51.02 120°45.05 4.12 217°11.11 21.17 21 249°56.98 177°23.68 ·15.71 81°29.26 ·49.79 150°48.77 ·4.06 247°16.06 ·21.21 22 249°56.98 177°23.68 ·15.71 81°29.26 ·49.79 150°48.77 ·4.06 247°16.06 ·21.21 23 280°1.91 207°22.16 16.14 96°30.36 491.8 165°50.63 4.03 262°18.53 21.22 248°95.98 178°23.61 61.57 111°31.45 48.57 180°52.49 4.00 277°21.01 21.24  Mer.pass. 04:23 \(\nu \nu \nu \nu \nu \nu \nu \nu \nu \nu											1		
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20 234*54.52 162*24.19 15.28 66*28.17 50.40 135*46.91 4.09 22*32*13.99 21.19   21 249*59.58 177*23.68 1.5.71 8159.26 4.9.79 150*48.77	19	219°52.06	147°24.70	14.85	51°27.08	51.02	120°45.05	4.12	$217^{\circ}11.11$	21.17	_		I
22 266*9.45   192°23.16   16.14   96°30.36   49.18   165*50.63   4.03   262°18.53   21.24     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:23   ν-0.5′ d0.4′ m-4.06   ν1.1′ d-0.6′ m1.56   ν1.9′ d-0.0′ m-1.90   ν2.5′ d0.0′ m0.88     Mer.pass. 04:24   ν-0.1′ d0.0′ m-1.90   ν2.5′ d0.0′ m0.88   ν-0.25′ d0.0′ d0.0′ d0.0′ d0.0′ d0.0′ d0	20									21.19	1	83°31.54	
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Mer.pass. 04:23   ν-0.5' d0.4' m-4.06   ν-1.1' d-0.6' m1.56   ν-1.9' d-0.0' m-1.90   ν-2.5' d0.0' m0.88   Peacock   53° 4.44   -56° 39.05   N-2.5' d0.0' m0.88   Peacock   S-2.2' d0.0' m0.0' m0.88   Peacock   S-2' d0.0' m0.0'											_		1
Thu GHA GHA Dec GHA DE	23	280°1.91	207°22.65	16.57	111°31.45	48.57	180°52.49	4.00	277°21.01	21.24	Altair	61°59.20	8°56.18
Thu GHA GHA OBC GHA Dec GHA GHA GFA GFA GFA GFA GFA GFA GFA GFA GFA GF	Mer.p	pass. 04:23	$\nu$ -0.5' d0.	4′ m-4.06	$\nu 1.1' \ d-0$	.6′ m1.56	$\nu$ 1.9′ d-0.	0′ m-1.90	$\nu 2.5' \ d0.$	0′ m0.88	Peacock	53°4.44	-56°39.05
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14 145°38.87 72°14.89 22.92 336°47.82 39.37 46°20.38 3.52 142°58.14 21.50 15 160°41.34 87°14.37 · · · 23.34 351°48.91 · · · 38.75 61°22.24 · · · 3.49 158°0.62 · · · 21.51 16 175°43.80 102°13.85 23.75 6°50.00 38.14 76°24.10 3.46 173°3.09 21.53 17 190°46.27 117°13.33 24.17 21°51.09 37.53 91°25.96 3.42 188°5.57 21.55 18 205°48.73 132°12.80 N20°24.58 36°52.18 N05°36.91 106°27.82 N23°3.39 203°8.05 501°21.57 19 220°51.19 147°12.28 25.00 51°53.27 36.30 121°29.68 3.36 218°10.53 21.59 20 235°53.66 162°11.76 25.41 66°54.36 35.68 136°31.54 3.33 233°13.00 21.60 21 250°56.12 177°11.23 · · · 25.82 81°55.45 · · · 35.07 151°33.40 · · · 3.29 248°15.48 · · · 21.62 22 265°58.59 192°10.71 26.23 96°56.54 34.45 166°35.26 3.26 263°17.96 21.64 23 281°1.05 207°10.18 26.64 111°57.64 33.84 181°37.12 3.23 278°20.44 21.66													I
15 160°41.34 87°14.37 · · 23.34 351°48.91 · · 38.75 61°22.24 · · 3.49 158°0.62 · · 21.51   16 175°43.80 102°13.85 23.75 6°50.00 38.14 76°24.10 3.46 173°3.09 21.53   17 190°46.27 117°13.33 24.17 21°51.09 37.53 91°25.96 3.42 188°5.57 21.55   18 205°48.73 132°12.80 N20°24.58 36°52.18 N05°36.91 106°27.82 N23°3.39 203°8.05 501°21.57   19 220°51.19 147°12.28 25.00 51°53.27 36.30 121°29.68 3.36 218°10.53 21.59   20 235°53.66 162°11.76 25.41 66°54.36 35.68 136°31.54 3.33 233°13.00 21.60   21 250°56.12 177°11.23 · · 25.82 81°55.45 · · 35.07 151°33.40 · · · 3.29 248°15.48 · · 21.62   22 265°58.59 192°10.71 26.23 96°56.54 34.45 166°35.26 3.26 263°17.96 21.64   23 281°1.05 207°10.18 26.64 111°57.64 33.84 181°37.12 3.23 278°20.44 21.66      Jul 17 Thu SHA Mer.pass Venus 287°17.76 09:11     Mars 191°28.16 15:33     Jupiter 260°49.97 10:55     Saturn 357°19.11 04:30     Sha Mer.pass Venus 287°17.76 09:11     Mars 191°28.16 15:33     Jupiter 260°49.97 10:55     Saturn 357°19.11 04:30     Sha Mer.pass Venus 287°17.76 09:11     Mars 191°28.16 15:33     Jupiter 260°49.97 10:55     Saturn 357°19.11 04:30     Sha Mer.pass Venus 287°17.76 09:11     Mars 191°28.16 15:33     Mars 191°28.16 15:33     Jupiter 260°49.97 10:55     Saturn 357°19.11 04:30     Sha Mer.pass Venus 287°17.76 09:11     Mars 191°28.16 15:33     Mars 191°28.16 15:33     Jupiter 260°49.97 10:55     Saturn 357°19.11 04:30     Sha Mer.pass Venus 287°17.76 09:11     Mars 191°28.16 15:33     Mars 191°28.16 1     Mars 191°28.16 1     Mars 191°28.16 1     Mars 191°28.16 1     Mars											Saturn	357°18.90	04:34
16       175°43.80       102°13.85       23.75       6°50.00       38.14       76°24.10       3.46       173°3.09       21.53       Venus       287°17.76       09:11         17       190°46.27       117°13.33       24.17       21°51.09       37.53       91°25.96       3.42       188°5.57       21.55       Mars       191°28.16       15:33         18       205°48.73       132°12.80       N20°24.58       36°52.18       N05°36.91       106°27.82       N23°3.39       203°8.05       S01°21.57       Jupiter       260°49.97       10:55         19       220°51.19       147°12.28       25.00       51°53.27       36.30       121°29.68       3.36       218°10.53       21.59       Saturn       357°19.11       04:30         20       235°53.66       162°11.76       25.41       66°54.36       35.68       136°31.54       3.33       233°13.00       21.60         21       250°56.12       177°11.23       25.82       81°55.45       35.07       151°33.40       3.29       248°15.48       21.62       40°20         22       265°58.59       192°10.71       26.23       96°56.54       34.45       166°35.26       3.26       263°17.96       21.64       40°20       40°2									158°0.62		Jul 17 Thu	SHA	Mer.pass
18  205° 48.73													
19 220°51.19 147°12.28 25.00 51°53.27 36.30 121°29.68 3.36 218°10.53 21.59 20 235°53.66 162°11.76 25.41 66°54.36 35.68 136°31.54 3.33 233°13.00 21.60 21 250°56.12 177°11.23 · · 25.82 81°55.45 · · · 35.07 151°33.40 · · · 3.29 248°15.48 · · · 21.62 22 265°58.59 192°10.71 26.23 96°56.54 34.45 166°35.26 3.26 263°17.96 21.64 23 281°1.05 207°10.18 26.64 111°57.64 33.84 181°37.12 3.23 278°20.44 21.66  Saturn 357°19.11 04:30  Horizontal parallax Venus: 0.1  Mars: 0.1													
20 235°53.66 162°11.76 25.41 66°54.36 35.68 136°31.54 3.33 233°13.00 21.60 21 250°56.12 177°11.23 · · 25.82 81°55.45 · · 35.07 151°33.40 · · 3.29 248°15.48 · · 21.62 22 265°58.59 192°10.71 26.23 96°56.54 34.45 166°35.26 3.26 263°17.96 21.64 23 281°1.05 207°10.18 26.64 111°57.64 33.84 181°37.12 3.23 278°20.44 21.66 Mars: 0.1													
21       250° 56.12       177° 11.23       · · · 25.82       81° 55.45       · · · 35.07       151° 33.40       · · · 3.29       248° 15.48       · · · 21.62       Horizontal parallax         22       265° 58.59       192° 10.71       26.23       96° 56.54       34.45       166° 35.26       3.26       263° 17.96       21.64       Venus:       0.1         23       281° 1.05       207° 10.18       26.64       111° 57.64       33.84       181° 37.12       3.23       278° 20.44       21.66       Mars:       0.1											Saturn	357°19.11	04:30
22 265°58.59 192°10.71 26.23 96°56.54 34.45 166°35.26 3.26 263°17.96 21.64 Venus: 0.1 23 281°1.05 207°10.18 26.64 111°57.64 33.84 181°37.12 3.23 278°20.44 21.66 Mars: 0.1											Horizor	ıtal parallax	
23 281°1.05 207°10.18 26.64 111°57.64 33.84 181°37.12 3.23 278°20.44 21.66 Mars: 0.1													0.1
Mer.pass. 04:19 $\nu$ -0.5' $d$ 0.4' m-4.06 $\nu$ 1.1' $d$ -0.6' m1.56 $\nu$ 1.9' $d$ -0.0' m-1.90 $\nu$ 2.5' $d$ 0.0' m0.88												Mars:	0.1
	Mer.r	pass. 04:19	$\nu$ -0.5' d0.	4′ m-4.06	$\nu 1.1' d-0$	.6′ m1.56	$\nu 1.9' \ d-0.$	.0′ m-1.90	$\nu 2.5' d0.$	0′ m0.88			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.28	N21°30.84	307°55.73	13.0'	S06°55.08	-15.9'	58.1'
1	193°30.21	30.44	322°27.71	13.0'	06°39.17	-15.9'	58.1'
2	208°30.15 223°30.09	30.05 •• 29.65	336°59.70 351°31.70	13.0' 13.0'	06°23.22 06°7.23	-16.0' -16.0'	58.1' 58.1'
4	238°30.03	29.26	6°3.72	13.0'	05°51.21	-16.1'	58.2'
5	253°29.96	28.86	$20^{\circ}35.75$	13.0'	$05^{\circ}35.15$	-16.1'	58.2'
6	268°29.90	N21°28.46	35°7.80	13.1'	S05°19.05	-16.1'	58.2'
7	283°29.84 298°29.78	28.06	49°39.86 64°11.92	13.1'	05°2.92	-16.2'	58.2'
8 9	298°29.78 313°29.72	27.66 •• 27.26	78°43.99	13.1' 13.1'	04°46.76 04°30.57	-16.2' -16.2'	58.2' 58.2'
10	328° 29.65	26.86	93°16.07	13.1'	04° 14.35	-16.2'	58.3
11	343°29.59	26.46	$107^{\circ}48.16$	13.1'	$03^{\circ}58.10$	-16.3'	58.3'
12	358°29.53	N21°26.06	122°20.25	13.1'	S03°41.82	-16.3'	58.3'
13 14	13°29.47 28°29.41	25.66 25.25	136°52.35 151°24.44	13.1' 13.1'	03°25.52 03°9.19	-16.3' -16.3'	58.3' 58.3'
14 15	43°29.35	25.25	151 24.44 165°56.54	13.1	03 9.19 02°52.84	-16.3 -16.4'	58.3'
16	58°29.29	24.44	180°28.64	13.1'	02°36.47	-16.4	58.4'
17	73°29.23	24.04	$195^{\circ}0.73$	13.1'	$02^{\circ}20.08$	-16.4'	58.4'
18	88°29.17	N21°23.63	209°32.82	13.1'	S02°3.67	-16.4'	58.4'
19 20	103°29.11 118°29.05	23.23 22.82	224°4.91 238°36.99	13.1' 13.1'	01°47.24 01°30.79	-16.4' -16.5'	58.4' 58.4'
20	118 29.05 133°28.99	22.82	258 30.99 253°9.06	13.1'	01°30.79	-16.5'	58.4'
22	148°28.94	22.00	$267^{\circ}41.13$	13.1'	00°57.85	-16.5'	58.5'
23	163°28.88	21.59	$282^{\circ}13.18$	13.0'	00°41.37	-16.5'	58.5'
	SD = 15.7'	d = -0.4'		SI	D = 15.8'		
Wed 0	<b>GHA</b> 178°28.82	<b>Dec</b> N21°21.19	<b>GHA</b> 296°45.23	u 13.0'	<b>Dec</b> \$00°24.87	d -16.5'	<b>HP</b> 58.5'
1	176 26.62 193°28.76	20.78	311°17.26	13.0'	500°24.87 500°8.36	-10.5'	58.5'
2	208°28.70	20.36	325°49.28	13.0'	N00°8.16	16.5'	58.5'
3	223°28.64	•• 19.95	340°21.28	13.0'	00°24.69	16.5'	58.5'
4	238°28.59	19.54	354°53.27	13.0'	00°41.22	16.5'	58.6'
5 6	253°28.53 268°28.47	19.13 N21°18.71	9°25.23 23°57.18	12.9' 12.9'	00°57.76 N01°14.30	16.5' 16.5'	58.6' 58.6'
7	283°28.42	18.30	38°29.11	12.9'	01°30.84	16.5	58.6'
8	298°28.36	17.89	53°1.02	12.9'	01°47.38	16.5'	58.6'
9	313°28.30	• • 17.47	67°32.90	12.9'	02°3.92	16.5'	58.6'
10	328°28.25 343°28.19	17.06 16.64	82°4.76 96°36.59	12.8' 12.8'	02°20.46 02°37.00	16.5' 16.5'	58.6' 58.7'
11 12	343 28.19 358°28.14	N21°16.22	96 36.59 111°8.40	12.8	N02°53.53	16.5	58.7'
13	13°28.08	15.80	125°40.17	12.7'	03°10.06	16.5	58.7'
14	28°28.03	15.39	140°11.92	12.7'	$03^{\circ}26.57$	16.5'	58.7'
15	43°27.97	• • 14.97	154°43.64	12.7'	03°43.08	16.5'	58.7'
16 17	58°27.92 73°27.86	14.55 14.13	169°15.32 183°46.96	12.6' 12.6'	03°59.58 04°16.07	16.5' 16.5'	58.7' 58.7'
18	88°27.81	N21°13.71	198°18.58	12.6'	N04°32.54	16.5	58.8'
19	103°27.75	13.28	212°50.15	12.5'	$04^{\circ}49.00$	16.4'	58.8'
20	118°27.70	12.86	227°21.69		05°5.45		58.8'
21 22	133°27.64 148°27.59	· · 12.44 12.02	241°53.18 256°24.64	12.5' 12.4'	05°21.87 05°38.28	16.4' 16.4'	58.8' 58.8'
23	163°27.54	11.59	270°56.05	12.4'	05°54.67	16.4	58.8'
	SD = 15.7'	d = -0.4'		SI	D = 16.0'		
	CUA		CILA			,	
Thu 0	<b>GHA</b> 178°27.48	<b>Dec</b> N21°11.17	<b>GHA</b> 285°27.42	u 12.3'	Dec N06°11.03	d 16.3'	<b>HP</b> 58.8'
1	193°27.43	10.74	299°58.74	12.3'	06°27.37	16.3	58.9'
2	208°27.38	10.32	314°30.02	12.2'	06°43.69	16.3'	58.9'
3 4	223°27.33 238°27.27	• • 9.89 9.46	329°1.24 343°32.42	12.2' 12.1'	06°59.98 07°16.25	16.3' 16.2'	58.9' 58.9'
4 5	253°27.27	9.46 9.04	343°32.42 358°3.55	12.1'	07°16.25 07°32.49	16.2	58.9'
6	268°27.17	N21°8.61	12°34.62	12.0'	N07°48.69	16.2'	58.9'
7	283°27.12	8.18	27°5.65	12.0'	08°4.86	16.1'	58.9'
8	298°27.07	7.75	41°36.61	11.9'	08°21.00	16.1'	58.9'
9 10	313°27.02 328°26.97	· · 7.32 6.89	56°7.52 70°38.38	11.9' 11.8'	08°37.11 08°53.18	16.1' 16.0'	59.0' 59.0'
11	343°26.92	6.46	85°9.17	11.7'	00° 53.10	16.0'	59.0'
12	358°26.87	N21°6.02	99°39.90	11.7'	N09°25.20	16.0'	59.0'
13	13°26.81	5.59	114°10.57	11.6'	09°41.15	15.9'	59.0'
14 15	28°26.76 43°26.72	5.16 •• 4.72	128°41.18 143°11.73	11.5' 11.5'	09°57.06 10°12.92	15.9' 15.8'	59.0' 59.0'
15 16	43°26.72 58°26.67	4.72	143°11.73 157°42.21	11.5	10°12.92 10°28.74	15.8'	59.0' 59.0'
17	73°26.62	3.85	172°12.62	11.3'	10° 44.51	15.7'	59.1'
18	88°26.57	N21°3.42	186°42.96	11.3'	N11°0.24	15.7'	59.1'
19	103°26.52	2.98	201°13.23	11.2'	11°15.91	15.6'	59.1'
20 21	118°26.47 133°26.42	2.54 · · 2.11	215°43.44 230°13.57	11.1' 11.1'	11°31.53 11°47.10	15.6' 15.5'	59.1' 59.1'
22	133 26.42 148°26.37	1.67	244°43.63	11.1	11 47.10 12°2.61	15.5'	59.1'
23	163°26.33	1.23	259°13.61	10.9'	12°18.06	15.4'	59.1'
	SD = 15.7'	d = -0.4'		SI	O = 16.0'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Mer.Pass.		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	82-62%	
15	05:59	06:02	12:06	03:35	15:58		
16	06:05	06:07	12:06	04:21	16:44		
17	06:10	06:13	12:06	05:08	17:32		

July 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	296°3.52	222°9.65 N20°27.05	126°58.73 N05°33.22	196°38.98 N23°3.20	293°22.92 <b>S</b> 01°21.68	
1	311°5.98	237°9.13 27.46	141°59.82 32.61	211°40.84 3.17	308°25.39 21.70	Alpheratz 357°34.18 29°13.81
2	326°8.44	252°8.60 27.87	157°0.91 31.99	226°42.70 3.13	323°27.87 21.71	Ankaa 353° 6.56 -42° 9.74
3	341° 10.91	267°8.07 · · 28.28	172°2.00 · · 31.38	241°44.56 · · 3.10	338°30.35 · · 21.73	Schedar 349°30.41 56°40.43
4	356° 13.37	282°7.55 28.69	187°3.09 30.76	256°46.42 3.07	353°32.83 21.75	Diphda 348°46.77 -17°50.60
5	11° 15.84	297°7.02 29.09	202°4.18 30.15	271°48.28 3.04	8°35.31 21.77	Achernar 335°19.83 -57°6.07
6	26° 18.30	312°6.49 N20°29.50	217°5.27 N05°29.53	286°50.14 N23°3.00	23°37.79 <b>S</b> 01°21.79	Hamal 327°50.75 23°34.94
7	41°20.76	327°5.96 29.90	232°6.35 28.92	301°52.01 2.97	38° 40.27 21.81	Polaris 313°59.52 89°22.00
8	56°23.23	342°5.43 30.30	247°7.44 28.30	316°53.87 2.94	53° 42.75 21.83	Acamar 315°11.58 -40°11.84
9	71°25.69	357°4.90 · · 30.71	262°8.53 · · 27.69	331°55.73 · · 2.91	68° 45.23 · · 21.84	Menkar 314°5.81 4°11.46 Mirfak 308°27.86 49°56.93
10	$86^{\circ}28.16$	12°4.37 31.11	277°9.62 27.07	346°57.59 2.87	83°47.71 21.86	Aldebaran 290°39.36 16°33.65
11	101°30.62	27°3.84 31.51	292°10.71 26.45	1°59.45 2.84	98°50.19 21.88	Rigel 281°3.72 -8°10.21
12	116°33.08	42°3.31 N20°31.91	307°11.80 N05°25.84	17°1.31 N23°2.81	113°52.67 <b>S</b> 01°21.90	Capella 280°21.63 46°1.32
13	131°35.55	57°2.77 32.31	322°12.89 25.22	32° 3.17 2.77	128°55.15 21.92	Bellatrix 278°22.69 6°22.43
14	146°38.01	72°2.24 32.71	337° 13.98 24.61	47° 5.03 2.74	143°57.63 21.94	Elnath 278°1.63 28°37.71
15	161°40.48	87°1.71 · · 33.10	352°15.07 · · 23.99	62°6.89 · · 2.71	159°0.11 · · 21.96	Alnilam 275°37.57 -1°11.05
16	176° 42.94	102°1.17 33.50	7°16.16 23.37	77°8.75 2.68	174°2.59 21.98	Betelgeuse 270°51.91 7°24.77
17	191°45.40	117°0.64 33.90	22°17.25 22.76	92°10.62 2.64	189°5.07 22.00	Canopus 263°52.72 -52°42.37
18	206° 47.87	132°0.11 N20°34.29	37°18.34 N05°22.14	107°12.48 N23°2.61	204°7.55 S01°22.02	Sirius 258°26.19 -16°44.96
19	221°50.33	146°59.57 34.69	52°19.43 21.52	122°14.34 2.58	219°10.03 22.04	Adhara 255° 5.90 -29° 0.29
20	236° 52.80 251° 55.26	161°59.03 35.08	67°20.51 20.91 82°21.60 · · 20.29	137°16.20 2.54	234°12.51 22.06	Procyon 244°50.71 5°9.64
21		176°58.50 · · 35.47		152°18.06 · · 2.51	249°15.00 · · 22.08	Pollux 243°17.15 27°57.92
22 23	266° 57.73 282° 0.19	191°57.96 35.86 206°57.42 36.25		167°19.92 2.48 182°21.79 2.44	264° 17.48 22.10 279° 19.96 22.12	Avior 234°15.23 -59°35.46
23	202 0.19					Suhail 222°46.43 -43°32.16
Mer.	pass. 04:15	$\nu$ -0.5 $'$ $d$ 0.4 $'$ m-4.05	$ u 1.1' \; d$ -0.6 $' \; { m m} 1.56$	$ u 1.9' \ d$ -0.0 $' \ m$ -1.90	$ u 2.5' \ d0.0' \ m0.87$	Miaplacidus 221°39.12 -69°49.38
						Alphard 217°47.63 -8°46.12
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.24 11°50.63
0 0	297°2.65	221°56.89 N20°36.64	127°24.87 N05°18.44	197°23.65 N23°2.41	294°22.44 \$01°22.14	Dubhe 193°40.88 61°37.03
1	312°5.12	236°56.35 37.03	142° 25.96 17.82	212°25.51 2.38	309°24.92 22.16	Denebola 182°24.66 14°25.87
2	327°7.58	251°55.81 37.42	157° 27.05 17.21	227°27.37 2.34	324°27.41 22.18	Gienah 175°43.26 -17°41.09
3	342° 10.05	266°55.27 · · 37.81	172°28.13 · · 16.59	242°29.23 · · 2.31	339°29.89 · · 22.20	Acrux 172°59.87 -63°14.72
4	357° 12.51	281°54.73 38.20	187° 29.22 15.97	257°31.09 2.28	354°32.37 22.22	Gacrux 171°51.36 -57°15.63
5	12° 14.97	296°54.19 38.58	202°30.31 15.35	272°32.96 2.24	9°34.85 22.24	Alioth 166°12.68 55°49.54
6	27° 17.44	311°53.65 N20°38.97	217°31.40 N05°14.74	287°34.82 N23°2.21	24°37.34 S01°22.26	Spica 158°21.86 -11°17.71
7	42° 19.90	326°53.11 39.35	232°32.49 14.12	302°36.68 2.18	39°39.82 22.28	Alkaid 152°51.62 49°11.39
8	57°22.37	341°52.57 39.74	247°33.57 13.50	317°38.54 2.14	54°42.30 22.30	Hadar 148°35.32 -60°30.04
9	72°24.83	356°52.03 · · 40.12	262°34.66 · · 12.88	332°40.41 · · 2.11	69°44.79 · · 22.32	Menkent 147°57.05 -36°29.91
10	87° 27.30	11°51.48 40.50	277°35.75 12.27	347°42.27 2.08	84°47.27 22.34	Arcturus 145°47.45 19°3.09
11	102°29.76	26°50.94 40.88	292°36.84 11.65	2°44.13 2.04	99° 49.75 22.36	Rigil Kent. 139°39.55 -60°56.72
12	117°32.22	41°50.40 N20°41.26	307°37.92 N05°11.03	17°45.99 N23°2.01	114°52.24 <b>S</b> 01°22.38	Kochab 137°19.40 74°3.27
13	$132^{\circ}34.69$	56°49.85 41.64	322°39.01 10.41	32°47.86 1.98	129° 54.72 22.40	Zuben'ubi 136°55.42 -16°8.93 Alphecca 126°3.18 26°37.86
14	$147^{\circ}37.15$	71°49.31 42.02	337°40.10 9.79	47°49.72 1.94	144°57.21 22.42	
15	$162^{\circ}39.62$	86°48.77 · · 42.40	352°41.19 · · 9.17	62°51.58 · · 1.91	159°59.69 · · 22.44	Antares 112°15.04 -26°29.38 Atria 107°8.43 -69°4.57
16	$177^{\circ}42.08$	101°48.22 42.78	7° 42.27 8.56	77°53.44 1.87	175°2.18 22.47	Sabik 102°2.00 -15°45.40
17	192°44.54	116° 47.67 43.15	22°43.36 7.94	92°55.31 1.84	190°4.66 22.49	Shaula 96°9.41 -37°7.39
18	$207^{\circ}47.01$	131°47.13 N20°43.53	37°44.45 N05°7.32	107°57.17 N23°1.81	205°7.15 <b>S</b> 01°22.51	Rasalhague 95°57.84 12°32.55
19	222°49.47	146°46.58 43.90	52°45.53 6.70	122°59.03 1.77	220°9.63 22.53	Eltanin 90°41.49 51°29.21
20	237°51.94	161°46.03 44.27	67°46.62 6.08	138° 0.89 1.74	235°12.12 22.55	Kaus Aust. 83°31.54 -34°22.35
21	252°54.40	176°45.49 · · 44.65	82°47.71 · · 5.46	153° 2.76 · · 1.71	250°14.60 · · 22.57	Vega 80°32.51 38°48.49
22	267° 56.87	191°44.94 45.02	97° 48.80 4.84	168° 4.62 1.67	265°17.09 22.59	Nunki 75°46.84 -26°15.87
23	282°59.33	206°44.39 45.39	112°49.88 4.22	183° 6.48 1.64	280° 19.57 22.62	Altair 61°59.19 8°56.19
Mer.	pass. 04:11	$\nu$ -0.5' $d$ 0.4' m-4.05	$\nu 1.1' \ d$ -0.6' m1.57	$\nu 1.9' \ d$ -0.0' m-1.90	$\nu 2.5' \ d0.0' \ m0.87$	Peacock 53°4.43 -56°39.06
						Deneb 49°25.06 45°22.24
_						Enif 33°38.08 9°59.56
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.96 -46°50.03
0	298°1.79	221°43.84 N20°45.76	127°50.97 N05°3.61	198°8.35 N23°1.60	295°22.06	Fomalhaut 15°13.77 -29°29.02
1 2	313°4.26 328°6.72	236° 43.29 46.13 251° 42.74 46.50	142°52.05 2.99 157°53.14 2.37	213°10.21 1.57 228°12.07 1.54	310°24.54 22.66 325°27.03 22.68	Scheat 13°44.55 28°13.23
3	343°9.19	266°42.19 · · 46.87	157 53.14 2.37 172°54.23 · · 1.75	243°13.94 · · 1.50	340°29.52 · · 22.70	Markab 13°29.25 15°20.57
3 4	358° 11.65	281°41.64 47.23	187°55.31 1.13	258°15.80 1.47	355°32.00 22.72	Jul 18 Fri SHA Mer.pass
5	13° 14.11	296°41.09 47.60	202°56.40 05°0.51	273°17.66 1.43	10°34.49 22.75	Venus 286°6.14 09:12
6	28° 16.58	311°40.54 N20°47.97	217°57.49 N04°59.89	288°19.53 N23°1.40	25°36.98 S01°22.77	Mars 190°55.21 15:31
7	43° 19.04	326°39.99 48.33	232°58.57 59.27	303°21.39 1.36	40°39.46 22.79	Jupiter 260°35.47 10:52
8	58°21.51	341°39.43 48.69	247°59.66 58.65	318°23.25 1.33	55°41.95 22.81	Saturn 357°19.40 04:26
9	73°23.97	356°38.88 · · 49.06	263°0.74 · · 58.03	333°25.12 · · 1.30	70°44.44 · · 22.83	
10	88° 26.44	11°38.33 49.42	278°1.83 57.41	348°26.98 1.26	85°46.93 22.86	Jul 19 Sat SHA Mer.pass
11	103°28.90	26°37.77 49.78	293°2.92 56.79	3°28.85 1.23	100°49.41 22.88	Venus 284°54.23 09:13
12	118°31.36	41°37.22 N20°50.14	308°4.00 N04°56.17	18°30.71 N23°1.19	115°51.90 <b>S</b> 01°22.90	Mars 190°22.21 15:29
13	133°33.83	56°36.66 50.50	323°5.09 55.55	33°32.57 1.16	130°54.39 22.92	Jupiter 260°20.99 10:49
14	$148^{\circ}36.29$	71°36.11 50.86	338°6.17 54.93	48°34.44 1.12	145°56.88 22.95	Saturn 357°19.79 04:22
15	163°38.76	86°35.55 · · 51.21	353°7.26 · · 54.31	63°36.30 · · 1.09	160°59.37 · · 22.97	Jul 20 Sun SHA Mer.pass
16	$178^{\circ}41.22$	101°34.99 51.57	8°8.34 53.69	78°38.17 1.05	176°1.86 22.99	Venus 283°42.05 09:13
17	193°43.69	116°34.44 51.93	23°9.43 53.07	93°40.03 1.02	191°4.34 23.01	Mars 189°49.17 15:27
18	208°46.15	131°33.88 N20°52.28	38°10.51 N04°52.45	108°41.89 N23°0.99	206°6.83 <b>S</b> 01°23.04	Jupiter 260° 6.55 10:46
19	223°48.61	146°33.32 52.64	53°11.60 51.83	123°43.76 0.95	221°9.32 23.06	Saturn 357°20.26 04:18
20	238°51.08	161°32.76 52.99	68°12.68 51.21	138°45.62 0.92	236°11.81 23.08	Having-t-1
21	253°53.54	176°32.20 · · 53.34	83°13.77 · · 50.58	153°47.49 · · 0.88	251°14.30 · · 23.11	Horizontal parallax
22	268° 56.01	191°31.65 53.69	98°14.85 49.96	168°49.35 0.85	266°16.79 23.13	Venus: 0.1
23	283° 58.47	206°31.09 54.05	113°15.94 49.34	183°51.22 0.81	281°19.28 23.15	Mars: 0.1
Mer.	pass. 04:07	ν-0.5' d0.4' m-4.04	$\nu 1.1' \ d$ -0.6' m1.57	ν1.9' d-0.0' m-1.90	ν2.5' d0.0' m0.86	
	·					

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.28	N21°0.79	273°43.52	10.8'	N12°33.46	15.3'	59.1'
1	193°26.23 208°26.18	21°0.35 20°59.91	288°13.35 302°43.10	10.8' 10.7'	12°48.80 13°4.07	15.3' 15.2'	59.1' 59.2'
2	200 20.10 223°26.14	. 59.47	317°12.78	10.7	13° 19.28	15.2 15.1'	59.2'
4	238°26.09	59.03	331°42.37	10.5'	13°34.43	15.1'	59.2'
5	253°26.04	58.58	346°11.88	10.4'	13°49.51	15.0'	59.2'
6 7	268°26.00 283°25.95	N20°58.14 57.70	0°41.31 15°10.66	10.3' 10.3'	N14°4.53 14°19.47	14.9' 14.9'	59.2' 59.2'
8	203 25.95 298°25.90	57.70 57.25	29°39.92	10.3	14 19.47 14°34.34	14.8'	59.2'
9	313°25.86	• • 56.81	44°9.09	10.1'	14°49.14	14.7'	59.2'
10	328°25.81	56.36	58°38.18	10.0'	15°3.86	14.6'	59.2'
11 12	343°25.77 358°25.72	55.91 N20°55.47	73°7.18 87°36.09	9.9' 9.8'	15°18.51 N15°33.08	14.6' 14.5'	59.2' 59.3'
13	13°25.68	55.02	102°4.91	9.7'	15°47.56	14.4	59.3'
14	28°25.63	54.57	116°33.64	9.6'	$16^{\circ}1.97$	14.3'	59.3'
15	43°25.59	• • 54.12	131°2.27	9.5'	16°16.29	14.2'	59.3'
16 17	58°25.54 73°25.50	53.67 53.22	145°30.82 159°59.27	9.5' 9.4'	16°30.53 16°44.68	14.2' 14.1'	59.3' 59.3'
18	88°25.46	N20°52.77	174°27.62	9.3'	N16°58.74	14.0'	59.3'
19	103°25.41	52.32	188°55.88	9.2'	$17^{\circ}12.71$	13.9'	59.3'
20	118°25.37	51.87	203°24.05	9.1'	17°26.59	13.8'	59.3' 59.3'
21 22	133°25.33 148°25.28	• • 51.42 50.96	217°52.11 232°20.08	9.0' 8.9'	17°40.38 17°54.06	13.7' 13.6'	59.3'
23	163°25.24	50.51	246°47.95	8.8'	18°7.66	13.5'	59.4
	SD = 15.7'	d = -0.4'			0 = 16.1'		
		<u> </u>	-	J.	10.1		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°25.20 193°25.16	N20°50.06 49.60	261°15.72 275°43.39	8.7' 8.6'	N18°21.15 18°34.54	13.4' 13.3'	59.4' 59.4'
2	208°25.12	49.00	275 43.39 290°10.96	8.5'	16 34.54 18°47.83	13.2	59.4'
3	223°25.07	• 48.69	304°38.43	8.4'	19°1.01	13.1'	59.4'
4	238°25.03	48.23	319°5.80	8.3'	19°14.08	13.0'	59.4
5 6	253°24.99 268°24.95	47.77 N20°47.32	333°33.06 348°0.23	8.2' 8.1'	19°27.05 N19°39.91	12.9' 12.7'	59.4' 59.4'
7	283°24.91	46.86	2°27.28	8.0'	19°52.66	12.6'	59.4
8	298°24.87	46.40	16°54.24	7.9'	20°5.29	12.5'	59.4'
9	313°24.83	• • 45.94	31°21.09	7.7'	20°17.80	12.4'	59.4'
10 11	328°24.79 343°24.75	45.48 45.02	45°47.84 60°14.48	7.6' 7.5'	20°30.20 20°42.48	12.3' 12.2'	59.4' 59.4'
12	358°24.71	N20°44.56	74°41.02	7.4'	N20°54.64	12.0'	59.4'
13	13°24.67	44.09	89°7.45	7.3'	21°6.67	11.9'	59.4'
14 15	28°24.63 43°24.59	43.63 •• 43.17	103°33.78 118°0.01	7.2' 7.1'	21°18.58 21°30.37	11.8' 11.7'	59.4' 59.5'
16	58°24.56	42.70	132°26.12	7.1 7.0'	21°42.02	11.7	59.5'
17	73°24.52	42.24	146°52.14	6.9'	21°53.55	11.4'	59.5'
18	88°24.48	N20°41.77	161°18.04	6.8'	N22°4.94	11.3'	59.5'
19 20	103°24.44 118°24.40	41.31 40.84	175°43.85 190°9.54	6.7' 6.6'	22°16.20 22°27.32	11.1' 11.0'	59.5' 59.5'
21	133°24.37	• • 40.37	204°35.14	6.5	22°38.31	10.8'	59.5'
22	148°24.33	39.91	219°0.63	6.4'	$22^{\circ}49.16$	10.7'	59.5'
23	163°24.29	39.44	233°26.01	6.3'	22°59.87	10.6'	59.5'
	SD = 15.7'	d = -0.5'		SE	0 = 16.2'		
Sun	GHA	Dec	GHA	ν	Dec	d	НР
Sun O	178°24.25	N20°38.97	247°51.29	ν 6.2'	N23°10.43	a 10.4'	<b>пР</b> 59.5'
1	193°24.22	38.50	$262^{\circ}16.47$	6.1'	23°20.85	10.3'	59.5'
2	208°24.18 223°24.15	38.03	276°41.55 291°6.52	6.0'	23°31.12 23°41.25	10.1'	59.5'
3 4	223°24.15 238°24.11	· · 37.56 37.09	291°6.52 305°31.39	5.9' 5.8'	23°41.25 23°51.22	10.0' 9.8'	59.5' 59.5'
5	253°24.07	36.61	319°56.16	5.7'	24°1.05	9.7'	59.5
6	268°24.04	N20°36.14	334°20.83	5.6'	N24°10.72	9.5'	59.5'
7 8	283°24.00 298°23.97	35.67 35.19	348°45.41 3°9.88	5.5' 5.4'	24°20.24 24°29.60	9.4' 9.2'	59.5' 59.5'
9	298 23.97 313°23.93	34.72	3 9.88 17°34.25	5.4 5.3'	24°29.60 24°38.80	9.2 9.0'	59.5'
10	328°23.90	34.24	31°58.53	5.2'	24°47.84	8.9'	59.5'
11	343°23.87	33.77	46°22.71	5.1'	24°56.73	8.7'	59.5'
12 13	358°23.83 13°23.80	N20°33.29 32.82	60°46.80 75°10.80	5.0' 4.9'	N25°5.45 25°14.00	8.6' 8.4'	59.5' 59.5'
14	28°23.77	32.82	89°34.70	4.9 4.8'	25°22.39	8.2'	59.5'
15	43°23.73	• • 31.86	103°58.51	4.7'	25°30.61	8.1'	59.5'
16	58°23.70	31.38	118°22.23	4.6'	25°38.66	7.9'	59.5'
17 18	73°23.67 88°23.63	30.90 N20°30.42	132°45.87 147°9.41	4.5' 4.5'	25°46.54 N25°54.25	7.7' 7.5'	59.5' 59.5'
19	103°23.60	29.94	161°32.87	4.5 4.4'	26°1.79	7.5 7.4'	59.5'
20	118°23.57	29.46	175°56.25	4.3'	$26^{\circ}9.15$	7.2'	59.5'
21	133°23.54 148°23.51	• • 28.98	190°19.55 204°42.76	4.2'	26°16.34 26°23.34	7.0'	59.5'
22 23	148°23.51 163°23.48	28.50 28.02	204° 42.76 219° 5.90	4.1' 4.1'	26°23.34 26°30.17	6.8' 6.6'	59.5' 59.5'
	SD = 15.7'	d = -0.5'			0 = 16.2'	0.0	
		u — -0.5		JL			

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

Lat.		Moonris	e		Moonset	:
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	19:36			16:43		
<b>N</b> 70°	20:30			15:52		
68°	21:03			15:20		
66°	21:27	20:49		14:57	17:30	
64°	21:47	21:29		14:39	16:51	
62°	22:03	21:57	21:49	14:25	16:24	18:35
60°	22:16	22:19	22:27	14:13	16:03	17:58
<b>N</b> 58°	22:28	22:37	22:54	14:02	15:46	17:31
56°	22:38	22:52	23:15	13:53	15:32	17:11
54°	22:47	23:05	23:33	13:45	15:19	16:54
52°	22:55	23:16	23:48	13:38	15:08	16:39
50°	23:02	23:26		13:31	14:59	16:26
45°	23:18	23:48		13:17	14:39	16:00
<b>N</b> 40°	23:31		00:05	13:06	14:22	15:40
35°	23:42	•• ••	00:20	12:56	14:09	15:22
30°	23:51	•• ••	00:33	12:48	13:57	15:08
20°	••••	80:00	00:55	12:34	13:37	14:43
<b>N</b> 10°		00:23	01:15	12:21	13:19	14:21
0°		00:37	01:33	12:09	13:03	14:01
<b>S</b> 10°		00:51	01:51	11:58	12:47	13:41
20°	00:05	01:06	02:11	11:45	12:30	13:20
30°	00:16	01:24	02:34	11:31	12:10	12:55
35°	00:23	01:34	02:47	11:23	11:58	12:41
40°	00:30	01:46	03:03	11:14	11:45	12:24
45°	00:40	02:00	03:22	11:03	11:30	12:04
<b>S</b> 50°	00:50	02:17	03:46	10:50	11:11	11:39
52°	00:56	02:25	03:57	10:44	11:02	11:28
54°	01:01	02:34	04:10	10:38	10:52	11:14
56°	01:08	02:45	04:25	10:30	10:41	10:58
58°	01:15	02:57	04:43	10:22	10:28	10:40
<b>S</b> 60°	01:23	03:10	05:05	10:13	10:14	10:17

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
Luy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	23-25	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	50-28%	
18	06:15	06:17	12:06	05:57	18:23		
19	06:19	06:21	12:06	06:50	19:18		
20	06.23	06.25	12.06	07.47	20.17		

July 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	299°0.93	221°30.53 N20°54.40	128°17.02 N04°48.72	198°53.08 N23°0.78	296°21.77 S01°23.17	
1	314°3.40	236°29.97 54.74	143° 18.11 48.10	213°54.95 0.74	311°24.26 23.20	Alpheratz 357°34.15 29°13.83
2	329°5.86	251°29.40 55.09	158° 19.19 47.48	228°56.81 0.71	326°26.75 23.22	Ankaa 353°6.53 -42°9.74
3	344°8.33	266°28.84 · · 55.44	173°20.28 · · 46.86	243°58.68 · · 0.67	341°29.24 · · 23.24	Schedar 349°30.36 56°40.45
4	359°10.79	281°28.28 55.79	188°21.36 46.24	259°0.54 0.64	356°31.73 23.27	Diphda 348°46.74 -17°50.59 Achernar 335°19.80 -57°6.06
5	14° 13.26	296°27.72 56.13	203°22.45 45.61	274° 2.41 0.60	11°34.22 23.29	Achernar 335°19.80 -57°6.06   Hamal 327°50.72 23°34.95
6	29° 15.72	311°27.16 N20°56.48	218°23.53 N04°44.99	289°4.27 N23°0.57	26°36.71 <b>S</b> 01°23.32	Polaris 313°57.67 89°21.99
7	44° 18.18	326°26.59 56.82	233°24.61 44.37	304°6.14 0.53	41°39.20 23.34	Acamar 315°11.55 -40°11.83
8	59°20.65	341°26.03 57.16	248°25.70 43.75	319°8.00 0.50	56°41.69 23.36	Menkar 314°5.78 4°11.47
9	74°23.11	356°25.46 · · 57.51	263°26.78 · · 43.13	334°9.87 · · 0.46	71°44.18 · · 23.39	Mirfak 308°27.82 49°56.93
10 11	89°25.58 104°28.04	11°24.90 57.85 26°24.33 58.19	278° 27.87 42.50 293° 28.95 41.88	349°11.73 0.43 4°13.60 0.39	86°46.68 23.41 101°49.17 23.43	Aldebaran 290°39.33 16°33.65
12	119° 30.51	41°23.77 N20°58.53	308°30.03 N04°41.26	19°15.46 N23°0.36	116°51.66 S01°23.46	Rigel 281°3.69 -8°10.20
13	134°32.97	56°23.20 58.87	323°31.12 40.64	34°17.33 0.32	131°54.15 23.48	Capella 280°21.60 46°1.31
14	149°35.43	71°22.64 59.21	338°32.20 40.02	49°19.19 0.28	146°56.64 23.51	Bellatrix 278°22.66 6°22.43
15	164°37.90	86°22.07 · · 59.54	353°33.28 · · 39.39	64°21.06 · · 0.25	161°59.13 · · 23.53	Elnath 278°1.60 28°37.70
16	179°40.36	101°21.50 20°59.88	8°34.37 38.77	79°22.93 0.21	177°1.63 23.55	Alnilam 275°37.55 -1°11.04   Betelgeuse 270°51.89 7°24.77
17	194° 42.83	116°20.94 21°0.21	23°35.45 38.15	94°24.79 0.18	192°4.12 23.58	Canopus 263°52.71 -52°42.35
18	209° 45.29	131°20.37 N21°0.55	38°36.53 N04°37.53	109°26.66 N23°0.14	207°6.61 S01°23.60	Sirius 258°26.17 -16°44.95
19	224° 47.75	146°19.80 0.88	53°37.62 36.90	124°28.52 0.11	222°9.11 23.63	Adhara 255° 5.88 -29° 0.28
20 21	239° 50.22 254° 52.68	161°19.23 1.22 176°18.66 · · 1.55	68°38.70 36.28 83°39.78 · · 35.66	139°30.39 0.07 154°32.26 · · 0.04	237°11.60 23.65 252°14.09 · · 23.68	Procyon 244°50.70 5°9.64
22	269°55.15	191°18.09 1.88	98° 40.87 35.03	169°34.12 0.00	267°16.58 23.70	Pollux 243°17.13 27°57.91
23	284°57.61	206°17.52 2.21	113°41.95 34.41	184°35.99 59.97	282°19.08 23.73	Avior 234°15.22 -59°35.44
		-				Suhail 222°46.43 -43°32.15
Mer.p	pass. 04:03	ν-0.6' d0.3' m-4.04	$\nu 1.1' \ d$ -0.6' m1.57	ν1.9' d-0.0' m-1.90	$\nu 2.5' \ d0.0' \ m0.86$	Miaplacidus 221°39.12 -69°49.37
						Alphard 217°47.62 -8°46.12 Regulus 207°34.24 11°50.63
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.90 61°37.02
0	300°0.08	221°16.95 N21°2.54	128°43.03 N04°33.79	199°37.85 N22°59.93	297°21.57 <b>S</b> 01°23.75	Denebola 182°24.66 14°25.87
1	315°2.54	236°16.38 2.87	143°44.12 33.16	214°39.72 59.89	312°24.07 23.78	Gienah 175°43.27 -17°41.08
2	330°5.00	251°15.81 3.19	158° 45.20 32.54	229°41.59 59.86	327°26.56 23.80	Acrux 172°59.88 -63°14.71
3 4	345°7.47 0°9.93	266°15.23 · · 3.52 281°14.66 3.85	173°46.28 · · 31.92	244°43.45 · · 59.82	342°29.05 · · 23.83 357°31.55 23.85	Gacrux 171°51.37 -57°15.63
5	0 9.93 15°12.40	281°14.66 3.85 296°14.09 4.17	188° 47.36 31.29 203° 48.45 30.67	259°45.32 59.79 274°47.19 59.75	357°31.55 23.85 12°34.04 23.88	Alioth 166°12.70 55°49.54
6	30° 14.86	311°13.52 N21°4.50	218°49.53 N04°30.05	289°49.05 N22°59.72	27°36.54 S01°23.90	Spica 158°21.86 -11°17.71
7	45° 17.33	326°12.94 4.82	233°50.61 29.42	304°50.92 59.68	42°39.03 23.93	Alkaid 152°51.64 49°11.39
8	60° 19.79	341°12.37 5.14	248°51.69 28.80	319°52.79 59.64	57°41.53 23.95	Hadar 148°35.34 -60°30.04 Menkent 147°57.06 -36°29.91
9	75°22.25	356°11.79 · · 5.46	263°52.77 · · 28.18	334°54.65 · · 59.61	72°44.02 · · 23.98	Arcturus 145°47.45 19°3.09
10	90°24.72	11°11.22 5.78	278°53.86 27.55	349°56.52 59.57	87°46.52 24.00	Rigil Kent. 139°39.56 -60°56.72
11	105°27.18	26°10.64 6.10	293°54.94 26.93	4°58.39 59.54	102°49.01 24.03	Kochab 137°19.46 74°3.27
12	120°29.65	41°10.07 N21°6.42	308°56.02 N04°26.30	20°0.25 N22°59.50	117°51.51 \$01°24.05	Zuben'ubi 136°55.43 -16°8.93
13	135°32.11	56°9.49 6.74	323°57.10 25.68	35°2.12 59.46 50°3.99 59.43	132°54.00 24.08	Alphecca 126°3.19 26°37.87
14 15	150° 34.58 165° 37.04	71°8.91 7.06 86°8.34 · · 7.37	338°58.18 25.05 353°59.27 · · 24.43	50° 3.99 59.43 65° 5.86 • 59.39	147°56.50 24.11 162°59.00 •• 24.13	Antares 112°15.04 -26°29.38
16	180°39.50	101°7.76 7.69	9°0.35 23.81	80°7.72 59.36	178°1.49 24.16	Atria 107°8.44 -69°4.58
17	195° 41.97	116°7.18 8.00	24°1.43 23.18	95° 9.59 59.32	193°3.99 24.18	Sabik 102°2.00 -15°45.40
18	210°44.43	131°6.60 N21°8.32	39°2.51 N04°22.56	110°11.46 N22°59.28	208°6.48 <b>S</b> 01°24.21	Shaula 96° 9.40 -37° 7.39 Rasalhague 95° 57.84 12° 32.56
19	225°46.90	146°6.02 8.63	54°3.59 21.93	125°13.33 59.25	223°8.98 24.24	Eltanin 90°41.50 51°29.23
20	240°49.36	161°5.44 8.94	69°4.67 21.31	140°15.19 59.21	238°11.48 24.26	Kaus Aust. 83°31.53 -34°22.35
21	255°51.82	176°4.86 · · 9.25	84°5.75 · · 20.68	155°17.06 · · 59.17	253°13.97 · · 24.29	Vega 80°32.51 38°48.51
22	270°54.29	191°4.28 9.56	99°6.83 20.06	170°18.93 59.14	268°16.47 24.31	Nunki 75°46.83 -26°15.87
23	285°56.75	206°3.70 9.87	114°7.92 19.43	185°20.80 59.10	283°18.97 24.34	Altair 61°59.18 8°56.20
Mer.p	pass. 03:59	$\nu$ -0.6 $'$ $d$ 0.3 $'$ m-4.04	$ u 1.1' \; d$ -0.6 $' \; {\sf m} 1.58$	$ u 1.9' \ d$ -0.0 $' \ { m m}$ -1.90	$ u 2.5' \ d0.0' \ \text{m}0.85$	Peacock 53°4.41 -56°39.06
			·			Deneb 49°25.04 45°22.26
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.06 9°59.57
0	300°59.22	221°3.12 N21°10.18	129°9.00 N04°18.81	200°22.66 N22°59.06	298°21.47	Al Na'ir 27°31.93 -46°50.03   Fomalhaut 15°13.75 -29°29.01
1	316°1.68	236°2.54 10.49	144°10.08 18.18	215°24.53 59.03	313°23.96 24.39	Scheat 13°44.52 28°13.24
2	331°4.15	251°1.96 10.79	159°11.16 17.56	230°26.40 58.99	328°26.46 24.42	Markab 13°29.22 15°20.58
3	346°6.61	266°1.38 · · 11.10	174°12.24 · · 16.93	245°28.27 · · 58.95	343°28.96 · · 24.45	
4	1°9.07	281°0.79 11.40	189°13.32 16.31	260°30.14 58.92	358°31.46 24.47	Jul 21 Mon SHA Mer.pass
5	16°11.54	296°0.21 11.71	204°14.40 15.68	275°32.00 58.88	13°33.96 24.50	Venus 282°29.59 09:14
6 7	31°14.00	310°59.63 N21°12.01	219°15.48 N04°15.05	290°33.87 N22°58.85	28°36.45	Mars 189°16.09 15:26   Jupiter 259°52.15 10:43
7 8	46° 16.47 61° 18.93	325°59.04 12.31 340°58.46 12.61	234°16.56 14.43 249°17.64 13.80	305°35.74 58.81 320°37.61 58.77	43°38.95 24.55 58°41.45 24.58	Saturn 357°20.83 04:14
9	76°21.40	355°57.87 · · 12.92	264° 18.72 · · 13.18	335°39.48 · · 58.74	73°43.95 · · 24.61	
10	91°23.86	10°57.29 13.21	279°19.80 12.55	350°41.35 58.70	88°46.45 24.63	Jul 22 Tue SHA Mer.pass
11	106° 26.32	25°56.70 13.51	294°20.88 11.93	5°43.22 58.66	103°48.95 24.66	Venus 281°16.87 09:15
12	121°28.79	40°56.12 N21°13.81	309°21.96 N04°11.30	20°45.08 N22°58.62	118°51.45 <b>S</b> 01°24.69	Mars 188°42.96 15:24 Jupiter 259°37.78 10:40
13	136° 31.25	55°55.53 14.11	324°23.04 10.67	35°46.95 58.59	133°53.95 24.72	Saturn 357°21.50 04:10
14	151°33.72	70°54.94 14.40	339°24.12 10.05	50°48.82 58.55	148°56.45 24.74	
15 16	166°36.18	85°54.36 · · 14.70	354°25.20 · · 9.42	65°50.69 · · 58.51	163°58.95 · · 24.77	Jul 23 Wed SHA Mer.pass
16 17	181°38.65 196°41.11	100°53.77 14.99 115°53.18 15.29	9°26.28 8.79 24°27.36 8.17	80°52.56 58.48 95°54.43 58.44	179°1.45 24.80 194°3.95 24.83	Venus 280° 3.90 09:16
18	211° 43.57	130°52.59 N21°15.58	39°28.44 N04°7.54	110°56.30 N22°58.40	209°6.45 S01°24.85	Mars 188° 9.78 15:22   Jupiter 259° 23.45 10:37
19	226° 46.04	145°52.00 15.87	54°29.52 6.91	125°58.17 58.37	224°8.95 24.88	Saturn 357°22.25 04:06
20	241°48.50	160°51.41 16.16	69°30.60 6.29	141°0.04 58.33	239°11.45 24.91	
21	256° 50.97	175°50.82 · · 16.45	84°31.68 · · 5.66	156°1.91 · · 58.29	254°13.95 · · 24.94	Horizontal parallax
22	271°53.43	190°50.23 16.74	99°32.75 5.03	171°3.77 58.25	269°16.45 24.96	Venus: 0.1 Mars: 0.1
23	286° 55.89	205°49.64 17.03	114°33.83 4.41	186° 5.64 58.22	284°18.95 24.99	Mars: 0.1
Mer.p	pass. 03:55	$\nu$ -0.6′ $d$ 0.3′ $m$ -4.03	$\nu 1.1' \ d\text{-}0.6' \ \text{m}1.58$	$\nu 1.9' \ d$ -0.0' m-1.91	$\nu 2.5' \ d0.0' \ m0.85$	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.44	N20°27.53	233°28.96	4.0'	N26°36.82	6.5'	59.5'
1	193°23.41	27.05	247°51.94	3.9'	26°43.29	6.3'	59.5'
2	208°23.38	26.56	262°14.85	3.8'	26°49.57	6.1'	59.5'
3 4	223°23.35 238°23.32	· · 26.08 25.59	276°37.69 291°0.46	3.8' 3.7'	26°55.67 27°1.58	5.9' 5.7'	59.5' 59.5'
5	253° 23.29	25.11	305°23.17	3.6'	27°7.31	5.7 5.5'	59.5'
6	268° 23.26	N20°24.62	319°45.81	3.6'	N27°12.85	5.4'	59.5'
7	283°23.23	24.13	334°8.38	3.5'	$27^{\circ}18.20$	5.2'	59.5'
8	298°23.20	23.64	348°30.90	3.5'	27°23.37	5.0'	59.5'
9 10	313°23.18 328°23.15	· · 23.15 22.66	2°53.36 17°15.76	3.4' 3.3'	27°28.34 27°33.12	4.8' 4.6'	59.5' 59.5'
11	343°23.12	22.17	31°38.11	3.3'	27°37.71	4.4'	59.5'
12	358° 23.09	N20°21.68	46°0.41	3.3'	N27°42.10	4.2'	59.4'
13	13°23.06	21.19	60°22.66	3.2'	$27^{\circ}46.31$	4.0'	59.4'
14	28°23.04	20.70	74°44.87	3.2'	27°50.31	3.8'	59.4'
15 16	43°23.01 58°22.98	· · 20.21 19.72	89°7.03 103°29.15	3.1' 3.1'	27°54.12 27°57.74	3.6' 3.4'	59.4' 59.4'
17	73° 22.95	19.22	117°51.23	3.0'	28°1.15	3.2'	59.4'
18	88°22.93	N20°18.73	132°13.28	3.0'	N28°4.37	3.0'	59.4'
19	103°22.90	18.23	146°35.30	3.0'	28°7.39	2.8'	59.4'
20	118° 22.87	17.74	160°57.29	3.0'	28°10.22	2.6'	59.4'
21 22	133° 22.85 148° 22.82	· · 17.24 16.75	175°19.24 189°41.18	2.9' 2.9'	28°12.84 28°15.26	2.4' 2.2'	59.4' 59.4'
23	163° 22.80	16.75	204°3.09	2.9'	28°17.49	2.0'	59.4
	SD = 15.7'	d = -0.5'			0 = 16.2'		
	JD — 13.1	u = -0.5		31	J — 10.Z		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178° 22.77	N20°15.75	218°24.99	2.9'	N28°19.51	1.8'	59.4'
1 2	193°22.75 208°22.72	15.25 14.75	232°46.87 247°8.74	2.9' 2.9'	28°21.33 28°22.95	1.6' 1.4'	59.4' 59.3'
3	208 22.72 223°22.70	• • 14.25	261°30.60	2.9'	28°24.37	1.2'	59.3'
4	238° 22.67	13.75	275°52.45	2.8'	28°25.59	1.0'	59.3'
5	253°22.65	13.25	290°14.30	2.8'	$28^{\circ}26.61$	0.8'	59.3'
6	268°22.63	N20°12.75	304°36.14	2.8'	N28°27.42	0.6'	59.3'
7 8	283°22.60 298°22.58	12.25 11.75	318°57.99 333°19.85	2.9' 2.9'	28°28.04 28°28.45	0.4' 0.2'	59.3' 59.3'
9	313°22.56	11.75	347°41.71	2.9'	28°28.66	0.2	59.3'
10	328° 22.53	10.74	2°3.58	2.9'	28°28.67	-0.2	59.3'
11	343°22.51	10.24	16°25.47	2.9'	28°28.48	-0.4'	59.3'
12	358° 22.49	N20° 9.73	30°47.38	2.9'	N28°28.09	-0.6'	59.2'
13 14	13°22.47 28°22.44	9.23 8.72	45°9.30 59°31.25	2.9' 3.0'	28°27.50 28°26.71	-0.8' -1.0'	59.2' 59.2'
15	43° 22.42	8.22	73°53.22	3.0'	28°25.71	-1.2	59.2'
16	58° 22.40	7.71	88°15.22	3.0'	28°24.52	-1.4'	59.2'
17	73°22.38	7.20	102°37.26	3.1'	28°23.13	-1.6'	59.2'
18	88°22.36	N20° 6.69	116°59.33 131°21.43	3.1'	N28°21.54 28°19.75	-1.8'	59.2'
19 20	103°22.34 118°22.32	6.18 5.67	131°21.43 145°43.58	3.1' 3.2'	28° 19.75 28° 17.77	-2.0' -2.2'	59.2' 59.1'
21	133° 22.30	5.16	160°5.77	3.2'	28°15.59	-2.4	59.1'
22	148°22.28	4.65	174°28.01	3.3'	28°13.21	-2.6'	59.1'
23	163°22.26	4.14	188°50.29	3.3'	28°10.64	-2.8'	59.1'
	SD = 15.7'	d = -0.5'		SI	O = 16.2'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178° 22.24	N20° 3.63	203°12.63	3.4'	N28°7.87	-3.0'	59.1'
1	193°22.22	3.12	217°35.02	3.4'	28°4.91	-3.2'	59.1'
2	208° 22.20 223° 22.18	2.60	231°57.46 246°19.97	3.5' 3.6'	28°1.76 27°58.42	-3.3'	59.0'
3 4	223°22.18 238°22.16	· · 2.09 1.58	246° 19.97 260° 42.54	3.6'	27°58.42 27°54.88	-3.5' -3.7'	59.0' 59.0'
5	253° 22.15	1.06	275° 5.17	3.7'	27°51.16	-3.7 -3.9'	59.0'
6	268°22.13	N20° 0.55	289°27.87	3.8'	N27°47.25	-4.1'	59.0'
7	283°22.11	20°0.03	303°50.64	3.8'	27°43.15	-4.3'	59.0'
8 9	298°22.09 313°22.08	19°59.52 •• 59.00	318°13.48 332°36.39	3.9' 4.0'	27°38.86 27°34.39	-4.5' -4.7'	58.9' 58.9'
10	313°22.08 328°22.06	58.48	332°36.39 346°59.38	4.0	27°34.39 27°29.73	-4.7' -4.8'	58.9'
11	343°22.04	57.96	1°22.45	4.2'	27°24.89	-5.0'	58.9'
12	358° 22.03	N19°57.44	15°45.61	4.2'	N27°19.87	-5.2'	58.9'
13	13°22.01	56.92	30°8.84	4.3'	27°14.67	-5.4'	58.9'
14 15	28°22.00 43°21.98	56.40 •• 55.88	44°32.16 58°55.56	4.4' 4.5'	27°9.29 27°3.73	-5.6' -5.7'	58.8' 58.8'
15 16	43 21.98 58°21.96	55.36	73°19.06	4.5 4.6'	21 3.13 26°57.99	-5.7 -5.9'	58.8'
17	73°21.95	54.84	87°42.65	4.7'	26°52.08	-6.1'	58.8'
18	88°21.93	N19°54.32	102°6.33	4.8'	N26°46.00	-6.3'	58.8'
19	103°21.92	53.80	116°30.10	4.9'	26°39.74	-6.4'	58.7'
20 21	118°21.91 133°21.89	53.27 •• 52.75	130°53.97 145°17.94	5.0' 5.1'	26°33.32 26°26.73	-6.6' -6.8'	58.7' 58.7'
22	133 21.89 148°21.88	52.75	145 17.94 159°42.01	5.1 5.2'	26° 26.73 26° 19.96	-6.8 -6.9	58.7'
23	163°21.86	51.70	174° 6.18	5.3'	26°13.04	-7.1'	58.7'
	SD = 15.7'	d = -0.5'		SI	O = 16.1'		

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

Lat.		Moonris	e		Moonset	:
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°						01.50
62° 60°	22:52	23.50		10.44	20.50	21:52
		23:59		19:44	20:50	21:14
N 58°	23:29		00:36	19:07	20:13	20:48
56° 54°	23:56	00:17	01:03 01:24	18:40 18:19	19:46 19:25	20:26 20:09
54 52°		00:17	01:24	18:19	19:25	20:09 19:54
50°	00:01	00:50	01:56	17:47	18:53	19:34
45°	00:01	01:20	02:26	17:17	18:22	19:14
<b>N</b> 40°	00:49	01:44	02:49	16:53	17:59	18:52
35°	01:07	02:04	03:09	16:34	17:39	18:35
30°	01:23	02:20	03:25	16:17	17:22	18:19
20°	01:49	02:49	03:53	15:49	16:54	17:53
N 10°	02:12	03:13	04:17	15:25	16:29	17:30
0°	02:33	03:36	04:39	15:03	16:07	17:09
<b>S</b> 10°	02:55	03:59	05:02	14:41	15:44	16:47
20°	03:18	04:24	05:26	14:17	15:19	16:24
30°	03:45	04:52	05:54	13:49	14:50	15:57
35°	04:01	05:10	06:10	13:32	14:33	15:42
40°	04:19	05:29	06:29	13:13	14:13	15:23
45°	04:42	05:54	06:52	12:50	13:49	15:00
<b>S</b> 50°	05:11	06:25	07:22	12:20	13:18	14:31
52°	05:25	06:41	07:36	12:06	13:02	14:17
54°	05:42	06:59	07:53	11:49	12:44	14:01
56°	06:02	07:21	08:13	11:29	12:22	13:41
58°	06:26	07:50	08:38	11:04	11:53	13:16
<b>S</b> 60°	07:00	08:32	09:12	10:30	11:11	12:43

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	301°58.36	220°49.05 N21°17.31	129°34.91 N04°3.78	201°7.51 N22°58.18	299°21.45 <b>S</b> 01°25.02	Alpheratz 357°34.12 29°13.84
1	317°0.82	235°48.46 17.60	144°35.99 3.15	216° 9.38 58.14	314°23.95 25.05	Ankaa 353°6.49 -42°9.73
2	332°3.29	250°47.87 17.88	159°37.07 2.53	231°11.25 58.11	329°26.46 25.08	Schedar 349°30.32 56°40.46
3	347°5.75	265°47.28 · · 18.17	174°38.15 · · 1.90	246°13.12 · · 58.07	344°28.96 · · 25.10	Diphda 348°46.71 -17°50.58
4 5	2°8.22 17°10.68	280° 46.68 18.45 295° 46.09 18.73	189°39.23 1.27 204°40.31 0.64	261°14.99 58.03 276°16.86 57.99	359°31.46 25.13 14°33.96 25.16	Achernar 335°19.76 -57°6.06
6	32° 13.14	310°45.50 N21°19.02	219°41.38 N04°0.02	291°18.73 N22°57.96	29°36.46 S01°25.19	Hamal 327°50.68 23°34.96
7	47° 15.61	325°44.90 19.30	234°42.46 03°59.39	306°20.60 57.92	44°38.97 25.22	Polaris 313°55.99 89°22.00
8	62° 18.07	340°44.31 19.58	249°43.54 58.76	321°22.47 57.88	59°41.47 25.25	Acamar 315°11.52 -40°11.82
9	77°20.54	355°43.72 · · 19.86	264°44.62 · · 58.13	336°24.34 · · 57.84	74°43.97 · · 25.28	Menkar 314°5.75 4°11.48
10	92°23.00	10°43.12 20.13	279°45.70 57.51	351°26.21 57.81	89°46.47 25.30	Mirfak 308°27.78 49°56.94
11	$107^{\circ}25.47$	25° 42.52 20.41	294° 46.77 56.88	6°28.08 57.77	104°48.98 25.33	Aldebaran 290° 39.30 16° 33.66 Rigel 281° 3.67 -8° 10.19
12	122°27.93	40°41.93 N21°20.69	309°47.85 N03°56.25	21°29.95 N22°57.73	119°51.48 S01°25.36	Rigel 281°3.67 -8°10.19 Capella 280°21.56 46°1.31
13	137°30.39	55°41.33 20.96	324°48.93 55.62	36°31.83 57.69	134°53.98 25.39	Bellatrix 278°22.64 6°22.44
14	152° 32.86	70°40.74 21.24	339°50.01 54.99	51°33.70 57.66	149°56.49 25.42	Elnath 278°1.57 28°37.71
15	167°35.32	85°40.14 · · 21.51	354°51.09 · · 54.37	66°35.57 · · 57.62	164°58.99 · · 25.45	Alnilam 275°37.52 -1°11.03
16	182°37.79	100°39.54 21.78	9°52.16 53.74	81°37.44 57.58	180°1.50 25.48	Betelgeuse 270°51.87 7°24.78
17	197° 40.25	115°38.94 22.05	24°53.24 53.11	96°39.31 57.54	195°4.00 25.51	Canopus 263°52.69 -52°42.34
18	212° 42.71	130°38.35 N21°22.32	39°54.32 N03°52.48	111°41.18 N22°57.51	210°6.50 S01°25.54	Sirius 258°26.15 -16°44.94
19	227° 45.18	145°37.75 22.59	54°55.40 51.85	126°43.05 57.47	225°9.01 25.57	Adhara 255°5.87 -29°0.26
20	242° 47.64	160°37.15 22.86	69°56.47 51.22	141°44.92 57.43	240°11.51 25.59	Procyon 244°50.68 5°9.64
21 22	257° 50.11 272° 52.57	175°36.55 · · 23.13 190°35.95 23.40	84°57.55 · · 50.60 99°58.63 49.97	156°46.79 · · 57.39 171°48.66 57.35	255°14.02 · · 25.62 270°16.52 25.65	Pollux 243°17.11 27°57.91
23	287°55.04	205°35.35 23.66	114°59.70 49.34	186°50.53 57.32	270°16.52 25.65 285°19.03 25.68	Avior 234°15.22 -59°35.43
	207 55.04		-			Suhail 222°46.42 -43°32.14
Mer.	pass. 03:51	$\nu$ -0.6 $'$ d0.3 $'$ m-4.03	$ u 1.1' \; d  0.6' \; \text{m} 1.58$	$\nu 1.9' \; d$ -0.0 $' \; m$ -1.91	$\nu 2.5' \ d0.0' \ m0.84$	Miaplacidus 221°39.14 -69°49.36
						Alphard 217°47.61 -8°46.12
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.23 11°50.63
0	302° 57.50	220°34.75 N21°23.93	130°0.78 N03°48.71	201°52.41 N22°57.28	300°21.53 S01°25.71	Dubhe 193°40.90 61°37.01
1	317°59.96	235°34.15 24.19	145°1.86 48.08	216°54.28 57.24	315°24.04 25.74	Denebola 182°24.66 14°25.86
2	333°2.43	250°33.55 24.46	160°2.93 47.45	231°56.15 57.20	330°26.54 25.77	Gienah 175° 43.27 -17° 41.08
3	348°4.89	265°32.95 · · 24.72	175°4.01 · · 46.82	246°58.02 · · 57.16	345°29.05 · · 25.80	Acrux 172°59.91 -63°14.71 Gacrux 171°51.39 -57°15.62
4	3°7.36	280°32.34 24.98	190°5.09 46.19	261°59.89 57.13	0°31.55 25.83	Alioth 166°12.71 55°49.53
5	$18^{\circ}9.82$	295°31.74 25.24	205°6.16 45.57	277°1.76 57.09	15°34.06 25.86	Spica 158°21.86 -11°17.71
6	33° 12.28	310°31.14 N21°25.50	220°7.24 N03°44.94	292°3.64 N22°57.05	30°36.57 S01°25.89	Alkaid 152°51.65 49°11.39
7	48° 14.75	325°30.54 25.76	235°8.32 44.31	$307^{\circ}5.51$ 57.01	45°39.07 25.92	Hadar 148°35.35 -60°30.05
8	63° 17.21	340°29.93 26.02	250°9.39 43.68	322°7.38 56.97	60°41.58 25.95	Menkent 147°57.07 -36°29.91
9	78° 19.68	355°29.33 · · 26.27	265° 10.47 · · 43.05	337°9.25 · · 56.93	75°44.08 · · 25.98	Arcturus 145°47.46 19°3.09
10	93°22.14	10°28.72 26.53	280° 11.55 42.42	352°11.12 56.90	90°46.59 26.01	Rigil Kent. 139°39.58 -60°56.73
11	108°24.61	25°28.12 26.79	295°12.62 41.79	7°13.00 56.86	105°49.10 26.04	Kochab 137°19.51 74°3.27
12	123°27.07	40°27.52 N21°27.04	310°13.70 N03°41.16	22°14.87 N22°56.82	120°51.60 S01°26.07	Zuben'ubi 136°55.43 -16°8.93
13 14	138°29.53	55°26.91 27.29	325°14.77 40.53	37°16.74 56.78	135°54.11 26.10	Alphecca 126°3.19 26°37.87
	153° 32.00 168° 34.46	70°26.30 27.55 85°25.70 •• 27.80	340°15.85 39.90 355°16.92 · · 39.27	52°18.61 56.74 67°20.49 •• 56.70	150°56.62 26.13 165°59.13 • 26.16	Antares 112°15.04 -26°29.39
15 16	183°36.93	100°25.09 28.05	10°18.00 38.64	82°22.36 56.67	181°1.63 26.20	Atria 107°8.44 -69°4.59
17	198°39.39	115°24.48 28.30	25°19.08 38.01	97°24.23 56.63	196°4.14 26.23	Sabik 102°1.99 -15°45.40
18	213° 41.85	130°23.88 N21°28.55	40°20.15 N03°37.38	112°26.10 N22°56.59	211°6.65 S01°26.26	Shaula 96°9.40 -37°7.40
19	228° 44.32	145°23.27 28.79	55°21.23 36.75	127°27.98 56.55	226°9.16 26.29	Rasalhague 95°57.84 12°32.56
20	243°46.78	160°22.66 29.04	70°22.30 36.12	142°29.85 56.51	241°11.67 26.32	Eltanin 90°41.51 51°29.24
21	258° 49.25	175°22.05 · · 29.29	85°23.38 · · 35.49	157°31.72 · · 56.47	256°14.17 · · 26.35	Kaus Aust. 83°31.53 -34°22.36 Vega 80°32.51 38°48.52
22	273°51.71	190°21.44 29.53	100°24.45 34.86	172°33.60 56.43	271°16.68 26.38	Nunki 75°46.82 -26°15.87
23	288°54.17	205°20.84 29.78	115°25.53 34.23	187°35.47 56.40	286°19.19 26.41	Altair 61°59.17 8°56.21
Mer	pass. 03:48	ν-0.6' d0.3' m-4.03	ν1.1' d-0.6' m1.59	ν1.9' d-0.0' m-1.91	$\nu 2.5' \ d0.0' \ m0.84$	Peacock 53°4.38 -56°39.07
IVICI.	pass. 05.40	ν-0.0 do.5 III-4.05	ν1.1 u-0.0 III1.39	ν1.9 d-0.0 III-1.91		Deneb 49°25.03 45°22.28
						Enif 33°38.04 9°59.59
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.90 -46°50.03
0	303°56.64	220°20.23 N21°30.02	130°26.60 N03°33.60	202°37.34 N22°56.36	301°21.70 S01°26.44	Fomalhaut 15°13.72 -29°29.01
1	318°59.10	235°19.62 30.26	145° 27.68 32.97	217°39.22 56.32	316°24.21 26.47	Scheat 13°44.50 28°13.26
2	334°1.57	250°19.01 30.50	160°28.75 32.34	232°41.09 56.28	331°26.72 26.51	Markab 13°29.20 15°20.59
3 4	349°4.03	265°18.40 · · 30.74 280°17.78 30.98	175°29.83 · · 31.71	247°42.96 · · 56.24 262°44.84 56.20	346°29.23 · · 26.54	Jul 24 Thu SHA Mer.pass
4 5	4°6.50 19°8.96	280°17.78 30.98 295°17.17 31.22	190°30.90 31.07 205°31.97 30.44	262°44.84 56.20 277°46.71 56.16	1°31.74 26.57 16°34.25 26.60	Venus 278° 50.69 09:17
6	34°11.42	310°16.56 N21°31.46	205 31.97 30.44 220°33.05 N03°29.81	292°48.58 N22°56.12	31°36.76 S01°26.63	Mars 187°36.55 15:21
7	49° 13.89	325°15.95 31.70	235°34.12 29.18	307°50.46 56.09	46°39.27 26.66	Jupiter 259°9.16 10:34
8	64° 16.35	340°15.34 31.93	250°35.20 28.55	322°52.33 56.05	61°41.78 26.70	Saturn 357°23.09 04:02
9	79° 18.82	355°14.72 · · 32.17	265°36.27 · · 27.92	337°54.20 · · 56.01	76°44.29 · · 26.73	
10	94°21.28	10°14.11 32.40	280° 37.35 27.29	352°56.08 55.97	91°46.80 26.76	Jul 25 Fri SHA Mer.pass
11	109°23.74	25°13.50 32.63	295°38.42 26.66	7°57.95 55.93	106°49.31 26.79	Venus 277°37.25 09:18
12	124°26.21	40°12.88 N21°32.87	310°39.49 N03°26.03	22°59.83 N22°55.89	121°51.82 <b>S</b> 01°26.82	Mars 187°3.28 15:19
13	139°28.67	55°12.27 33.10	325°40.57 25.39	38° 1.70 55.85	136°54.33 26.85	Jupiter 258°54.91 10:31
14	154°31.14	70°11.66 33.33	340°41.64 24.76	53°3.58 55.81	151°56.84 26.89	Saturn 357°24.03 03:58
15	$169^{\circ}33.60$	85°11.04 · · 33.56	355°42.71 · · 24.13	68°5.45 · · 55.77	166°59.35 · · 26.92	Jul 26 Sat SHA Mer.pass
16	184°36.06	100°10.43 33.78	10°43.79 23.50	83°7.32 55.73	182°1.86 26.95	Venus 276°23.59 09:19
17	199°38.53	115°9.81 34.01	25°44.86 22.87	98° 9.20 55.69	197°4.38 26.98	Mars 186°29.96 15:17
18	214° 40.99	130°9.19 N21°34.24	40°45.93 N03°22.24	113°11.07 N22°55.66	212°6.89 S01°27.02	Jupiter 258°40.70 10:28
19	229° 43.46	145°8.58 34.46	55°47.01 21.60	128°12.95 55.62	227°9.40 27.05	Saturn 357°25.06 03:54
20	244° 45.92	160°7.96 34.69	70°48.08 20.97	143°14.82 55.58	242°11.91 27.08	Horizontal parallax
21	259°48.39	175°7.34 · · 34.91	85°49.15 · · 20.34	158°16.70 · · 55.54	257°14.42 · · 27.11	Venus: 0.1
22	274°50.85	190°6.73 35.13	100° 50.23 19.71	173°18.57 55.50	272°16.94 27.15	Mars: 0.1
23	289°53.31	205°6.11 35.36	115°51.30 19.08	188°20.45 55.46	287°19.45 27.18	
Mer.	pass. 03:44	$\nu$ -0.6′ $d$ 0.2′ m-4.02	$ u 1.1' \ d$ -0.6 $' \ m 1.59$	$ u 1.9' \; d ext{-}0.0' \;  ext{m-}1.91$	$ u 2.5' \ d0.0' \ m0.83$	

h	Su	n			Moon		
hu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°21.85	N19°51.17	188°30.45	5.4'	N26°5.94	-7.3'	58.6
1	193°21.84	50.65	202°54.83	5.5'	25°58.69	-7.4'	58.6
2	208°21.83	50.12	217°19.31	5.6'	25°51.28	-7.6'	58.6
3	223°21.81	• • 49.59	231°43.90	5.7'	25°43.70	-7.7'	58.6
4	238°21.80	49.07	246°8.60	5.8'	25°35.97	-7.9'	58.6
5	253°21.79	48.54	260°33.41	5.9'	25°28.08	-8.0'	58.5
6	268°21.78	N19°48.01	274°58.33	6.0'	N25°20.04	-8.2'	58.5
7	283°21.77	47.48	289°23.36	6.1'	25°11.85	-8.3'	58.5
8	298°21.75	46.95	303°48.51	6.3'	25°3.50	-8.5'	58.5
9	313°21.74	• • 46.42	318°13.76	6.4'	24°55.01	-8.6'	58.4
LO	328°21.73	45.89	332°39.14	6.5'	24°46.37	-8.8'	58.4
.1	343°21.72	45.35	347°4.63	6.6'	24°37.58	-8.9'	58.4
2	358°21.71	N19°44.82	1°30.23	6.7'	N24°28.65	-9.1'	58.4
.3	13°21.70	44.29	15°55.95	6.8'	24°19.58	-9.2'	58.3
4	28°21.69	43.75	30°21.79	7.0'	24°10.37	-9.3'	58.3
.5	43°21.68	• • 43.22	44°47.75	7.1'	24°1.02	-9.5'	58.3
.6	58°21.67	42.69	59°13.83	7.2'	23°51.54	-9.6'	58.3
.7	73°21.66	42.15	73°40.03	7.3'	23°41.92	-9.8'	58.3
.8	88°21.66	N19°41.61	88°6.34	7.4'	N23°32.17	-9.9'	58.2
9	103°21.65	41.08	102°32.78	7.6'	23°22.28	-10.0'	58.2
20	118°21.64	40.54	116°59.34	7.7'	23°12.27	-10.1'	58.2
21	133°21.63	• • 40.00	131°26.02	7.8'	23°2.13	-10.3'	58.2
22	148°21.62	39.47	$145^{\circ}52.82$	7.9'	22°51.87	-10.4'	58.1
23	163°21.62	38.93	160°19.74	8.0'	22°41.48	-10.5'	58.1
	SD = 15.7'	d = -0.5'		SI	D = 16.0'		
ri	GHA	Dec	GHA		Dec	d	НР
-rı 0	178°21.61	N19°38.39	174°46.78	ν 8.2'	N22°30.98	-10.6'	58.1
1	178 21.01 193°21.60	37.85	174 40.76 189°13.95	8.3'	22°20.35	-10.0	58.1
2	208°21.60	37.83	203°41.24	8.4'	22°9.60	-10.7 -10.9'	58.0
2 3	208 21.00 223°21.59	36.77	218°8.65	8.5'	21°58.74	-10.9	58.0
ა 4	238°21.58	36.22	232°36.18	8.7'	21°47.77	-11.1'	58.0
<del></del> 5	253°21.58	35.68	247°3.83	8.8'	21°36.68	-11.1 -11.2'	57.9
5 6	268°21.57	N19°35.14	261°31.61	8.9'	N21°25.48	-11.2	57.9
7	283°21.57 298°21.56	34.60	275°59.50 290°27.52	9.0'	21°14.18 21°2.76	-11.4'	57.9'
8		34.05		9.1'		-11.5'	57.9
9	313°21.56	• • 33.51	304°55.66	9.3'	20°51.25	-11.6'	57.8
0	328°21.55	32.96	319°23.92	9.4'	20°39.63	-11.7'	57.8
1	343°21.55	32.42	333°52.30	9.5'	20°27.90	-11.8'	57.8
2	358°21.54	N19°31.87	348°20.80	9.6'	N20°16.08	-11.9'	57.8
.3	13°21.54	31.32	2°49.42	9.7'	20°4.17 19°52.15	-12.0'	57.7
L4	28°21.54	30.78	17°18.15	9.9'		-12.1'	57.7
.5	43°21.53	• • 30.23	31°47.01	10.0'	19°40.04	-12.2'	57.7
6	58°21.53	29.68	46°15.99	10.1'	19°27.85	-12.3'	57.6
7	73°21.53	29.13	60°45.08	10.2'	19°15.56	-12.4'	57.6
18	88°21.53	N19°28.58	75°14.29	10.3'	N19°3.18	-12.5'	57.6
9	103°21.52		89°43.61		18°50.71		57.6
20	118°21.52	27.48	104°13.05	10.6'	18°38.16	-12.6'	57.5
21	133°21.52	• • 26.93	118°42.61	10.7'	18°25.53	-12.7'	57.5
2	148°21.52	26.38	133°12.28	10.8'	18°12.82	-12.8'	57.5
23	163°21.52	25.83	147°42.07	10.9'	18°0.02	-12.9'	57.4
	SD = 15.7'	d = -0.5'		SI	D = 15.8'		
at	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°21.52	N19°25.27	162°11.96	11.0'	N17°47.15	-12.9'	57.4
1	193°21.52	24.72	176°41.97	11.1'	17°34.20	-13.0'	57.4
2	208°21.52	24.17	191°12.09	11.2'	17°21.18	-13.1'	57.4
3	223°21.52	• • 23.61	205°42.33	11.3'	17°8.08	-13.2'	57.3
4	$238^{\circ}21.52$	23.06	$220^{\circ}12.67$	11.4'	16°54.91	-13.2'	57.3
5	253°21.52	22.50	$234^{\circ}43.12$	11.6'	16°41.68	-13.3'	57.3
5	268°21.52	N19°21.95	249°13.67	11.7'	N16°28.37	-13.4'	57.2
7	283°21.52	21.39	263°44.34	11.8'	16°15.00	-13.4'	57.2
8	298°21.52	20.83	$278^{\circ}15.11$	11.9'	$16^{\circ}1.56$	-13.5'	57.2
9	313°21.52	• • 20.27	292°45.98	12.0'	15°48.06	-13.6'	57.2
.0	$328^{\circ}21.52$	19.71	$307^{\circ}16.96$	12.1'	15°34.50	-13.6'	57.1
1	343°21.52	19.16	321°48.05	12.2'	15°20.88	-13.7'	57.1
-	358°21.53	N19°18.60	336°19.23	12.3'	N15°7.20	-13.7'	57.1
		18.04	350°50.52	12.4'	14°53.46	-13.8'	57.0
.2	13°21.53		5°21.90	12.5'	14°39.67	-13.8'	57.0
2	13°21.53 28°21.53	17.48			14°25.83	-13.9'	57.0
.2 .3 .4		17.48 •• 16.91	19°53.39	12.6'	11 25.05		
.2	28°21.53			12.6′ 12.7′	14°11.93	-13.9'	57.0
.2 .3 .4 .5	28°21.53 43°21.54	• • 16.91	19°53.39				
.2 .3 .4 .5	28°21.53 43°21.54 58°21.54	· · 16.91 16.35	19°53.39 34°24.97	12.7'	14°11.93	-13.9'	56.9
.2 .3 .4 .5 .6	28°21.53 43°21.54 58°21.54 73°21.54	· · 16.91 16.35 15.79	19°53.39 34°24.97 48°56.65	12.7' 12.8'	14°11.93 13°57.98	-13.9' -14.0'	56.9°
2 3 4 5 6 7	28°21.53 43°21.54 58°21.54 73°21.54 88°21.55	· · 16.91 16.35 15.79 N19°15.23	19°53.39 34°24.97 48°56.65 63°28.42	12.7' 12.8' 12.9'	14°11.93 13°57.98 N13°43.98	-13.9' -14.0' -14.0'	56.9° 56.9°
2 3 4 5 6 7 8	28°21.53 43°21.54 58°21.54 73°21.54 88°21.55 103°21.55	· · 16.91 16.35 15.79 N19°15.23 14.66	19°53.39 34°24.97 48°56.65 63°28.42 78°0.29	12.7' 12.8' 12.9' 13.0'	14°11.93 13°57.98 N13°43.98 13°29.93	-13.9' -14.0' -14.0' -14.1'	56.9° 56.9° 56.8°
2 3 4 5 6 7 8 9	28°21.53 43°21.54 58°21.54 73°21.54 88°21.55 103°21.55 118°21.55	· 16.91 16.35 15.79 N19°15.23 14.66 14.10	19°53.39 34°24.97 48°56.65 63°28.42 78°0.29 92°32.26	12.7' 12.8' 12.9' 13.0' 13.1' 13.1'	14°11.93 13°57.98 N13°43.98 13°29.93 13°15.84	-13.9' -14.0' -14.0' -14.1' -14.1'	56.9° 56.9° 56.8° 56.8°
2 3 4 5 6 7 8 9 0	28°21.53 43°21.54 58°21.54 73°21.54 88°21.55 103°21.55 118°21.55 133°21.56	·· 16.91 16.35 15.79 N19°15.23 14.66 14.10 ·· 13.54	19°53.39 34°24.97 48°56.65 63°28.42 78°0.29 92°32.26 107°4.31	12.7' 12.8' 12.9' 13.0' 13.1'	14°11.93 13°57.98 N13°43.98 13°29.93 13°15.84 13°1.70	-13.9' -14.0' -14.0' -14.1' -14.1' -14.2'	57.0° 56.9° 56.9° 56.8° 56.8° 56.8° 56.8°

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-2%	
24	06:33	06:33	12:07	11:54	-:-		
25	06:34	06:34	12:07	12:48	00:22		
26	06:34	06:34	12:07	13:38	01:14		

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	304°55.78	220°5.49 N21°35.58	130°52.37 N03°18.44	203°22.32 N22°55.42	302°21.96 <b>S</b> 01°27.21	
1	319°58.24	235°4.87 35.80	145°53.45 17.81	218°24.20 55.38	317°24.47 27.24	Alpheratz 357°34.10 29°13.85 Ankaa 353°6.46 -42°9.73
2	$335^{\circ}0.71$	250°4.25 36.02	160°54.52 17.18	233°26.07 55.34	332°26.99 27.28	Ankaa 353°6.46 -42°9.73 Schedar 349°30.29 56°40.47
3	350°3.17	265°3.63 · · 36.23	175°55.59 · · 16.55	248°27.95 · · 55.30	347°29.50 · · 27.31	Diphda 348°46.69 -17°50.58
4	5°5.63	280°3.02 36.45	190°56.66 15.91	263°29.82 55.26	2°32.01 27.34	Achernar 335°19.72 -57°6.05
5	20°8.10	295°2.40 36.67	205°57.74 15.28	278°31.70 55.22	17°34.53 27.38	Hamal 327°50.66 23°34.97
6	35° 10.56	310°1.78 N21°36.88	220°58.81 N03°14.65	293°33.57 N22°55.18	32°37.04 S01°27.41	Polaris 313°54.57 89°22.00
7 8	50° 13.03 65° 15.49	325°1.15 37.10 340°0.53 37.31	235°59.88 14.02 251°0.95 13.38	308°35.45 55.14 323°37.33 55.10	47°39.55 27.44 62°42.07 27.48	Acamar 315°11.49 -40°11.81
9	80° 17.95	354° 59.91 · · 37.52	266°2.02 · · 12.75	338°39.20 · · 55.06	77°44.58 · · 27.51	Menkar 314°5.73 4°11.49
10	95°20.42	9°59.29 37.73	281°3.10 12.12	353°41.08 55.02	92°47.10 27.54	Mirfak 308°27.75 49°56.94
11	110°22.88	24°58.67 37.94	296°4.17 11.48	8°42.95 54.98	107°49.61 27.58	Aldebaran 290°39.28 16°33.66
12	125°25.35	39°58.05 N21°38.15	311°5.24 N03°10.85	23°44.83 N22°54.94	122°52.12 <b>S</b> 01°27.61	Rigel 281°3.65 -8°10.18 Capella 280°21.54 46°1.31
13	140°27.81	54°57.42 38.36	326°6.31 10.22	38°46.71 54.90	137°54.64 27.64	Bellatrix 278°22.62 6°22.45
14	155° 30.27	69°56.80 38.57	341°7.38 9.59	53°48.58 54.86	152°57.15 27.68	Elnath 278°1.55 28°37.71
15	170°32.74	84°56.18 · · 38.78	356°8.46 · · 8.95	68°50.46 · · 54.82	167°59.67 · · 27.71	Alnilam 275°37.51 -1°11.02
16 17	185° 35.20 200° 37.67	99°55.55 38.98 114°54.93 39.19	11°9.53 8.32 26°10.60 7.69	83°52.34 54.78 98°54.21 54.74	183°2.18 27.75 198°4.70 27.78	Betelgeuse 270°51.85 7°24.78
18	215° 40.13	129°54.31 N21°39.39	41°11.67 N03°7.05	113°56.09 N22°54.70	213°7.21 S01°27.81	Canopus 263°52.67 -52°42.32
19	230°42.60	144°53.68 39.59	56°12.74 6.42	128°57.97 54.66	228°9.73 27.85	Sirius 258°26.14 -16°44.93
20	245°45.06	159°53.06 39.80	71°13.81 5.79	143°59.84 54.62	243°12.25 27.88	Adhara 255°5.86 -29°0.25
21	$260^{\circ}47.52$	174°52.43 · · 40.00	86°14.88 · · 5.15	159°1.72 · · 54.58	258°14.76 · · 27.92	Procyon 244°50.67 5°9.65 Pollux 243°17.10 27°57.91
22	275° 49.99	189°51.81 40.20	101°15.95 4.52	174° 3.60 54.54	273°17.28 27.95	Avior 234°15.22 -59°35.41
23	290°52.45	204°51.18 40.40	116°17.03 3.88	189° 5.47 54.50	288°19.79 27.98	Suhail 222°46.42 -43°32.12
Mer.p	pass. 03:40	ν-0.6' d0.2' m-4.02	$\nu 1.1' \ d$ -0.6' m1.59	ν1.9' d-0.0' m-1.91	ν2.5' d0.0' m0.83	Miaplacidus 221°39.15 -69°49.34
						Alphard 217°47.61 -8°46.11
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.23 11°50.63
0	305°54.92	219°50.55 N21°40.60	131°18.10 N03°3.25	204°7.35 N22°54.46	303°22.31 S01°28.02	Dubhe 193°40.91 61°37.00
1	320° 57.38	234°49.93 40.79	146° 19.17 2.62	219° 9.23 54.42	318°24.83 28.05	Denebola 182°24.67 14°25.86
2	335° 59.84	249°49.30 40.99	161°20.24 1.98	234°11.10 54.38	333°27.34 28.09	Gienah 175°43.28 -17°41.08 Acrux 172°59.94 -63°14.70
3	351°2.31	264°48.67 · · 41.18	176°21.31 · · 1.35	249°12.98 · · 54.34	348°29.86 · · 28.12	Gacrux 171°51.41 -57°15.62
4	6°4.77	279°48.05 41.38	191°22.38 0.71	264°14.86 54.30	3°32.38 28.16	Alioth 166°12.73 55°49.52
5	21°7.24	294° 47.42 41.57	206°23.45 03°0.08	279°16.74 54.26	18°34.89 28.19	Spica 158°21.88 -11°17.71
6	36°9.70	309°46.79 N21°41.76 324°46.16 41.96	221°24.52 N02°59.45	294°18.61 N22°54.22	33°37.41 S01°28.23	Alkaid 152°51.67 49°11.39
7 8	51° 12.16 66° 14.63	324°46.16 41.96 339°45.53 42.15	236°25.59 58.81 251°26.66 58.18	309°20.49 54.18 324°22.37 54.14	48°39.93 28.26 63°42.45 28.30	Hadar 148°35.38 -60°30.05
9	81° 17.09	354°44.90 · · 42.34	266° 27.73 · · 57.54	339°24.25 · · 54.10	78°44.96 · · 28.33	Menkent 147°57.08 -36°29.91
10	96° 19.56	9°44.27 42.52	281°28.80 56.91	354°26.13 54.06	93°47.48 28.36	Arcturus 145°47.47 19°3.09
11	111°22.02	24° 43.64 42.71	296°29.87 56.27	9°28.00 54.02	108°50.00 28.40	Rigil Kent. 139°39.61 -60°56.73 Kochab 137°19.56 74°3.27
12	126°24.48	39°43.01 N21°42.90	311°30.94 N02°55.64	24°29.88 N22°53.98	123°52.52 S01°28.44	Zuben'ubi 136°55.44 -16°8.93
13	141°26.95	54°42.38 43.09	326°32.01 55.00	39°31.76 53.94	138°55.04 28.47	Alphecca 126°3.21 26°37.87
14	156°29.41	69°41.75 43.27	341°33.08 54.37	54°33.64 53.90	153°57.56 28.51	Antares 112°15.05 -26°29.39
15	171°31.88	84°41.12 · · 43.45	356°34.15 · · 53.74	69°35.52 · · 53.85	169°0.07 · · 28.54	Atria 107°8.47 -69°4.60
16 17	186° 34.34 201° 36.80	99° 40.49 43.64 114° 39.86 43.82	11°35.22 53.10 26°36.29 52.47	84°37.39 53.81 99°39.27 53.77	184°2.59 28.58 199°5.11 28.61	Sabik 102°2.00 -15°45.40
18	216°39.27	129°39.22 N21°44.00	41°37.36 N02°51.83	114°41.15 N22°53.73	214°7.63 S01°28.65	Shaula 96°9.41 -37°7.40
19	231°41.73	144°38.59 44.18	56°38.42 51.20	129°43.03 53.69	229°10.15 28.68	Rasalhague 95°57.85 12°32.57
20	246°44.20	159°37.96 44.36	71°39.49 50.56	144°44.91 53.65	244°12.67 28.72	Eltanin 90°41.52 51°29.25 Kaus Aust. 83°31.53 -34°22.36
21	261°46.66	174°37.33 · · 44.54	86°40.56 · · 49.93	159°46.79 · · 53.61	259°15.19 · · 28.75	Vega 80°32.52 38°48.53
22	276°49.12	189°36.69 44.71	101°41.63 49.29	174°48.67 53.57	274°17.71 28.79	Nunki 75°46.82 -26°15.87
23	291°51.59	204°36.06 44.89	116° 42.70 48.65	189°50.55 53.53	289°20.23 28.83	Altair 61°59.17 8°56.22
Mer.	pass. 03:36	ν-0.6' d0.2' m-4.02	ν1.1' d-0.6' m1.59	ν1.9' d-0.0' m-1.91	ν2.5' d0.0' m0.82	Peacock 53°4.37 -56°39.08
						Deneb 49°25.03 45°22.29
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.03 9°59.59
0	306° 54.05	219°35.42 N21°45.07	131°43.77 N02°48.02	204°52.42 N22°53.49	304°22.75 \$01°28.86	Al Na'ir 27°31.88 -46°50.04
1	321°56.52	234°34.79 45.24	146° 44.84 47.38	219°54.30 53.45	319°25.27 28.90	Fomalhaut 15°13.70 -29°29.01 Scheat 13°44.48 28°13.27
2	$336^{\circ}58.98$	249°34.16 45.41	161°45.91 46.75	234°56.18 53.41	334°27.79 28.93	Markab 13°29.18 15°20.60
3	352°1.45	264°33.52 · · 45.59	176°46.97 · · 46.11	249° 58.06 · · 53.36	349°30.31 · · 28.97	
4	7°3.91	279°32.89 45.76	191°48.04 45.48	264°59.94 53.32	4°32.83 29.01	Jul 27 Sun SHA Mer.pass
5	22°6.37 37°8.84	294°32.25 45.93	206°49.11 44.84	280°1.82 53.28 295°3.70 N22°53.24	19°35.35 29.04 34°37.87 <b>S</b> 01°29.08	Venus 275° 9.71 09:20 Mars 185° 56.60 15:15
6 7	52°11.30	309°31.61 N21°46.10 324°30.98 46.27	221°50.18 N02°44.21 236°51.25 43.57	295°3.70 N22°53.24 310°5.58 53.20	49°40.39 29.11	Jupiter 258°26.54 10:25
8	67° 13.77	339°30.34 46.43	251°52.32 42.93	325°7.46 53.16	64°42.92 29.15	Saturn 357°26.18 03:50
9	82° 16.23	354°29.70 · · 46.60	266° 53.38 · · 42.30	340°9.34 · · 53.12	79°45.44 · · 29.19	
10	$97^{\circ}18.69$	9°29.07 46.77	281°54.45 41.66	355°11.22 53.08	94°47.96 29.22	Jul 28 Mon         SHA         Mer.pass           Venus         273°55.64         09:21
11	112°21.16	24°28.43 46.93	296°55.52 41.03	10°13.10 53.04	109°50.48 29.26	Mars 185°23.18 15:14
12	127°23.62	39°27.79 N21°47.09	311°56.59 N02°40.39	25°14.98 N22°52.99	124°53.00 \$01°29.30	Jupiter 258°12.43 10:22
13	142°26.09	54°27.15 47.26	326° 57.65 39.75	40°16.86 52.95	139°55.52 29.33	Saturn 357°27.39 03:46
14 15	157° 28.55 172° 31.01	69°26.51 47.42 84°25.88 •• 47.58	341°58.72 39.12 356°59.79 · · 38.48	55°18.74 52.91 70°20.62 · · 52.87	154°58.05 29.37 170°0.57 •• 29.41	
16	172 31.01 187°33.48	99°25.24 47.74	12°0.86 37.84	85°22.50 52.83	185°3.09 29.44	Jul 29 Tue         SHA         Mer.pass           Venus         272°41.37         09:22
17	202°35.94	114°24.60 47.90	27°1.92 37.21	100°24.38 52.79	200°5.61 29.48	Mars 184°49.72 15:12
18	217°38.41	129°23.96 N21°48.06	42°2.99 N02°36.57	115°26.26 N22°52.75	215°8.14 S01°29.52	Jupiter 257°58.37 10:19
19	232° 40.87	144°23.32 48.21	57°4.06 35.94	130°28.14 52.70	230°10.66 29.55	Saturn 357°28.70 03:42
20	247° 43.33	159°22.68 48.37	72°5.13 35.30	145°30.02 52.66	245°13.18 29.59	Horizontal parallax
21 22	262° 45.80 277° 48.26	174°22.04 · · 48.53 189°21.40 48.68	87°6.19 · · 34.66 102°7.26 34.03	160°31.91 · · 52.62 175°33.79 52.58	260°15.71 · · · 29.63 275°18.23	Venus: 0.1
23	277 46.20 292°50.73	204°20.76 48.83	102 7.20 34.03 117°8.33 33.39	175 35.79 52.56 190°35.67 52.54	290°20.75 29.70	Mars: 0.1
ıvıer.	pass. 03:32	ν-0.6′ d0.2′ m-4.01	ν1.1′ d-0.6′ m1.60	ν1.9' d-0.0' m-1.91	ν2.5′ d0.0′ m0.82	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.58	N19°11.84	$150^{\circ}41.02$	13.4'	$N12^{\circ}19.03$	-14.3'	56.7'
1	193°21.58	11.27	165° 13.44	13.5'	12°4.72	-14.3'	56.7'
2	208°21.59 223°21.59	10.71 •• 10.14	179° 45.94 194° 18.52	13.6' 13.7'	11°50.38 11°36.00	-14.4' -14.4'	56.7' 56.6'
3 4	223 21.59 238°21.60	9.57	208°51.19	13.8'	11 36.00 11°21.59	-14.4 -14.4'	56.6'
5	253°21.61	9.00	223°23.94	13.8'	11°7.14	-14.5'	56.6'
6	268°21.61	N19°8.43	237° 56.78	13.9'	N10°52.65	-14.5'	56.5'
7	283°21.62	7.86	252°29.69	14.0'	10°38.14	-14.5'	56.5'
8	298°21.63	7.29	267°2.69	14.1'	10°23.60	-14.6'	56.5'
9 10	313°21.64 328°21.64	· · 6.72 6.15	281°35.76 296°8.91	14.1' 14.2'	10°9.02 09°54.42	-14.6' -14.6'	56.5' 56.4'
11	343°21.65	5.58	310° 42.14	14.2	09°34.42	-14.0 -14.7'	56.4'
12	358°21.66	N19°5.00	325° 15.44	14.4'	N09°25.14	-14.7'	56.4'
13	13°21.67	4.43	339°48.81	14.4'	$09^{\circ}10.47$	-14.7'	56.3'
14	28°21.68	3.86	354° 22.26	14.5'	08° 55.77	-14.7'	56.3'
15	43°21.69	• • 3.28	8°55.77	14.6'	08°41.05	-14.7'	56.3'
16	58°21.70 73°21.71	2.71 2.13	23°29.36 38°3.01	14.7' 14.7'	08°26.31 08°11.55	-14.8' -14.8'	56.3' 56.2'
17 18	88°21.72	2.13 N19°1.55	52° 36.73	14.7	N07°56.77	-14.8'	56.2'
19	103°21.73	0.98	67° 10.52	14.9'	07°41.97	-14.8'	56.2'
20	118°21.74	19°0.40	81°44.37	14.9'	07°27.16	-14.8'	56.1'
21	133°21.75	$18^{\circ}59.82$	96° 18.28	15.0'	07°12.34	-14.8'	56.1'
22	148°21.76	59.25	110°52.26	15.0'	06°57.50	-14.9'	56.1'
23	163°21.78	58.67	125°26.30	15.1'	06°42.64	-14.9'	56.1'
	SD = 15.7'	d = -0.6'		SI	O = 15.5'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	178°21.79	N18° 58.09	140°0.39	15.2'	N06°27.78	-14.9'	56.0'
1	193°21.80	57.51	154°34.55	15.2'	$06^{\circ}12.91$	-14.9'	56.0'
2	208°21.81	56.93	169°8.76	15.3'	05°58.02	-14.9'	56.0'
3	223°21.82	• • 56.35	183°43.03	15.3'	05°43.13	-14.9'	55.9'
4 5	238°21.84 253°21.85	55.76 55.18	198° 17.35 212° 51.73	15.4' 15.4'	05°28.23 05°13.33	-14.9' -14.9'	55.9' 55.9'
6	268°21.86	N18° 54.60	212 51.75 227°26.15	15.4	N04°58.42	-14.9'	55.9'
7	283°21.88	54.02	242°0.63	15.5'	04°43.50	-14.9'	55.8'
8	298°21.89	53.43	256° 35.16	15.6'	04° 28.58	-14.9'	55.8'
9	313°21.91	• • 52.85	271°9.74	15.6'	04° 13.66	-14.9'	55.8'
10	328°21.92	52.27	285° 44.36	15.7'	03°58.74	-14.9'	55.8'
11	343°21.94	51.68	300°19.03	15.7'	03°43.82	-14.9'	55.7'
12 13	358°21.95 13°21.97	N18°51.09 50.51	314°53.74 329°28.50	15.8' 15.8'	N03°28.90 03°13.98	-14.9' -14.9'	55.7' 55.7'
14	28°21.98	49.92	344°3.29	15.8'	03°13.96	-14.9'	55.6'
15	43°22.00	• • 49.33	358°38.13	15.9'	02°44.15	-14.9'	55.6'
16	58°22.01	48.75	13°13.01	15.9'	02°29.24	-14.9'	55.6'
17	73°22.03	48.16	27° 47.93	16.0'	02°14.33	-14.9'	55.6'
18	88°22.05	N18° 47.57	42°22.88	16.0'	N01°59.43 01°44.54	-14.9'	55.5'
19 20	103°22.06 118°22.08	46.98 46.39	56° 57.87 71° 32.89	16.0' 16.1'	01°44.54 01°29.66	-14.9' -14.9'	55.5'
21	133°22.10	• • 45.80	86°7.95	16.1	01°29.00	-14.9'	55.5' 55.5'
22	148°22.12	45.21	100°43.04	16.1'	00°59.92	-14.9'	55.4'
23	163°22.13	44.62	$115^{\circ}18.16$	16.1'	00°45.07	-14.8'	55.4'
	SD = 15.7'	d = -0.6'		SI	D = 15.3'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.15	N18° 44.02	129°53.31	16.2'	N00°30.22	-14.8'	55.4'
1	193°22.17	43.43	144°28.48	16.2'	00° 15.39	-14.8'	55.4'
2	208°22.19	42.84	159°3.69	16.2'	N00°0.57	-14.8'	55.3'
3	223°22.21 238°22.23	· · 42.24	173°38.92 188°14.18	16.3' 16.3'	500°14.23 00°29.02	14.8'	55.3'
4 5	238°22.23 253°22.25	41.65 41.05	188° 14.18 202° 49.45	16.3'	00°29.02 00°43.80	14.8' 14.8'	55.3' 55.3'
6	268°22.27	N18° 40.46	202 49.45 217°24.76	16.3'	S00° 58.55	14.7	55.3'
7	283°22.29	39.86	232°0.08	16.3'	01° 13.29	14.7'	55.2'
8	298°22.31	39.27	246°35.42	16.4'	$01^{\circ}28.02$	14.7'	55.2'
9	313°22.33	• • 38.67	261°10.78	16.4'	01°42.72	14.7'	55.2'
10	328°22.35	38.07	275°46.16	16.4	01°57.41	14.7'	55.2'
11 12	343°22.37 358°22.39	37.47 N18°36.88	290°21.55 304°56.96	16.4' 16.4'	02°12.07 \$02°26.72	14.6' 14.6'	55.1' 55.1'
13	13°22.42	36.28	304 50.90 319°32.39	16.4	02°41.34	14.6	55.1'
14	28°22.44	35.68	334°7.82	16.4	02°55.94	14.6	55.1'
15	43°22.46	• • 35.08	$348^{\circ}43.27$	16.5'	$03^{\circ}10.51$	14.6'	55.1'
16	58°22.48	34.48	3°18.73	16.5'	03°25.07	14.5'	55.0'
17	73°22.51	33.88	17°54.20	16.5'	03°39.59	14.5'	55.0'
18	88°22.53	N18°33.27	32°29.67	16.5'	\$03°54.10 04°8.57	14.5'	55.0'
19 20	103°22.55 118°22.58	32.67 32.07	47°5.15 61°40.64	16.5' 16.5'	04°8.57 04°23.02	14.4' 14.4'	55.0' 54.9'
21	133°22.60	•• 31.47	76° 16.13	16.5'	04 23.02 04°37.44	14.4	54.9'
22	148°22.63	30.86	90°51.63	16.5	04°51.84	14.4'	54.9'
23	163°22.65	30.26	$105^{\circ}27.13$	16.5'	05°6.20	14.3'	54.9'
	SD = 15.7'	d = -0.6'	_	SI	D = 15.1'		

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

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

		Sun			Moon	
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-19%
27	06:34	06:33	12:07	14:23	02:01	
28	06:33	06:32	12:07	15:06	02:45	
29	06:31	06:30	12:07	15:46	03:26	

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$307^{\circ}53.19$	219°20.11 N21°48.98	132°9.39 N02°32.75	205°37.55 N22°52.50	305°23.28 <b>S</b> 01°29.74	Alpheratz 357°34.08 29°13.87
1	322°55.65	234°19.47 49.14	147°10.46 32.11	220°39.43 52.45	320°25.80 29.78	Ankaa 353°6.44 -42°9.73
2	337°58.12	249°18.83 49.29	162°11.53 31.48	235°41.31 52.41	335°28.32 29.82	Schedar 349°30.27 56°40.48
3	353°0.58	264°18.19 · · 49.44	177°12.59 · · 30.84	250°43.19 · · 52.37	350°30.85 · · 29.85	Diphda 348°46.67 -17°50.57
4 5	8°3.05 23°5.51	279°17.55 49.58 294°16.90 49.73	192°13.66 30.20 207°14.72 29.57	265°45.07 52.33 280°46.96 52.29	5°33.37 29.89 20°35.90 29.93	Achernar 335°19.69 -57°6.05
6	38°7.97	309°16.26 N21°49.88	222°15.79 N02°28.93	295°48.84 N22°52.25	35°38.42 S01°29.97	Hamal 327°50.64 23°34.98
7	53° 10.44	324°15.62 50.02	237°16.86 28.29	310°50.72 52.20	50°40.95 30.00	Polaris 313°53.08 89°22.00
8	$68^{\circ}12.90$	339° 14.97 50.17	252°17.92 27.65	325°52.60 52.16	65°43.47 30.04	Acamar 315°11.47 -40°11.80 Menkar 314°5.71 4°11.50
9	83° 15.37	354°14.33 · · 50.31	267°18.99 · · 27.02	340°54.48 •• 52.12	80°46.00 · · 30.08	Mirfak 308°27.72 49°56.95
10	98° 17.83	9°13.68 50.45	282°20.05 26.38	355°56.37 52.08	95°48.52 30.12	Aldebaran 290°39.26 16°33.67
11	113°20.30	24°13.04 50.59	297°21.12 25.74	10°58.25 52.04	110°51.05 30.16	Rigel 281°3.64 -8°10.17
12 13	128° 22.76 143° 25.22	39°12.39 N21°50.73 54°11.75 50.87	312°22.19 N02°25.10 327°23.25 24.47	26° 0.13 N22° 51.99 41° 2.01 51.95	125°53.57 S01°30.19 140°56.10 30.23	Capella 280°21.52 46°1.31
14	143 25.22 158° 27.69	69°11.10 51.01	342°24.32 23.83	56°3.90 51.91	155°58.62 30.27	Bellatrix 278°22.61 6°22.45
15	173°30.15	84°10.46 · · 51.15	357°25.38 · · 23.19	71°5.78 · · 51.87	171°1.15 · · 30.31	Elnath 278°1.54 28°37.71
16	188°32.62	99°9.81 51.29	12°26.45 22.55	86°7.66 51.83	186°3.68 30.35	Alnilam 275°37.49 -1°11.02
17	203°35.08	114°9.16 51.42	$27^{\circ}27.51$ $21.92$	101° 9.54 51.78	201°6.20 30.39	Betelgeuse 270°51.84 7°24.79 Canopus 263°52.66 -52°42.31
18	218° 37.54	129°8.52 N21°51.56	42°28.58 N02°21.28	116°11.43 N22°51.74	216°8.73 S01°30.42	Sirius 258°26.13 -16°44.92
19	233°40.01	144°7.87 51.69	57°29.64 20.64	131°13.31 51.70	231°11.26 30.46	Adhara 255°5.85 -29°0.24
20	248° 42.47	159°7.22 51.82	72°30.71 20.00	146°15.19 51.66 161°17.07 · · 51.61	246°13.78 30.50	Procyon 244°50.66 5°9.65
21 22	263° 44.94 278° 47.40	174°6.58 · · 51.95 189°5.93 52.09	87°31.77 ·· 19.36 102°32.84 18.73	161°17.07 · · 51.61 176°18.96 51.57	261°16.31 · · · 30.54 276°18.84	Pollux 243°17.09 27°57.91
23	293°49.86	204°5.28 52.22	117° 33.90 18.09	191°20.84 51.53	291°21.36 30.62	Avior 234°15.22 -59°35.39
						Suhail 222°46.43 -43°32.11
Mer.	pass. 03:28	ν-0.6' d0.2' m-4.01	ν1.1' d-0.6' m1.60	$\nu 1.9' \ d$ -0.0' m-1.91	$\nu 2.5' \ d0.0' \ \text{m}0.81$	Miaplacidus 221°39.16 -69°49.32
						Alphard 217°47.62 -8°46.10 Regulus 207°34.24 11°50.63
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.93 61°36.99
0	308° 52.33	219°4.63 N21°52.34	132°34.97 N02°17.45	206°22.72 N22°51.49	306°23.89 <b>S</b> 01°30.66	Denebola 182°24.68 14°25.87
1	323°54.79	234°3.98 52.47	147°36.03 16.81	221°24.61 51.44	321°26.42 30.70	Gienah 175°43.29 -17°41.07
2	338° 57.26 353° 59.72	249°3.33 52.60 264°2.69 · · 52.72	162°37.09 16.17 177°38.16 · · 15.53	236°26.49 51.40 251°28.37 · · 51.36	336°28.95 30.73 351°31.47 · · 30.77	Acrux 172°59.97 -63°14.69
3 4	9°2.18	279°2.04 52.85	192°39.22 14.90	266°30.26 51.32	6°34.00 30.81	Gacrux 171°51.43 -57°15.61
5	24°4.65	294°1.39 52.97	207°40.29 14.26	281°32.14 51.27	21°36.53 30.85	Alioth 166°12.75 55°49.52
6	39°7.11	309°0.74 N21°53.10	222°41.35 N02°13.62	296°34.03 N22°51.23	36°39.06 <b>S</b> 01°30.89	Spica 158°21.89 -11°17.70 Alkaid 152°51.69 49°11.39
7	$54^{\circ}9.58$	324°0.09 53.22	237° 42.41 12.98	311°35.91 51.19	51°41.59 30.93	Alkaid 152°51.69 49°11.39 Hadar 148°35.41 -60°30.04
8	69° 12.04	338°59.44 53.34	252° 43.48 12.34	326°37.79 51.15	66°44.12 30.97	Menkent 147°57.10 -36°29.90
9	84° 14.50	353°58.78 · · 53.46	267°44.54 · · 11.70	341°39.68 · · 51.10	81°46.65 · · 31.01	Arcturus 145°47.49 19°3.10
10	99° 16.97	8° 58.13 53.58	282°45.61 11.06	356°41.56 51.06 11°43.45 51.02	96°49.17 31.05	Rigil Kent. 139°39.64 -60°56.73
11 12	114° 19.43 129° 21.90	23° 57.48 53.70 38° 56.83 N21° 53.81	297° 46.67 10.42 312° 47.73 N02° 9.79	11°43.45 51.02 26°45.33 N22°50.98	111°51.70 31.09 126°54.23 \$01°31.13	Kochab 137°19.62 74°3.27
13	144°24.36	53°56.18 53.93	327°48.80 9.15	41°47.22 50.93	141°56.76 31.17	Zuben'ubi 136°55.45 -16°8.92
14	159° 26.83	68°55.53 54.04	342°49.86 8.51	56°49.10 50.89	156°59.29 31.21	Alphecca 126°3.22 26°37.88
15	174°29.29	83°54.87 · · 54.16	357°50.92 · · 7.87	71°50.98 · · 50.85	172°1.82 · · 31.25	Antares 112°15.06 -26°29.39 Atria 107°8.50 -69°4.61
16	189°31.75	98°54.22 54.27	12°51.99 7.23	86°52.87 50.81	187°4.35 31.29	Sabik 102°2.01 -15°45.40
17	204°34.22	113°53.57 54.38	27°53.05 6.59	101°54.75 50.76	202°6.88 31.33	Shaula 96°9.42 -37°7.41
18	219°36.68	128°52.92 N21°54.49	42°54.11 N02°5.95	116°56.64 N22°50.72	217°9.41 S01°31.37	Rasalhague 95°57.86 12°32.58
19 20	234° 39.15 249° 41.61	143°52.26 54.60 158°51.61 54.71	57°55.17 5.31 72°56.24 4.67	131°58.52 50.68 147°0.41 50.63	232°11.94 31.41 247°14.47 31.45	Eltanin 90°41.54 51°29.26
21	264° 44.07	173°50.95 · · 54.82	72°56.24 4.67 87°57.30 · · 4.03	162°2.29 · · 50.59	247°14.47 31.45 262°17.00 · · 31.49	Kaus Aust. 83°31.54 -34°22.37
22	279°46.54	188°50.30 54.93	102°58.36 3.39	177° 4.18 50.55	277°19.53 31.53	Vega 80°32.53 38°48.55
23	294°49.00	203°49.65 55.03	117°59.42 2.75	192°6.07 50.50	292°22.06 31.57	Nunki 75°46.83 -26°15.87 Altair 61°59.17 8°56.23
Mari	pass. 03:24	ν-0.6' d0.1' m-4.01	ν1.1' d-0.6' m1.60	ν1.9' d-0.0' m-1.92	$\nu 2.5' \ d0.0' \ m0.81$	Peacock 53°4.37 -56°39.09
- Ivier.	pass. 03.24	ν-0.0 d0.1 III-4.01	ν1.1 α-0.0 III1.00	ν1.9 α-0.0 III-1.92	V2.5 d0.0 1110.81	Deneb 49°25.03 45°22.31
						Enif 33°38.02 9°59.60
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.87 -46°50.04
0 1	309°51.47 324°53.93	218°48.99 N21°55.14 233°48.34 55.24	133°0.49 N02°2.11 148°1.55 1.47	207° 7.95 N22° 50.46 222° 9.84 50.42	307°24.59 S01°31.61 322°27.13 31.65	Fomalhaut 15°13.69 -29°29.01
2	339° 56.39	248° 47.68 55.35	163°2.61 0.83	237°11.72 50.38	337°29.66 31.69	Scheat 13°44.47 28°13.28
3	354° 58.86	263°47.02 · · 55.45	178°3.67 02°0.19	252°13.61 · · 50.33	352°32.19 · · 31.73	Markab 13°29.17 15°20.61
4	$10^{\circ}1.32$	278° 46.37 55.55	193°4.73 01°59.55	267°15.49 50.29	7°34.72 31.77	Jul 30 Wed SHA Mer.pass
5	25°3.79	293°45.71 55.65	208°5.80 58.91	282°17.38 50.25	22°37.25 31.81	Venus 271°26.92 09:23
6	40°6.25	308°45.06 N21°55.75	223°6.86 N01°58.27	297°19.27 N22°50.20	37°39.78 S01°31.85	Mars 184°16.20 15:10
7	55°8.71	323°44.40 55.85	238°7.92 57.63	312°21.15 50.16	52°42.32 31.89	Jupiter 257°44.36 10:16
8 9	70° 11.18 85° 13.64	338°43.74 55.94 353°43.09 •• 56.04	253°8.98 56.99 268°10.04 • 56.35	327°23.04 50.12 342°24.92 · · 50.07	67°44.85 31.93 82°47.38 · · 31.97	Saturn 357°30.09 03:38
10	100° 16.11	8°42.43 56.14	283°11.10 55.71	342 24.92 · · 50.07 357°26.81 50.03	82°47.38 · · 31.97 97°49.91 32.01	Jul 31 Thu SHA Mer.pass
11	115° 18.57	23°41.77 56.23	298°12.17 55.07	12°28.70 49.99	112°52.45 32.05	Venus 270°12.30 09:24
12	130°21.04	38°41.11 N21°56.32	313°13.23 N01°54.43	27°30.58 N22°49.94	127°54.98 S01°32.10	Mars 183° 42.64 15:09
13	145°23.50	53°40.45 56.42	328°14.29 53.79	42°32.47 49.90	142°57.51 32.14	Jupiter 257°30.40 10:13 Saturn 357°31.56 03:34
14	160°25.96	68°39.80 56.51	343° 15.35 53.15	57°34.36 49.86	158°0.04 32.18	Saturn 357°31.56 03:34
15	175°28.43	83°39.14 · · 56.60	358°16.41 · · 52.51	72°36.25 · · 49.81	173°2.58 · · 32.22	Aug 01 Fri SHA Mer.pass
16	190°30.89	98°38.48 56.69	13°17.47 51.87	87°38.13 49.77	188° 5.11 32.26	Venus 268° 57.52 09:25
17 18	205° 33.36 220° 35.82	113°37.82 56.77 128°37.16 N21°56.86	28°18.53 51.23 43°19.59 N01°50.59	102°40.02 49.73 117°41.91 N22°49.68	203°7.64 32.30 218°10.18 S01°32.34	Mars 183°9.02 15:07
19	235° 38.28	143°36.50 56.95	58° 20.65 49.95	132°43.79 49.64	233°12.71 32.38	Jupiter 257°16.49 10:10 Saturn 357°33.13 03:30
20	250° 40.75	158°35.84 57.03	73°21.71 49.31	147°45.68 49.59	248°15.25 32.43	
21	$265^{\circ}43.21$	173°35.18 · · 57.12	88°22.77 · · 48.67	162°47.57 · · 49.55	263°17.78 · · 32.47	Horizontal parallax
22	280°45.68	188° 34.52 57.20	103°23.84 48.03	177°49.46 49.51	278°20.31 32.51	Venus: 0.1
23	295°48.14	203°33.86 57.28	118°24.90 47.39	192°51.34 49.46	293°22.85 32.55	Mars: 0.1
Mer.	pass. 03:20	ν-0.7' d0.1' m-4.00	ν1.1' d-0.6' m1.60	ν1.9' d-0.0' m-1.92	ν2.5′ d0.0′ m0.80	

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.67	N18°29.65	$120^{\circ}2.63$	16.5'	S05°20.53	14.3'	54.9
1	193°22.70	29.05	134°38.13	16.5'	05°34.84	14.3'	54.8
2	208°22.73	28.44	149°13.62	16.5'	$05^{\circ}49.11$	14.2'	54.8
3	223°22.75	• • 27.84	163°49.12	16.5'	06°3.35	14.2'	54.8
4	238°22.78	27.23	178°24.61	16.5'	$06^{\circ}17.56$	14.2'	54.8
5	253°22.80	26.62	193°0.10	16.5'	06°31.73	14.1'	54.8
6	268°22.83	N18°26.01	207°35.58	16.5'	S06°45.87	14.1'	54.8
7	283°22.86	25.40	222°11.05	16.5	06°59.98	14.1'	54.7
8	298°22.88	24.80	236°46.52	16.5	07°14.05	14.0'	54.7
9	313°22.91	24.19	251°21.98	16.4	07°28.08	14.0'	54.7
10	328°22.94	23.58	265°57.42	16.4	07°42.08	14.0'	54.7
	343°22.97						
11		22.96	280°32.86	16.4'	07°56.04	13.9'	54.7
12	358°22.99	N18°22.35	295°8.28	16.4'	S08°9.96	13.9'	54.7
13	13°23.02	21.74	309°43.69	16.4'	08°23.84	13.8'	54.6
14	28°23.05	21.13	324°19.08	16.4'	08°37.68	13.8'	54.6
15	43°23.08	• • 20.52	338°54.46	16.4'	08°51.49	13.8'	54.6
16	58°23.11	19.90	353°29.82	16.3'	09°5.25	13.7'	54.6
17	73°23.14	19.29	8°5.17	16.3'	09°18.97	13.7'	54.6
18	88°23.17	N18° 18.68	22°40.49	16.3'	S09°32.65	13.6'	54.6
19	103°23.20	18.06	37°15.80	16.3'	09°46.28	13.6'	54.5
20	118°23.23	17.45	51°51.08	16.3'	09°59.87	13.5'	54.5
21	133°23.26	• • 16.83	66°26.34	16.2'	10° 13.42	13.5'	54.5
22	148°23.29	16.21	81°1.58	16.2'	10° 15.42 10° 26.92	13.5'	54.5
23	163°23.32	15.60	95°36.79	16.2'	10°20.92	13.4	54.5
۷3			93 30.19			13.4	54.5
	SD = 15.7'	d = -0.6'		SE	0 = 15.0'		
Γhu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°23.35	N18°14.98	110°11.98	16.2'	S10°53.78	13.4'	54.5
1	193°23.38	14.36	124°47.14	16.1'	11°7.14	13.3'	54.5
2	208°23.42	13.74	139°22.28	16.1'	11°20.46	13.3'	54.5
3	223°23.45	• • 13.12	153°57.38	16.1'	11°33.72	13.2'	54.4
4	238°23.48	12.50	168°32.46	16.0'	11°46.94	13.2'	54.4
5	253°23.51	11.89	183°7.51	16.0'	12°0.10	13.1'	54.4
6	268°23.55	N18° 11.26	197°42.52	16.0'	\$12°13.22	13.1	54.4
7	283°23.58	10.64	212°17.50	15.9'	12°26.28	13.1	54.4
	283°23.58 298°23.61		212°17.50 226°52.45	15.9' 15.9'	12° 26.28 12° 39.29		
8		10.02				13.0'	54.4
9	313°23.65	• • 9.40	241°27.36	15.9'	12°52.25	12.9'	54.4
10	328°23.68	8.78	256°2.24	15.8'	13°5.16	12.9'	54.4
11	343°23.72	8.15	270°37.08	15.8'	13° 18.01	12.8'	54.4
12	358°23.75	N18°7.53	285°11.88	15.8'	S13°30.80	12.7'	54.3
13	13°23.79	6.91	299°46.64	15.7'	13°43.55	12.7'	54.3
14	28°23.82	6.28	314°21.37	15.7'	13°56.23	12.6'	54.3
15	43°23.86	• • 5.66	328°56.05	15.6'	14°8.86	12.6'	54.3
16	58°23.89	5.03	343°30.69	15.6'	14°21.43	12.5'	54.3
17	73°23.93	4.41	358°5.29	15.6'	14°33.94	12.5'	54.3
18	88°23.96	N18°3.78	12°39.85	15.5'	\$14°46.39	12.4'	54.3
19	103°24.00	3.15	27°14.36		14°58.79		54.3
20	118°24.04	2.52	41°48.83	15.4'	15°11.12	12.3'	54.3
21	133°24.07	. 1.90	56°23.25	15.4	15 11.12 15°23.39	12.3	54.3
22	133 24.07 148°24.11	1.27	50 23.25 70°57.62	15.4	15 23.39 15°35.60	12.2	54.3
	148°24.11 163°24.15		70°57.62 85°31.95		15° 35.60 15° 47.74		
23	$\frac{163^{\circ}24.15}{\text{SD} = 15.7'}$	$\frac{0.64}{d = -0.6'}$	00 31.95	15.3'	0 = 14.9'	12.1'	54.3
	3υ = 15. <i>l</i> ′	a = -0.0		SL	v = 14.9°		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°24.19	N18°0.01	100°6.23	15.2'	S15°59.83	12.0'	54.2
1	193°24.23	17°59.38	114°40.45	15.2'	$16^{\circ}11.84$	12.0'	54.2
2	208°24.26	58.75	129°14.63	15.1'	16°23.80	11.9'	54.2
3	223°24.30	. 58.12	143°48.75	15.1'	16°35.68	11.8'	54.2
4	238°24.34	57.49	158°22.83	15.0'	16°47.51	11.8'	54.2
5	253°24.38	56.85	172°56.84	15.0'	16° 59.26	11.7'	54.2
6	268°24.42	N17° 56.22	172 30.84 187°30.81	14.9'	\$17° 10.94	11.6'	54.2
7	283°24.46	55.59	202°4.72	14.9'	17°22.56	11.5'	54.2
8	298°24.50	54.95	202 4.72 216°38.57	14.9	17 22.50 17°34.11	11.5'	54.2
9	298 24.50 313°24.54	54.95 •• 54.32	210° 38.57 231° 12.37	14.8 14.7'	17° 34.11 17° 45.59	11.5	54.2
10	328°24.58	53.68	245°46.11	14.7'	17°56.99	11.3'	54.2
11	343°24.62	53.05	260°19.79	14.6'	18°8.33	11.3'	54.2
12	358°24.66	N17°52.41	274°53.42	14.6'	S18° 19.59	11.2'	54.2
13	13°24.70	51.78	289°26.98	14.5'	18°30.78	11.1'	54.2
14	28°24.75	51.14	304°0.48	14.4'	18°41.89	11.0'	54.2
15	43°24.79	• • 50.50	318°33.93	14.4'	$18^{\circ}52.93$	11.0'	54.2
16	58°24.83	49.87	333°7.31	14.3'	19°3.89	10.9'	54.2
10	73°24.87	49.23	347°40.62	14.3'	19° 14.78	10.8	54.2
	88°24.92	N17°48.59	2°13.88	14.2'	\$19°25.59	10.7	54.2
17			16°47.07	14.1'	19°36.32	10.7	54.2
17 18			10 41.01		19° 30.32 19° 46.97	10.7	54.2
17 18 19	103°24.96	47.95 47.31	31°20 10	1/11'			J4.2
17 18 19 20	103°24.96 118°25.00	47.31	31°20.19	14.1'			E 4 0
17 18 19 20 21	103°24.96 118°25.00 133°25.05	47.31 •• 46.67	45°53.25	14.0'	19°57.54	10.5'	54.2
17 18 19 20 21 22	103°24.96 118°25.00 133°25.05 148°25.09	47.31 •• 46.67 46.03	45°53.25 60°26.25	14.0' 13.9'	19°57.54 20°8.03	10.5' 10.4'	54.2
17 18 19 20 21	103°24.96 118°25.00 133°25.05	47.31 •• 46.67	45°53.25	14.0'	19°57.54	10.5'	

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	6-8	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	27-45%	
30	06:29	06:28	12:06	16:27	04:07		
31	06:27	06:25	12:06	17:08	04:47		
01	06:23	06:21	12:06	17:51	05:29		

#### August 02, 03, 04 UT (Sat., Sun., Mon.)

h	Aries	Ver	nus	M	ars	Jup	oiter	Sat	urn		Stars
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA
0	310°50.60	218°33.20	N21°57.37	133°25.96	N01°46.74	207°53.23	N22°49.42	308°25.38	S01°32.59		
1	325°53.07	233°32.54	57.45	148° 27.02	46.10	222°55.12	49.38	323°27.92	32.63	Alpheratz	
2	340°55.53	248°31.88	57.52	163°28.08	45.46	237°57.01	49.33	338°30.45	32.68	Ankaa	353°6.42
3	355°58.00	263°31.21	• • 57.60	178°29.14	• • 44.82	252°58.90	• • 49.29	353°32.99	• • 32.72	Schedar	349°30.23
4	11°0.46	278°30.55	57.68	193°30.20	44.18	268° 0.78	49.24	8°35.52	32.76	Diphda	348°46.65
5	26°2.93	293°29.89	57.76	208°31.26	43.54	283° 2.67	49.20	23°38.06	32.80	Achernar	335°19.65 327°50.62
6	41°5.39	308°29.23	N21°57.83	223°32.31	N01°42.90	298° 4.56	N22°49.16	38°40.59	S01°32.84	Hamal Polaris	313°51.36
7	56°7.85	323°28.57	57.91	238°33.37	42.26	313°6.45	49.11	53°43.13	32.89	Acamar	315°11.44
8	71° 10.32	338°27.90	57.98	253°34.43	41.62	328°8.34	49.07	68°45.67	32.93	Menkar	314°5.69
9	86° 12.78	353°27.24	• • 58.05	268°35.49	• • 40.97	343°10.23	• • 49.03	83°48.20	• • 32.97	Mirfak	308°27.68
10	101° 15.25	8°26.58	58.12	283°36.55	40.33	358°12.11	48.98	98°50.74	33.01	Aldebaran	290°39.24
11	116° 17.71 131° 20.17	23°25.91 38°25.25	58.19 N21°58.26	298°37.61	39.69 N01°39.05	13°14.00	48.94	113°53.27 128°55.81	33.06 \$01°33.10	Rigel	281°3.62
12 13	131 20.17 146°22.64	50 25.25 53°24.58	58.33	313°38.67 328°39.73	38.41	28°15.89 43°17.78	N22°48.89 48.85	143°58.35	33.14	Capella	280°21.49
14	140 22.04 161°25.10	68°23.92	58.40	343°40.79	37.77	43 17.76 58°19.67	48.81	159°0.88	33.14	Bellatrix	278°22.59
15	176° 27.57	83°23.26	• • 58.46	358°41.85	37.12	73°21.56	48.76	174°3.42	• • 33.23	Elnath	278°1.52
16	191°30.03	98°22.59	58.53	13°42.91	36.48	88°23.45	48.72	189°5.96	33.27	Alnilam	275°37.48
17	206°32.50	113°21.93	58.59	28°43.96	35.84	103°25.34	48.67	204°8.49	33.31	Betelgeuse	270°51.82
18	221°34.96	128°21.26	N21°58.66	43°45.02	N01°35.20	118°27.23	N22°48.63	219°11.03	S01°33.35	Canopus	263°52.64
19	236°37.42	143°20.60	58.72	58°46.08	34.56	133°29.12	48.58	234°13.57	33.40	Sirius	258°26.12 255°5.84
20	251°39.89	$158^{\circ}19.93$	58.78	73°47.14	33.91	148°31.01	48.54	249°16.11	33.44	Adhara Procyon	244°50.65
21	$266^{\circ}42.35$	173° 19.27	• • 58.84	88°48.20	• • 33.27	163°32.90	• • 48.50	264°18.64	• • 33.48	Pollux	244° 30.03 243° 17.08
22	281°44.82	188° 18.60	58.90	103°49.26	32.63	178°34.79	48.45	279°21.18	33.53	Avior	234°15.21
23	296° 47.28	203°17.93	58.96	118°50.31	31.99	193°36.68	48.41	294°23.72	33.57	Suhail	222°46.42
Mer.r	pass. 03:16	$\nu$ -0.7′ d0.	1′ m-4.00	$\nu 1.1' d-0$	.6′ m1.60	$\nu 1.9' \ d-0$	.0′ m-1.92	$\nu 2.5' d0$	.0′ m0.79	Miaplacidus	221°39.16
										Alphard	217°47.61
	CIIA	CIIA		CIIA	Б	CIIA	Б	CIIA	Б	Regulus	207°34.24
Sun	GHA	GHA	Dec	GHA	<b>Dec</b> N01°31.35	<b>GHA</b> 208°38.57	Dec	<b>GHA</b> 309°26.26	Dec	Dubhe	193°40.94
0 1	311°49.74 326°52.21	218° 17.27 233° 16.60	N21°59.02 59.07	133°51.37 148°52.43	30.70	208° 38.57 223° 40.46	N22°48.36 48.32	309°26.26 324°28.80	S01°33.61 33.66	Denebola	182°24.68
2	341°54.67	248° 15.93	59.07	146 52.45 163°53.49	30.70	238°42.35	48.27	339°31.33	33.70	Gienah	175°43.30
3	356° 57.14	246 15.93 263°15.27	59.18	178° 54.55	29.42	250 42.35 253°44.24	. 48.23	354°33.87	33.74		172°59.99
4	11°59.60	278° 14.60	59.24	193°55.60	28.78	268°46.13	48.19	9°36.41	33.79		171°51.45
5	27°2.06	293°13.93	59.29	208°56.66	28.13	283°48.02	48.14	24°38.95	33.83	Alioth	166°12.77
6	42°4.53	308°13.26	N21°59.34	223°57.72	N01°27.49	298°49.91	N22°48.10	39°41.49	S01°33.87	Spica	158°21.90
7	57°6.99	323°12.60	59.39	238° 58.77	26.85	313°51.80	48.05	54°44.03	33.92	Alkaid Hadar	152°51.71 148°35.43
8	72°9.46	$338^{\circ}11.93$	59.44	253°59.83	26.21	328°53.69	48.01	69°46.57	33.96		148 35.43 147°57.11
9	$87^{\circ}11.92$	353°11.26	• • 59.49	269°0.89	• • 25.56	343°55.58	• • 47.96	84°49.11	• • 34.00	Arcturus	147 57.11 145°47.50
10	102° 14.39	$8^{\circ}10.59$	59.53	$284^{\circ}1.95$	24.92	358°57.47	47.92	99°51.65	34.05	Rigil Kent.	139°39.66
11	117° 16.85	23°9.92	59.58	299°3.00	24.28	13°59.36	47.87	114°54.19	34.09	Kochab	137°19.68
12	132° 19.31	38°9.25	N21°59.63	314°4.06	N01°23.64	29° 1.25	N22°47.83	129°56.73	S01°34.14	Zuben'ubi	136°55.46
13	147°21.78	53°8.58	59.67	329°5.12	22.99	44°3.15	47.78	144°59.27	34.18	Alphecca	126°3.24
14	162°24.24	68°7.91	59.71	344°6.17	22.35	59°5.04	47.74	160°1.81	34.22	Antares	$112^{\circ}15.07$
15 16	177°26.71 192°29.17	83°7.24 98°6.57	· · 59.76 59.80	359°7.23 14°8.29	· · 21.71 21.06	74° 6.93 89° 8.82	· · 47.69 47.65	175°4.35 190°6.89	· · 34.27 34.31	Atria	107°8.53
17	207°31.63	96 0.57 113°5.90	59.80 59.84	29°9.34	20.42	104° 10.71	47.60	205°9.43	34.36	Sabik	102°2.02
18	222°34.10	128°5.23	N21°59.88	44°10.40	N01°19.78	119°12.60	N22°47.56		S01°34.40	Shaula	96°9.43
19	237°36.56	143°4.56	21°59.91	59° 11.46	19.14	134°14.50	47.52	235°14.51	34.44	Rasalhague	95°57.86
20	252°39.03	158°3.89	21°59.95	74° 12.51	18.49	149°16.39	47.47	250°17.05	34.49	Eltanin	90°41.55
21	267°41.49	173°3.22	• • 59.99	89° 13.57	• • 17.85	164°18.28	• • 47.43	265°19.59	• • 34.53	Kaus Aust. Vega	83°31.54 80°32.53
22	282°43.96	188°2.55	0.02	104° 14.62	17.21	179°20.17	47.38	280°22.13	34.58	Nunki	75°46.83
23	297°46.42	203°1.88	0.06	$119^{\circ}15.68$	16.56	194°22.06	47.34	295°24.68	34.62	Altair	61°59.17
Merr	pass. 03:12	v-0.7' d0	1' m-4.00	v1 1' d-0	.6′ m1.61	1/1 9' d-0	.0′ m-1.92	v2 5' d0	.0′ m0.79	Peacock	53°4.36
- IVICI.	7433. 03.12	ν σ.τ ασ.		- VI.I U O		ν1.5 d 0	.0 111 1.32	- VZ.5 UO	.0 1110.73	Deneb	49°25.02
										Enif	33°38.01
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.86
0	312°48.88	218°1.21	N22°0.09	134°16.73 149°17.79	N01°15.92	209°23.96 224°25.85	N22°47.29	310°27.22	S01°34.67	Fomalhaut	15°13.67
1 2	327°51.35 342°53.81	233°0.53 247°59.86	0.12 0.15	149° 17.79 164° 18.85	15.28 14.63	224°25.85 239°27.74	47.25 47.20	325°29.76 340°32.30	34.71 34.76	Scheat	13°44.45
3	357° 56.28	262°59.19	0.13	179° 19.90	• • 13.99	254°29.63	• 47.16	355°34.84	• • 34.80	Markab	13°29.16
4	12°58.74	277°58.52	0.10	194°20.96	13.34	269°31.53	47.11	10°37.38	34.85	Aug 02 Sat	SHA
5	28°1.20	292°57.85	0.24	209°22.01	12.70	284°33.42	47.07	25°39.93	34.89		267°42.59
6	43°3.67	307°57.17	N22° 0.27	224°23.07	N01°12.06	299°35.31			501°34.94	Mars	$182^{\circ}35.35$
7	58°6.13	322°56.50	0.29	239°24.12	11.41	314°37.21	46.98	55°45.01	34.98	Jupiter	257°2.63
8	73°8.60	337°55.83	0.32	254°25.18	10.77	329°39.10	46.93	70°47.56	35.03	Saturn	357°34.78
9	88° 11.06	352°55.15	• • 0.34	269° 26.23	• • 10.13	344°40.99	• • 46.88	85°50.10	• • 35.07	Aug 03 Sun	SHA
10	103° 13.53	7°54.48	0.37	284°27.29	9.48	359°42.89	46.84	100°52.64	35.12		266°27.52
11	118° 15.99	22°53.81	0.39	299°28.34	8.84	14°44.78	46.79	115°55.18	35.16	Mars	
12	133° 18.45	37°53.13	N22°0.41	314°29.40	N01°8.19	29°46.67	N22°46.75		S01°35.21		256°48.82
13 14	148° 20.92 163° 23.38	52°52.46 67°51.78	0.43 0.45	329°30.45 344°31.50	7.55 6.91	44°48.57 59°50.46	46.70 46.66	146°0.27 161°2.82	35.25 35.30		357°36.51
14 15	163°23.38 178°25.85	82°51.11	· · 0.45	344°31.50 359°32.56	• • 6.26	74°52.35	46.66	161°2.82 176°5.36	35.30 •• 35.34	A.c. 04 B4-	СПУ
16	176 25.65 193°28.31	97°50.43	0.48	14°33.61	5.62	89°54.25	46.57	170 5.30 191°7.90	35.39	Aug 04 Mon	<b>SHA</b> 265°12.32
17	208° 30.77	112°49.76	0.50	29°34.67	4.97	104°56.14	46.52	206°10.45	35.43		205 12.32 181°27.85
18	223°33.24	127°49.08	N22° 0.51	44°35.72	N01°4.33	119°58.04	N22°46.48		S01°35.48		256°35.07
19	238° 35.70	142°48.41	0.53	59°36.77	3.69	134°59.93	46.43	236°15.54	35.52		357°38.33
20	253°38.17	$157^{\circ}47.73$	0.54	74°37.83	3.04	150° 1.83	46.39	251°18.08	35.57		
21	268° 40.63	172°47.06	• • 0.55	89°38.88	• • 2.40	165° 3.72	• • 46.34	266°20.63	• • 35.62	Horizor	ntal parallax
22	283°43.10	187°46.38	0.56	104°39.94	1.75	180°5.62	46.29	281°23.17	35.66		Venus:
23	298° 45.56	202°45.71	0.57	119°40.99	1.11	195°7.51	46.25	296°25.71	35.71		Mars:
Mer.	pass. 03:08	$\nu$ -0.7' d0.	0′ m-3.99	$\nu 1.1^{\prime} d-0$	.6′ m1.61	$\nu$ 1.9 $^{\prime}$ d-0	.0′ m-1.92	$\nu$ 2.5′ d0	.0′ m0.78		
				-							

Dec 29°13.88

-42°9.73

56°40 50

 $-57^{\circ}6.05$ 

 $23^{\circ}34.98$ 

 $89^{\circ}22.00$ 

-40°11.80

4°11.50

49°56.95

16°33.67

-8°10.16

 $46^{\circ}1.30$ 

 $6^{\circ}22.46$ 

28°37.71

 $-1^{\circ}11.01$ 

-52°42.29

-16°44.91

-29°0.23

 $27^{\circ}57.90$ 

-59° 35.38

-43°32.10 -69°49.31

-8°46.10

11°50.63

 $61^{\circ}36.98$ 

 $14^{\circ}25.87$ 

-17°41.06

-63°14.69

-57° 15.60

55°49.51

-11°17.70

49°11.38

-60°30.04 -36°29.90

 $19^{\circ}3.10$ 

-60°56.72

74°3.27

-16°8.92

26°37.88

-26°29.39

-69°4.61

-15°45.39

 $-37^{\circ}7.41$ 

 $12^{\circ}32.58$ 

51°29.28

-34°22.37

38°48.56

-26° 15.87

8°56.24

-56°39.10

 $45^{\circ}22.33$ 

 $9^{\circ}59.61$ 

-46°50.05

-29°29.01

28°13.30

15°20.63

Mer.pass

09:26

15:05

10:07

03:26

09:27

15:04

10:04

03:22

09:28

15:02

10:01

03:18

0.1

0.1

Mer.pass

Mer.pass

 $5^{\circ}9.65$ 

 $7^{\circ}24.79$ 

-17°50.57

h	Su	Moon					
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.18	N17° 44.75	89°32.04	13.8'	S20°28.77	10.2'	54.2'
1	193°25.22	44.10	104°4.83	13.7'	20°39.01	10.2'	54.2'
2	208°25.27 223°25.31	43.46 •• 42.82	118° 37.55 133° 10.21	13.7' 13.6'	20° 49.17 20° 59.24	10.1'	54.2'
3 4	223 25.31 238°25.36	42.82	133 10.21 147°42.79	13.5	20 59.24 21°9.23	10.0' 9.9'	54.2' 54.2'
5	253°25.40	41.53	162° 15.31	13.4'	21° 19.23	9.8'	54.2'
6	268°25.45	N17° 40.89	176° 47.75	13.4'	S21°28.95	9.7'	54.2'
7	283°25.50	40.24	$191^{\circ}20.13$	13.3'	21°38.68	9.6'	54.2'
8	298°25.54	39.59	205°52.43	13.2'	21°48.31	9.5'	54.2'
9	313°25.59 328°25.64	• • 38.95	220°24.66	13.2'	21°57.86 22°7.32	9.5'	54.2'
10 11	328°25.64 343°25.68	38.30 37.65	234° 56.82 249° 28.90	13.1' 13.0'	22° 16.68	9.4' 9.3'	54.2' 54.2'
12	358°25.73	N17°37.01	264°0.92	12.9'	S22°25.95	9.2	54.2'
13	13°25.78	36.36	278° 32.86	12.9'	22°35.13	9.1'	54.2'
14	28°25.83	35.71	293°4.72	12.8'	$22^{\circ}44.22$	9.0'	54.2'
15	43°25.88	• • 35.06	307°36.51	12.7'	22°53.20	8.9'	54.2'
16	58°25.92 73°25.97	34.41	322°8.22 336°39.86	12.6' 12.6'	23°2.10 23°10.89	8.8'	54.2' 54.2'
17 18	88°26.02	33.76 N17°33.11	351°11.43	12.5'	S23° 19.59	8.7' 8.6'	54.2'
19	103°26.07	32.46	5° 42.92	12.4'	23°28.19	8.5	54.3'
20	118°26.12	31.81	20° 14.33	12.3'	23°36.68	8.4'	54.3'
21	133°26.17	• • 31.16	$34^{\circ}45.67$	12.3'	23°45.08	8.3'	54.3'
22	148°26.22	30.50	49° 16.93	12.2'	23°53.38	8.2'	54.3'
23	163°26.27	29.85	63°48.12	12.1'	24°1.57	8.1'	54.3'
	SD = 15.8'	d = -0.6'		SE	0 = 14.8'		
Sun	GHA	Dec	GHA		Dec	d	НР
Sun 0	дна 178°26.32	Dec N17°29.20	78° 19.23	u 12.0'	Dec \$24°9.66	<i>a</i> 8.0'	HP 54.3'
1	193°26.38	28.54	92°50.26	12.0'	24° 17.64	7.9'	54.3'
2	208°26.43	27.89	$107^{\circ}21.21$	11.9'	$24^{\circ}25.52$	7.8'	54.3'
3	223°26.48	• • 27.23	121°52.09	11.8'	24°33.30	7.7'	54.3'
4	238°26.53	26.58	136°22.89	11.7'	24°40.96	7.6'	54.3'
5 6	253°26.58 268°26.64	25.92 N17°25.26	150°53.62 165°24.27	11.6' 11.6'	24° 48.52 \$24° 55.97	7.4' 7.3'	54.3' 54.3'
7	283°26.69	24.61	179° 54.84	11.5'	25°3.31	7.2'	54.4'
8	298°26.74	23.95	194°25.33	11.4	25° 10.54	7.1	54.4'
9	313°26.79	• • 23.29	208°55.75	11.3'	$25^{\circ}17.66$	7.0'	54.4'
10	328°26.85	22.63	223°26.09	11.3'	25°24.66	6.9'	54.4'
11	343°26.90	21.97	237°56.36	11.2'	25°31.55	6.8'	54.4'
12 13	358°26.96 13°27.01	N17°21.31 20.65	252°26.55 266°56.66	11.1' 11.0'	\$25°38.33 25°44.99	6.7' 6.5'	54.4' 54.4'
14	28°27.07	19.99	281°26.69	11.0'	25 44.99 25°51.54	6.4	54.4'
15	43°27.12	. 19.33	295°56.66	10.9'	25°57.96	6.3'	54.4'
16	58°27.18	18.67	$310^{\circ}26.54$	10.8'	$26^{\circ}4.27$	6.2'	54.5'
17	73°27.23	18.01	324° 56.35	10.7'	26° 10.46	6.1'	54.5'
18	88°27.29	N17° 17.35	339°26.09	10.7'	\$26° 16.53 26° 22.48	5.9'	54.5'
19 20	103°27.34 118°27.40	16.69 16.02	353°55.75 8°25.34	10.6' 10.5'	26° 22.48 26° 28.31	5.8' 5.7'	54.5' 54.5'
21	133°27.46	. 15.36	o 25.34 22°54.86	10.5	26°34.02	5. <i>1</i> 5.6'	54.5'
22	148°27.51	14.69	37°24.30	10.4	26°39.60	5.5'	54.5'
23	163°27.57	14.03	51°53.67	10.3'	$26^{\circ}45.06$	5.3'	54.6'
	SD = 15.8'	d = -0.7'		SE	0 = 14.8'		
	CUA		CIIA		ъ	,	
Mon 0	<b>GHA</b> 178°27.63	<b>Dec</b> N17° 13.36	<b>GHA</b> 66° 22.96	u  10.2'	<b>Dec</b> \$26° 50.39	<i>d</i> 5.2'	<b>HP</b> 54.6'
1	193°27.68	12.70	80° 52.19	10.2'	26°55.59	5.1'	54.6'
2	208°27.74	12.03	95°21.35	10.1'	27°0.67	5.0'	54.6'
3	223°27.80	• • 11.37	109° 50.43	10.0'	27°5.62	4.8'	54.6'
4	238°27.86	10.70	124° 19.45	9.9'	27° 10.45	4.7'	54.6'
5 6	253°27.92 268°27.98	10.03 N17°9.36	138° 48.39 153° 17.27	9.9' 9.8'	27° 15.14 \$27° 19.70	4.6' 4.4'	54.6' 54.7'
о 7	268°27.98 283°28.04	N17 9.36 8.69	153° 17.27 167° 46.08	9.8° 9.7'	27° 24.13	4.4	54.7' 54.7'
8	298°28.10	8.02	182° 14.82	9.7'	27°28.43	4.2'	54.7'
9	313°28.16	7.35	196°43.50	9.6'	27°32.60	4.0'	54.7'
10	328°28.22	6.68	211° 12.11	9.5'	27°36.63	3.9'	54.7'
11	343°28.28	6.01	225° 40.66	9.5'	27°40.53	3.8'	54.7'
12 13	358°28.34 13°28.40	N17°5.34 4.67	240°9.14 254°37.57	9.4' 9.4'	\$27°44.29 27°47.92	3.6' 3.5'	54.8' 54.8'
13 14	13°28.40 28°28.46	4.6 <i>7</i> 4.00	254°37.57 269°5.93	9.4	27°47.92 27°51.41	3.5'	54.8'
15	43°28.52	3.33	283° 34.23	9.3 9.2'	27°54.76	3.4	54.8'
16	58°28.58	2.65	298°2.46	9.2'	27° 57.97	3.1'	54.8'
17	73°28.64	1.98	$312^{\circ}30.64$	9.1'	28°1.04	2.9'	54.8'
18	88°28.71	N17°1.31	326°58.77	9.1'	\$28°3.98	2.8'	54.9'
19 20	103°28.77 118°28.83	0.63 16°59.96	341°26.83 355°54.84	9.0' 9.0'	28°6.77 28°9.42	2.7' 2.5'	54.9' 54.9'
20 21	118°28.83 133°28.89	16°59.96 16°59.28	355°54.84 10°22.80	9.0° 8.9'	28° 9.42 28° 11.93	2.5'	54.9'
22	148°28.96	58.61	24° 50.70	8.8'	28°14.30	2.4	54.9'
23	163°29.02	57.93	39° 18.55	8.8'	28° 16.53	2.1'	55.0'
	SD = 15.8'	d = -0.7'		SF	0 = 14.9'		
					•		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	55-73%	
02	06:19	06:17	12:06	18:36	06:13		
03	06:15	06:12	12:06	19:25	07:00		
04	06:09	06:07	12:06	20.17	07.51		

### August 05, 06, 07 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	313°48.02	217°45.03 N22°0.58	134°42.04 N01°0.46	210°9.40 N22°46.20	311°28.26 S01°35.75
1	328° 50.49	232°44.35 0.59	149°43.10 00°59.82	225°11.30 46.16	326°30.81 35.80
2	343°52.95	247°43.68 0.60	164° 44.15 59.17	240°13.19 46.11	341°33.35 35.85
3	358° 55.42	262°43.00 · · 0.60	179°45.20 · · 58.53		356°35.90 · · 35.89
4	13°57.88	277° 42.32 0.61	194° 46.25 57.89	270°16.98 46.02	11°38.44 35.94
5	29°0.35	292°41.65 0.61	209°47.31 57.24	285°18.88 45.98	26°40.99 35.99
6	44°2.81	307°40.97 N22°0.61	224°48.36 N00°56.60	300°20.78 N22°45.93	41°43.53 <b>S</b> 01°36.03
7	59°5.27	322°40.29 0.61	239°49.41 55.95	315°22.67 45.88	56°46.08 36.08
8	74°7.74	337°39.61 0.61	254°50.47 55.31	330°24.57 45.84	71°48.63 36.12
9	89° 10.20	352°38.94 · · 0.61	269°51.52 · · 54.66	345°26.46 · · 45.79	86°51.17 · · 36.17
10	104° 12.67	7°38.26 0.61	284° 52.57 54.02	0°28.36 45.75	101°53.72 36.22
11	119° 15.13	22° 37.58 0.61	299°53.62 53.37	15°30.25 45.70	116°56.27 36.26
12	134° 17.59	37°36.90 N22°0.61	314°54.68 N00°52.73	30°32.15 N22°45.65	131°58.81 S01°36.31
13	149° 20.06	52°36.22 0.60	329°55.73 52.08	45°34.05 45.61	147°1.36 36.36
14	164° 22.52	67°35.54 0.60	344°56.78 51.44	60°35.94 45.56	162°3.91 36.40
15	179°24.99	82°34.86 · · 0.59	359° 57.83 · · 50.79	75°37.84 · · 45.52	177°6.45 · · 36.45
16	194° 27.45	97°34.19 0.58	14°58.88 50.15	90°39.74 45.47	192°9.00 36.50
17	209°29.92	112°33.51 0.57	29°59.93 49.50	105°41.63 45.43	207°11.55 36.54
18	224°32.38	127°32.83 N22°0.57	45°0.99 N00°48.86	120°43.53 N22°45.38	222°14.10 S01°36.59
19	239° 34.84	142°32.15 0.55	60°2.04 48.21	135°45.43 45.33	237°16.64 36.64
20	254° 37.31	157°31.47 0.54	75°3.09 47.57	150°47.32 45.29	252°19.19 36.69
21	269° 39.77	172°30.79 · · 0.53	90°4.14 · · 46.92	165°49.22 · · 45.24	267°21.74 · · · 36.73
22	284° 42.24	187°30.11 0.52	105°5.19 46.27	180°51.12 45.19	282°24.29 36.78
23	299°44.70	202°29.43 0.50	120°6.24 45.63	195°53.01 45.15	297°26.84 36.83
Mer.	pass. 03:04	ν-0.7′ d0.0′ m-3.99	ν1.1' d-0.6' m1.61	ν1.9' d-0.0' m-1.92	ν2.5′ d0.0′ m0.78
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	314°47.16	217°28.75 N22°0.49	135°7.29 N00°44.98	210°54.91 N22°45.10	312°29.39
1	329°49.63	232°28.07 0.47	150°8.34 44.34	225°56.81 45.06	327°31.93 36.92
	329 49.03 344°52.09		165°9.40 43.69	240°58.71 45.00	
2					
3	359° 54.56	262°26.70 · · 0.43	180°10.45 · · 43.05	256° 0.60 · · 44.96	357°37.03 · · 37.02
4	14° 57.02	277°26.02 0.41	195° 11.50 42.40	271° 2.50 44.92	12°39.58 37.06
5	29°59.49	292°25.34 0.39	210° 12.55 41.76	286° 4.40 44.87	27°42.13 37.11
6	$45^{\circ}1.95$	307°24.66 N22°0.37	225°13.60 N00°41.11	301°6.30 N22°44.82	42°44.68 <b>S</b> 01°37.16
7	60°4.41	322°23.98 0.35	240° 14.65 40.46	316° 8.19 44.78	57°47.23 37.21
8	75°6.88	337°23.30 0.32	255° 15.70 39.82	331°10.09 44.73	72°49.78 37.26
9	90°9.34	352°22.61 · · 0.30	270°16.75 · · 39.17	346°11.99 · · 44.69	87°52.33 · · 37.30
10	105° 11.81	7°21.93 0.27	285°17.80 38.53	1°13.89 44.64	102°54.88 37.35
	105 11.81 120° 14.27			1 13.89 44.64 16°15.79 44.59	
11					
12	135° 16.74	37°20.57 N22°0.22	315°19.90 N00°37.23	31°17.69 N22°44.55	132°59.98 S01°37.45
13	150° 19.20	52°19.89 0.19	330°20.95 36.59	46°19.58 44.50	148°2.53 37.50
14	$165^{\circ}21.66$	67°19.20 0.16	345°22.00 35.94	61°21.48 44.45	163°5.08 37.54
15	$180^{\circ}24.13$	82°18.52 · · 0.13	0°23.05 · · 35.30	76°23.38 · · 44.41	178°7.63 · · 37.59
16	$195^{\circ}26.59$	97°17.84 0.10	15°24.10 34.65	91°25.28 44.36	193°10.18 37.64
17	210°29.06	112°17.15 0.06	30°25.15 34.00	106°27.18 44.31	208°12.73 37.69
18	225°31.52	127°16.47 N22°0.03	45°26.20 N00°33.36	121°29.08 N22°44.27	223°15.28 S01°37.74
19	240° 33.98	142°15.79 59.99		136°30.98 44.22	238°17.84 37.79
	255° 36.45		_		
20					253°20.39 37.83
21	270°38.91	172°14.42 21°59.92		166°34.78 · · 44.13	268°22.94 · · 37.88
22	285°41.38	187°13.74 59.88		181°36.68 44.08	283°25.49 37.93
23	300°43.84	202°13.05 59.84	120°31.44 30.13	196°38.58 44.03	298°28.04 37.98
Mer.	pass. 03:00	ν-0.7' d-0.0' m-3.99	ν1.1' d-0.6' m1.61	ν1.9′ d-0.0′ m-1.93	ν2.5′ d0.0′ m0.77
Th	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
Thu	<b>GHA</b> 315°46.31	<b>GHA Dec</b> 217°12.37 N21°59.80			<b>GHA Dec</b> 313°30.59 <b>S</b> 01°38.03
0					
1	330°48.77	232°11.68 59.76		226°42.38 43.94	328°33.15 38.08
2	345°51.23	247°11.00 59.72		241°44.28 43.89	343°35.70 38.13
3	$0^{\circ}53.70$	262°10.31 · · 59.67	180°35.63 · · 27.54	256°46.18 · · 43.85	358°38.25 · · 38.17
4	$15^{\circ}56.16$	277°9.63 59.63	195°36.68 26.89	271°48.08 43.80	13°40.80 38.22
5	30°58.63	292°8.94 59.59		286°49.98 43.75	28°43.36 38.27
6	46°1.09	307°8.26 N21°59.54	225°38.78 N00°25.60	301°51.88 N22°43.71	43°45.91 S01°38.32
7	61°3.55	322°7.57 59.49	240°39.83 24.95	316°53.78 43.66	58°48.46 38.37
8	76°6.02	337°6.89 59.44	255° 40.87 24.31	331°55.68 43.61	73°51.02 38.42
	76 6.02 91°8.48	352°6.20 · · 59.39	270°41.92 · · 23.66		
9					
10	106° 10.95	7°5.52 59.34	285°42.97 23.01	1°59.48 43.52	103°56.12 38.52
11	121° 13.41	22°4.83 59.29	300°44.02 22.36	17° 1.38 43.47	118°58.68 38.57
12	$136^{\circ}15.88$	37°4.15 N21°59.24		32°3.28 N22°43.42	134°1.23 <b>S</b> 01°38.62
13	$151^{\circ}18.34$	52°3.46 59.18		47°5.18 43.38	149°3.78 38.67
14	$166^{\circ}20.80$	67°2.77 59.13	345°47.16 20.42	62°7.09 43.33	164°6.34 38.72
15	181°23.27	82°2.09 · · 59.07	0°48.21 · · 19.78	77°8.99 · · 43.28	179°8.89 · · 38.77
16	196° 25.73	97°1.40 59.02		92°10.89 43.24	194°11.45 38.82
17	211° 28.20	112°0.71 58.96		107°12.79 43.19	209°14.00 38.87
18	226°30.66	127°0.03 N21°58.90	45°51.35 N00°17.84	122°14.69 N22°43.14	224°16.55 S01°38.91
19	241°33.12	141°59.34 58.84	60° 52.39 17.19	137°16.59 43.10	239°19.11 38.96
20	256° 35.59	156° 58.65 58.78	75°53.44 16.54	152°18.49 43.05	254°21.66 39.01
21	271°38.05	171°57.97 · · 58.72	90°54.49 · · 15.89	167°20.40 · · 43.00	269°24.22 · · 39.06
22	286°40.52	186°57.28 58.65	105° 55.53 15.25	182°22.30 42.95	284°26.77 39.11
23	301°42.98	201°56.59 58.59	120° 56.58 14.60	197°24.20 42.91	299°29.33 39.16
ا، Wer	pass. 02:56	ν-0.7' d-0.0' m-3.99	$\nu 1.0' \ d$ -0.6' m1.61	$\nu 1.9' \ d$ -0.0' m-1.93	ν2.6′ d0.0′ m0.77

	SHA	Dec
Alpheratz	357°34.04	29°13.89
Ankaa	$353^{\circ}6.39$	$-42^{\circ}9.73$
Schedar	349°30.20	56°40.51
Diphda	348°46.63	-17°50.56
Achernar	335°19.62	-57°6.05
Hamal	327°50.59	23°34.99
Polaris	313°49.56	89°22.00
Acamar	315°11.41	-40°11.79
Menkar	314°5.66	4°11.51
Mirfak	308°27.64	49°56.95
Aldebaran	290°39.21	16°33.67
Rigel	281°3.60	-8°10.16
Capella	280°21.45	46°1.30
Bellatrix	278°22.56	6°22.46
Elnath	278°1.49	28°37.71
Alnilam	275°37.45	-1°11.01
Betelgeuse	270°51.80	7°24.79
Canopus	263°52.62	-52°42.28
Sirius	258°26.10	-16°44.90
Adhara	255°5.82	-29°0.22
Procyon	244°50.64	5°9.65
Pollux	243°17.06	27°57.90
Avior	234°15.20	-59°35.37
Suhail	222°46.42	-43°32.09
Miaplacidus	221°39.16	-69°49.30
Alphard	217°47.60	-8°46.09
Regulus	207°34.23	11°50.63
Dubhe	193°40.95	61°36.96
Denebola	182°24.68	14°25.86
Gienah	175°43.30	-17°41.06
Acrux	173°0.00	-63°14.68
Gacrux	171°51.46	-57°15.59
Alioth	166°12.79	55°49.51
Spica	158°21.90	-11°17.70
Alkaid	$152^{\circ}51.73$	49°11.38
Hadar	148°35.45	-60°30.04
Menkent	147°57.12	-36°29.89
Arcturus	$145^{\circ}47.51$	$19^{\circ}3.10$
Rigil Kent.	139°39.68	-60°56.72
Kochab	$137^{\circ}19.74$	74°3.27
Zuben'ubi	136°55.47	-16°8.92
Alphecca	$126^{\circ}3.24$	26°37.89
Antares	$112^{\circ}15.08$	$-26^{\circ}29.39$
Atria	$107^{\circ}8.55$	-69°4.62
Sabik	102°2.02	-15°45.39
Shaula	96° 9.43	-37°7.41
Rasalhague	95°57.87	12°32.59
Eltanin	90°41.57	51°29.29
Kaus Aust.	83°31.54	-34°22.37
Vega	80°32.54	38°48.57
Nunki	$75^{\circ}46.83$	$-26^{\circ}15.87$
Altair	$61^{\circ}59.16$	8°56.25
Peacock	53°4.35	$-56^{\circ}39.11$
Deneb	49°25.02	45°22.35
Enif	33°38.00	$9^{\circ}59.62$
Al Na'ir	$27^{\circ}31.84$	$-46^{\circ}50.05$
Fomalhaut	$15^{\circ}13.65$	$-29^{\circ}29.01$
Scheat	13°44.43	$28^{\circ}13.31$
Markab	$13^{\circ}29.14$	$15^{\circ}20.64$
A OF T	CIIA	N4
Aug 05 Tue	SHA 262° 57.01	Mer.pass
Venus	263°57.01 180°54.02	09:29
Mars		15:00
Jupiter	256°21.38	09:58
Saturn	357°40.24	03:14
Aug 06 Wed	SHA	Mer.pass
Venus	262°41.58	09:31
Mars	180°20.13	14:58
Jupiter	$256^{\circ}7.75$	09:55
Saturn	$357^{\circ}42.22$	03:10
Aug 07 Thu	SHA	Mer.pass
. ,	261°26.06	09:32
Venus	179°46.18	14:57
Mars		
Mars Jupiter	$255^{\circ}54.17$	09:52
Mars		09:52 03:05
Mars Jupiter Saturn	$255^{\circ}54.17$	
Mars Jupiter Saturn	255°54.17 357°44.29	
Mars Jupiter Saturn	255°54.17 357°44.29 ntal parallax	03:05

Stars SHA

Dec

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.08	N16°57.25	53°46.35	8.7'	\$28°18.61	1.9'	55.0'
1	193°29.15	56.58	68°14.10	8.7'	28°20.54	1.8'	55.0'
2	208°29.21	55.90	82°41.80	8.7'	28°22.33	1.6'	55.0'
3	223°29.28	• • 55.22	97°9.45	8.6'	$28^{\circ}23.98$	1.5'	55.0'
4	238°29.34	54.54	111°37.06	8.6'	28°25.47	1.4'	55.1'
5	253°29.41	53.86	126°4.62	8.5'	28°26.82	1.2'	55.1'
6	268°29.47	N16°53.18	140°32.14 154°59.62	8.5'	\$28°28.03 28°29.08	1.1'	55.1'
7 8	283°29.54 298°29.60	52.50 51.82	154 59.62 169°27.05	8.4' 8.4'	28° 29.08 28° 29.99	0.9' 0.8'	55.1' 55.1'
9	313°29.67	51.02	183°54.45	6.4 8.4'	28°30.74	0.6	55.2'
10	328° 29.74	50.46	198°21.81	8.3'	28°31.35	0.5	55.2'
11	343°29.80	49.78	212°49.13	8.3'	28°31.80	0.3'	55.2'
12	358°29.87	N16°49.10	227°16.41	8.3'	S28°32.11	0.2'	55.2'
13	13°29.94	48.41	241°43.66	8.2'	28°32.26	0.0'	55.3'
14	28°30.00	47.73	256°10.88	8.2'	28°32.27	-0.1'	55.3'
15	43°30.07	• • 47.05	270°38.07	8.2'	28°32.12	-0.3'	55.3'
16 17	58°30.14 73°30.21	46.36 45.68	285°5.23 299°32.36	8.1' 8.1'	28°31.82 28°31.36	-0.5'	55.3'
18	88°30.21	45.08 N16°44.99	299 32.30 313°59.47	8.1'	28 31.30 \$28°30.75	-0.6' -0.8'	55.4' 55.4'
19	103°30.35	44.31	328° 26.55	8.1'	28°29.99	-0.9	55.4'
20	118°30.41	43.62	342°53.61	8.0'	28°29.08	-1.1'	55.4'
21	133°30.48	• • 42.93	357°20.64	8.0'	28°28.01	-1.2'	55.4'
22	148°30.55	42.25	11°47.66	8.0'	$28^{\circ}26.78$	-1.4'	55.5'
23	163°30.62	41.56	$26^{\circ}14.65$	8.0'	$28^{\circ}25.41$	-1.5'	55.5'
	SD = 15.8'	d = -0.7'		SE	D = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	178°30.69	N16°40.87	40°41.63	8.0'	\$28°23.87	-1.7'	55.5'
1	193°30.76	40.18	55°8.59	7.9'	28°22.19	-1.8'	55.5'
2	208°30.83	39.50	69°35.54	7.9'	$28^{\circ}20.34$	-2.0'	55.6'
3	223°30.91	• • 38.81	84°2.48	7.9'	28°18.34	-2.2'	55.6'
4	238°30.98	38.12	98°29.40	7.9'	28°16.19	-2.3'	55.6'
5	253°31.05	37.43	112°56.32	7.9'	28°13.88	-2.5'	55.6'
6	268°31.12 283°31.19	N16°36.74	127°23.22 141°50.13	7.9'	\$28°11.41 28°8.79	-2.6'	55.7'
7 8	283°31.19 298°31.26	36.04 35.35	141°50.13 156°17.02	7.9' 7.9'	28° 6.02	-2.8' -2.9'	55.7' 55.7'
9	313°31.34	• • 34.66	170°43.91	7.9'	28°3.08	-2.9	55.7'
10	328°31.41	33.97	185° 10.81	7.9'	27°59.99	-3.2'	55.8'
11	343°31.48	33.27	199°37.70	7.9'	27°56.75	-3.4'	55.8'
12	358°31.56	N16°32.58	214°4.59	7.9'	S27°53.35	-3.6'	55.8'
13	13°31.63	31.89	228°31.48	7.9'	$27^{\circ}49.79$	-3.7'	55.8'
14	28°31.70	31.19	242°58.38	7.9'	27°46.08	-3.9'	55.9'
15	43°31.78	• • 30.50	257°25.29	7.9'	27°42.21	-4.0'	55.9'
16 17	58°31.85 73°31.93	29.80 29.11	271°52.20 286°19.12	7.9' 7.9'	27°38.19 27°34.01	-4.2' -4.3'	55.9' 55.9'
18	88°32.00	N16°28.41	300°46.05	7.9'	\$27°29.67	-4.5'	56.0'
19	103°32.08	27.71	315°13.00	8.0'	27°25.18	-4.6'	56.0'
20	118°32.15	27.02	329°39.95	8.0'	27°20.54	-4.8'	56.0'
21	133°32.23	• • 26.32	344°6.92	8.0'	$27^{\circ}15.74$	-5.0'	56.1'
22	148°32.30	25.62	$358^{\circ}33.91$	8.0'	$27^{\circ}10.79$	-5.1'	56.1'
23	163°32.38	24.92	13°0.92	8.0'	27°5.68	-5.3'	56.1'
	SD = 15.8'	d = -0.7'		SE	O = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.46	N16°24.22	27°27.94	8.0'	S27°0.42	-5.4'	56.1'
1	193°32.53	23.52	41°54.98	8.1'	26°55.01	-5.6'	56.2'
2	208°32.61	22.82	56°22.05	8.1'	26°49.44	-5.7'	56.2'
3	223°32.69	• • 22.12	70°49.14	8.1'	26°43.72	-5.9'	56.2'
4 5	238°32.76 253°32.84	21.42 20.72	85°16.25 99°43.39	8.1' 8.2'	26°37.85 26°31.82	-6.0' -6.2'	56.2' 56.3'
6	253 32.84 268°32.92	N16°20.02	99 43.39 114°10.55	8.2'	20 31.82 \$26°25.65	-6.2 -6.3'	56.3
7	283°33.00	19.32	128°37.74	8.2'	26°19.32	-6.5'	56.3'
8	298°33.08	18.62	143°4.96	8.3'	26°12.85	-6.6'	56.3'
9	313°33.16	• • 17.91	157°32.21	8.3'	26°6.22	-6.8'	56.4'
10	328°33.23	17.21	171°59.50	8.3'	25°59.44	-6.9'	56.4'
11	343°33.31	16.50	186°26.81	8.3'	25°52.52	-7.1'	56.4'
12	358°33.39 13°33.47	N16°15.80	200°54.16	8.4' 8.4'	\$25°45.45 25°38.23	-7.2'	56.5'
13 14	13°33.47 28°33.55	15.10 14.39	215°21.55 229°48.97	8.4 <sup>7</sup> 8.5 <sup>7</sup>	25°38.23 25°30.86	-7.4' -7.5'	56.5' 56.5'
15	43°33.63	13.68	244°16.42	6.5 8.5'	25°23.34	-7.7'	56.5'
16	58°33.71	12.98	258°43.92	8.5	25°15.68	-7.8'	56.6'
17	73°33.79	12.27	273°11.45	8.6'	25°7.88	-8.0'	56.6'
18	88°33.88	N16°11.56	287°39.02	8.6'	S24°59.93	-8.1'	56.6'
19	103°33.96	10.86	302°6.64	8.7'	24°51.83	-8.2'	56.6'
20	118°34.04	10.15	316°34.29	8.7'	24°43.60	-8.4'	56.7'
21	133°34.12	• • 9.44	331°1.99	8.7'	24°35.22	-8.5'	56.7'
22 23	148°34.20 163°34.28	8.73 8.02	345°29.73 359°57.52	8.8' 8.8'	24°26.70 24°18.03	-8.7' -8.8'	56.7' 56.8'
23			309 31.52			-o.ŏ	ეს.ბ
	SD = 15.8'	d = -0.7'		SE	O = 15.3'		

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

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

### August 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	316° 45.45	216°55.91 N21°58.5		212°26.10 N22°42.86	314°31.88 S01°39.21	
1	$331^{\circ}47.91$	231°55.22 58.4		227°28.01 42.81	329°34.44 39.26	Alpheratz 357°34.02 29°13.91 Ankaa 353°6.36 -42°9.73
2	$346^{\circ}50.37$	246°54.53 58.3		242°29.91 42.76	344°37.00 39.31	Schedar 349°30.17 56°40.53
3	1°52.84	261°53.84 · · 58.3		257°31.81 · · 42.72	359°39.55 · · 39.36	Diphda 348°46.60 -17°50.56
4	16°55.30	276°53.15 58.2		272°33.71 42.67	14°42.11 39.42	Achernar 335°19.58 -57°6.05
5	31°57.77	291°52.47 58.1		287°35.62 42.62	29°44.66 39.47	Hamal 327°50.56 23°35.01
6 7	47°0.23 62°2.69	306°51.78 N21°58.1 321°51.09 58.0		302°37.52 N22°42.58 317°39.42 42.53	44°47.22 S01°39.52 59°49.78 39.57	Polaris 313°47.94 89°22.00
8	77°5.16	336°50.40 57.9		317 39.42 42.53 332°41.33 42.48	74°52.33 39.62	Acamar 315°11.38 -40°11.78
9	92°7.62	351°49.71 · · 57.8		347°43.23 · · 42.43	89°54.89 · · 39.67	Menkar 314°5.63 4°11.52
10	107° 10.09	6°49.02 57.8		2°45.13 42.39	104°57.45 39.72	Mirfak 308°27.61 49°56.96
11	122° 12.55	21°48.33 57.7		17°47.04 42.34	120°0.00 39.77	Aldebaran 290°39.19 16°33.68
12	137° 15.02	36°47.65 N21°57.6	6 316°10.17 N00°6.18	32°48.94 N22°42.29	135°2.56 <b>S</b> 01°39.82	Rigel 281°3.57 -8°10.15
13	$152^{\circ}17.48$	51°46.96 57.5	9 331°11.22 5.53	47°50.84 42.24	150°5.12 39.87	Capella 280°21.42 46°1.30 Bellatrix 278°22.54 6°22.47
14	$167^{\circ}19.94$	66°46.27 57.5		62°52.75 42.19	165°7.67 39.92	Elnath 278°1.46 28°37.71
15	182°22.41	81°45.58 · · 57.4		77°54.65 · · 42.15	180°10.23 · · 39.97	Alnilam 275°37.43 -1°11.00
16	197° 24.87	96°44.89 57.3		92°56.56 42.10	195°12.79 40.02	Betelgeuse 270°51.77 7°24.80
17	212°27.34	111°44.20 57.2		107°58.46 42.05	210°15.35 40.07	Canopus 263°52.60 -52°42.27
18 19	227° 29.80 242° 32.26	126°43.51 N21°57.1 141°42.82 57.0		123°0.36 N22°42.00 138°2.27 41.96	225°17.90 S01°40.12 240°20.46 40.18	Sirius 258°26.08 -16°44.89
20	242 32.20 257°34.73	156° 42.13 57.0		138° 2.27 41.96 153° 4.17 41.91	240°20.46 40.18 255°23.02 40.23	Adhara 255°5.80 -29°0.20
21	272° 37.19	171°41.44 · · 56.9		168° 6.08 · · 41.86	270°25.58 · · 40.28	Procyon 244°50.62 5°9.66
22	287° 39.66	186° 40.75 56.8		183°7.98 41.81	285°28.14 40.33	Pollux 243°17.05 27°57.89
23	302°42.12	201°40.06 56.7		198° 9.89 41.77	300°30.70 40.38	Avior 234°15.20 -59°35.35
		-		ν1.9' d-0.0' m-1.93	-	Suhail 222°46.41 -43°32.07
ivier.	pass. 02:52	ν-0.7' d-0.1' m-3.9	$\nu 1.0' \ d$ -0.6' m1.61	ν1.9 <i>α</i> -υ.υ m-1.93	$\nu 2.6' \ d0.1' \ m0.76$	Miaplacidus 221°39.17 -69°49.28 Alphard 217°47.60 -8°46.09
						Regulus 207°34.23 11°50.63
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.95 61°36.95
0	317°44.59	216°39.37 N21°56.6		213°11.79 N22°41.72	315°33.25 S01°40.43	Denebola 182°24.68 14°25.86
1	332°47.05	231°38.68 56.5		228°13.70 41.67	330°35.81 40.48	Gienah 175°43.30 -17°41.06
2	347° 49.51	246°37.99 56.4		243°15.60 41.62	345°38.37 40.54	Acrux 173°0.03 -63°14.67
3 4	2°51.98 17°54.44	261°37.30 · · · 56.3 276°36.61 56.2		258°17.51 · · 41.57 273°19.41 41.53	0°40.93 · · 40.59 15°43.49 40.64	Gacrux 171°51.48 -57°15.59
5	32° 56.91	270 30.01 50.2 291°35.92 56.1		273°19.41 41.53 288°21.32 41.48	15°43.49 40.64 30°46.05 40.69	Alioth 166°12.80 55°49.50
6	47° 59.37	306°35.23 N21°56.0		303°23.23 N22°41.43	45°48.61 S01°40.74	Spica 158°21.91 -11°17.69
7	63°1.83	321°34.53 56.0	_	318°25.13 41.38	60°51.17 40.79	Alkaid 152°51.74 49°11.37
8	78°4.30	336°33.84 55.9		333°27.04 41.33	75°53.73 40.85	Hadar 148°35.47 -60°30.04
9	93°6.76	351°33.15 · · 55.8		348°28.94 · · 41.29	90°56.29 · · 40.90	Menkent 147°57.13 -36°29.89 Arcturus 145°47.51 19°3.10
10	108°9.23	6°32.46 55.7	0 286°33.13 8.08	3°30.85 41.24	105°58.85 40.95	Rigil Kent. 139°39.70 -60°56.72
11	123° 11.69	21°31.77 55.6		18°32.75 41.19	121°1.41 41.00	Kochab 137°19.80 74°3.26
12	138° 14.15	36°31.08 N21°55.4		33°34.66 N22°41.14	136°3.97 S01°41.05	Zuben'ubi 136°55.48 -16°8.92
13	153° 16.62	51°30.39 55.3		48°36.57 41.09	151°6.53 41.11	Alphecca 126°3.25 26°37.89
14	168° 19.08	66°29.69 55.2 81°29.00 · · 55.1		63°38.47 41.05	166°9.09 41.16 181°11.65 · · 41.21	Antares 112°15.08 -26°29.39
15 16	183°21.55 198°24.01	81°29.00 · · 55.1 96°28.31 55.0		78°40.38 · · 41.00 93°42.29 40.95	181°11.65 · · 41.21 196°14.21	Atria 107°8.57 -69°4.63
17	213° 26.48	111°27.62 54.9		108°44.19 40.90	211°16.77 41.31	Sabik 102°2.02 -15°45.39
18	228° 28.94	126°26.93 N21°54.8		123°46.10 N22°40.85	226°19.33 S01°41.37	Shaula 96°9.43 -37°7.42
19	243°31.40	141°26.23 54.7	5104051 1000	138°48.01 40.81	241°21.89 41.42	Rasalhague 95°57.87 12°32.59
20	258° 33.87	156°25.54 54.6		153°49.92 40.76	256°24.46 41.47	Eltanin 90°41.58 51°29.30 Kaus Aust. 83°31.54 -34°22.38
21	273°36.33	171°24.85 · · 54.5	3 91°44.60 · · 15.22	168°51.82 · · 40.71	271°27.02 · · 41.52	Vega 80°32.55 38°48.58
22	288°38.80	186°24.16 54.4		183°53.73 40.66	286°29.58 41.58	Nunki 75°46.82 -26°15.88
23	303°41.26	201°23.47 54.3	0 121°46.68 16.52	198°55.64 40.61	301°32.14 41.63	Altair 61°59.16 8°56.25
Mer.	pass. 02:49	$\nu$ -0.7' d-0.1' m-3.9	$\nu 1.0' \ d0.6' \ m1.61$	ν1.9' d-0.0' m-1.93	$\nu$ 2.6′ $d$ 0.1′ $m$ 0.76	Peacock 53°4.34 -56°39.12
						Deneb 49°25.01 45°22.36
C	CIIA	CHA 5	CUA 5	CHA 5	CHA D	Enif 33°37.99 9°59.63
Sun 0	<b>GHA</b> 318° 43.72	<b>GHA Dec</b> 216°22.77 N21°54.1	<b>GHA Dec</b> 9 136°47.72 \$00°17.17	<b>GHA Dec</b> 213°57.55 N22°40.56	<b>GHA Dec</b> 316°34.70 <b>S</b> 01°41.68	Al Na'ir 27°31.82 -46°50.06
1	333° 46.19	231°22.08 54.0		213 57.55 N22 40.50 228°59.45 40.52	331°37.27 41.73	Fomalhaut 15°13.63 -29°29.01
2	348° 48.65	246°21.39 53.9		244°1.36 40.47	346°39.83 41.79	Scheat 13°44.41 28°13.33
3	3°51.12	261°20.69 · · 53.8		259°3.27 · · 40.42	1°42.39 · · 41.84	Markab 13°29.12 15°20.65
4	18° 53.58	276°20.00 53.7	_	274°5.18 40.37	16°44.95 41.89	Aug 08 Fri SHA Mer.pass
5	33°56.04	291°19.31 53.6		289°7.09 40.32	31°47.51 41.95	Venus 260°10.46 09:33
6	48°58.51	306°18.61 <b>N</b> 21°53.4	8 226°53.96 S00°21.06	304°8.99 N22°40.27	46°50.08 <b>S</b> 01°42.00	Mars 179°12.18 14:55
7	64°0.97	321°17.92 53.3		319°10.90 40.22	61°52.64 42.05	Jupiter 255°40.66 09:49
8	79°3.44	336°17.23 53.2		334°12.81 40.18	76°55.20 42.11	Saturn 357°46.44 03:01
9	94°5.90	351°16.53 · · 53.1		349°14.72 · · 40.13	91°57.77 · · 42.16	Aug 09 Sat SHA Mer.pass
10	109°8.36	6°15.84 52.9		4°16.63 40.08	107° 0.33 42.21	Venus 258° 54.78 09:34
11 12	124° 10.83 139° 13.29	21°15.15 52.8 36°14.45 N21°52.7		19°18.54 40.03 34°20.45 N22°39.98	122°2.89 42.27 137°5.46 \$01°42.32	Mars 178°38.12 14:53
13	154° 15.76	51°13.76 52.6		49°22.36 39.93	152°8.02 42.37	Jupiter 255°27.21 09:46
14	169° 18.22	66°13.07 52.4		64°24.26 39.88	167°10.58 42.43	Saturn 357° 48.67 02:57
15	184° 20.69	81°12.37 · · 52.3		79°26.17 · · 39.84	182°13.15 · · 42.48	Aug 10 Sun SHA Mer.pass
16	199° 23.15	96°11.68 52.2		94°28.08 39.79	197°15.71 42.53	Venus 257°39.05 09:35
17	214° 25.61	111°10.98 52.0		109°29.99 39.74	212°18.28 42.59	Mars 178°4.00 14:52
18	229°28.08	126°10.29 N21°51.9		124°31.90 N22°39.69	227°20.84 <b>S</b> 01°42.64	Jupiter 255°13.82 09:43
19	244°30.54	141°9.60 51.8	1 62°7.48 29.50	139°33.81 39.64	242°23.41 42.69	Saturn 357°50.98 02:53
20	259° 33.01	156°8.90 51.6		154°35.72 39.59	257°25.97 42.75	
21	274° 35.47	171°8.21 · · 51.5		169°37.63 · · 39.54	272°28.54 · · 42.80	Horizontal parallax
22	289° 37.93	186°7.51 51.4		184°39.54 39.49	287°31.10 42.86	Venus: 0.1 Mars: 0.1
23	304°40.40	201°6.82 51.2		199°41.45 39.45	302°33.67 42.91	iviais. U.1
Mer.	pass. 02:45	ν-0.7′ d-0.1′ m-3.9	$\nu 1.0' \ d0.6' \ m1.62$	ν1.9′ d-0.0′ m-1.93	ν2.6′ d0.1′ m0.75	

h	Su	n	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	178°34.37	N16°7.31	14°25.35	8.9'	S24° 9.23	-8.9'	56.8'	
1	193°34.45	6.60	28°53.22	8.9'	24°0.29	-9.1'	56.8'	
2	208° 34.53	5.89	43°21.14	9.0'	23°51.21	-9.2'	56.8'	
3 4	223°34.62 238°34.70	· · 5.18 4.47	57°49.11 72°17.13	9.0' 9.1'	23°42.00 23°32.64	-9.4' -9.5'	56.9' 56.9'	
5	253° 34.78	3.76	86°45.19	9.1	23°23.15	-9.5' -9.6'	56.9'	
6	268° 34.87	N16° 3.04	101°13.31	9.2'	S23°13.53	-9.8'	56.9'	
7	283°34.95	2.33	115°41.47	9.2'	23°3.77	-9.9'	57.0'	
8	298°35.04	1.62	130°9.68	9.3'	22°53.88	-10.0'	57.0'	
9 10	313°35.12 328°35.21	· · 0.90 16° 0.19	144°37.95 159°6.26	9.3' 9.4'	22°43.86 22°33.70	-10.2' -10.3'	57.0' 57.1'	
11	343°35.29	15°59.48	173°34.62	9.4	22°23.42	-10.3	57.1'	
12	358° 35.38	N15°58.76	188°3.04	9.5'	S22°13.00	-10.5'	57.1'	
13	13°35.46	58.04	202°31.51	9.5'	22°2.46	-10.7'	57.1'	
14	28° 35.55	57.33	217°0.03	9.6'	21°51.79	-10.8'	57.2'	
15 16	43°35.64 58°35.72	· · 56.61 55.89	231°28.60 245°57.23	9.6' 9.7'	21°41.00 21°30.08	-10.9' -11.0'	57.2' 57.2'	
17	73° 35.81	55.18	260°25.91	9.7'	21°19.03	-11.2'	57.2	
18	88° 35.90	N15°54.46	274°54.64	9.8'	S21°7.86	-11.3'	57.3'	
19	103°35.99	53.74	289°23.43	9.8'	20°56.58	-11.4'	57.3'	
20	118° 36.07 133° 36.16	53.02	303°52.27	9.9'	20°45.17	-11.5'	57.3'	
21 22	133° 36.16 148° 36.25	· · 52.30 51.58	318°21.17 332°50.11	9.9' 10.0'	20°33.64 20°21.99	-11.6' -11.8'	57.3' 57.4'	
23	163° 36.34	50.86	347°19.12	10.0	20° 21.99 20° 10.22	-11.6 -11.9'	57.4'	
	SD = 15.8'	d = -0.7'			D = 15.5'			
	JD — 13.0	u — -0.1		ال				
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP	
0	178° 36.43 193° 36.52	N15°50.14	1°48.17	10.1'	\$19°58.34	-12.0'	57.4'	
1 2	193°36.52 208°36.61	49.42 48.70	16°17.28 30°46.44	10.2' 10.2'	19°46.34 19°34.23	-12.1' -12.2'	57.4' 57.5'	
3	208 30.01 223°36.69	• • 47.98	45°15.66	10.2	19° 34.23	-12.2	57.5'	
4	238° 36.78	47.26	59°44.93	10.3'	19° 9.67	-12.4'	57.5'	
5	253° 36.87	46.53	74°14.26	10.4'	18°57.23	-12.6'	57.5'	
6	268° 36.96	N15°45.81	88°43.64	10.4	\$18°44.67	-12.7'	57.6'	
7 8	283°37.06 298°37.15	45.09 44.36	103°13.07 117°42.55	10.5' 10.5'	18°32.01 18°19.24	-12.8' -12.9'	57.6' 57.6'	
9	313° 37.24	• • 43.64	132°12.09	10.6'	18° 6.36	-13.0'	57.6'	
10	328° 37.33	42.92	146°41.68	10.6'	17°53.38	-13.1'	57.7'	
11	343°37.42	42.19	161°11.33	10.7'	17°40.30	-13.2'	57.7'	
12	358° 37.51	N15°41.46	175°41.02	10.7'	\$17°27.11	-13.3'	57.7'	
13 14	13°37.60 28°37.70	40.74 40.01	190°10.77 204°40.57	10.8' 10.8'	17°13.83 17°0.44	-13.4' -13.5'	57.7' 57.8'	
15	43°37.79	39.28	219°10.42	10.9	16°46.96	-13.6'	57.8'	
16	58° 37.88	38.56	233°40.32	11.0'	$16^{\circ}33.38$	-13.7'	57.8'	
17	73°37.97	37.83	248°10.27	11.0'	16°19.70	-13.8'	57.8'	
18 19	88° 38.07 103° 38.16	N15°37.10 36.37	262°40.27 277°10.32	11.0' 11.1'	\$16°5.93 15°52.07	-13.9' -14.0'	57.9' 57.9'	
20	118° 38.25	35.64	291°40.41		15 52.07 15°38.12		57.9'	
21	133°38.35	34.91	306°10.56	11.2'	15°24.07	-14.1'	57.9'	
22	148°38.44	34.18	320°40.75	11.2'	$15^{\circ}9.94$	-14.2'	58.0'	
23	163°38.54	33.45	335°11.00	11.3'	14°55.72	-14.3'	58.0'	
	SD = 15.8'	d = -0.7'	SD = 15.7′					
Sun	GHA	Dec	GHA	ν	Dec	d	НР	
Sun 0	178° 38.63	N15°32.72	349°41.28	u 11.3'	S14°41.41	a -14.4'	пР 58.0'	
1	193°38.73	31.99	4°11.62	11.4'	14°27.02	-14.5'	58.0'	
2	208° 38.82	31.26	18°42.00	11.4'	14°12.54	-14.6'	58.1'	
3	223°38.92	• • 30.53	33°12.42	11.5'	13°57.99	-14.6'	58.1'	
4 5	238°39.01 253°39.11	29.79 29.06	47°42.89 62°13.40	11.5' 11.6'	13°43.35 13°28.63	-14.7' -14.8'	58.1' 58.1'	
6	268° 39.21	N15°28.33	76°43.95	11.6'	\$13°13.83	-14.9	58.1'	
7	283°39.30	27.59	91°14.55	11.6'	12°58.96	-14.9'	58.2'	
8	298°39.40	26.86	105°45.18	11.7'	12°44.01	-15.0'	58.2'	
9 10	313°39.50 328°39.59	· · 26.12 25.39	120°15.86 134°46.58	11.7' 11.8'	12°28.99 12°13.89	-15.1' -15.2'	58.2' 58.2'	
11	343°39.69	25.39 24.65	134 40.58 149°17.33	11.8	12 13.89 11°58.73	-15.2' -15.2'	58.2'	
12	358° 39.79	N15°23.92	163°48.12	11.8'	S11°43.49	-15.3'	58.3'	
13	13°39.89	23.18	178°18.95	11.9'	11°28.19	-15.4'	58.3'	
14	28°39.98	22.44	192°49.82	11.9'	11°12.81	-15.4'	58.3'	
15 16	43°40.08 58°40.18	· · 21.71 20.97	207°20.72 221°51.66	11.9' 12.0'	10°57.38 10°41.87	-15.5' -15.6'	58.3' 58.4'	
17	73°40.28	20.97	236°22.63	12.0'	10° 41.87 10° 26.31	-15.6'	58.4'	
18	88° 40.38	$N15^{\circ}19.49$	250°53.63	12.0'	S10°10.68	-15.7'	58.4'	
19	103°40.48	18.75	265°24.67	12.1'	09°55.00	-15.7'	58.4'	
20 21	118° 40.58 133° 40.68	18.01 •• 17.27	279°55.73 294°26.83	12.1' 12.1'	09°39.25 09°23.45	-15.8'	58.4'	
21	133°40.68 148°40.78	16.53	294°26.83 308°57.95	12.1	09°23.45 09°7.59	-15.9' -15.9'	58.4' 58.5'	
23	163°40.88	15.79	323°29.10	12.2'	08°51.68	-16.0'	58.5	
	SD = 15.8'	d = -0.7'		SI	D = 15.8'			

Naut.   Civil     Civil   Naut.   Na	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70°	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68°         ////         00:35         02:54         21:13         23:18         ////           66°         ////         01:47         03:17         20:52         22:18         ////           64°         ////         02:22         03:34         20:35         21:45         ////           62°         00:32         02:46         03:48         20:21         21:22         23:2           60°         01:36         03:06         04:00         20:09         21:03         22:3           N 58°         02:08         03:21         04:11         19:59         20:48         22:0           56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16 <th>N 72°</th> <th>////</th> <th>////</th> <th>01:37</th> <th>22:25</th> <th>////</th> <th>////</th>	N 72°	////	////	01:37	22:25	////	////
66°         ////         01:47         03:17         20:52         22:18         ////           64°         ////         02:22         03:34         20:35         21:45         ////           62°         00:32         02:46         03:48         20:21         21:22         23:23           60°         01:36         03:06         04:00         20:09         21:03         22:3           N 58°         02:08         03:21         04:11         19:59         20:48         22:0           56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16<		////	////	02:24	21:42	////	////
64°         ////         02:22         03:34         20:35         21:45         ////           62°         00:32         02:46         03:48         20:21         21:22         23:2           60°         01:36         03:06         04:00         20:09         21:03         22:3           N 58°         02:08         03:21         04:11         19:59         20:48         22:0           56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38<		////	00:35	02:54	21:13	23:18	////
62°         00:32         02:46         03:48         20:21         21:22         23:2           60°         01:36         03:06         04:00         20:09         21:03         22:3           N 58°         02:08         03:21         04:11         19:59         20:48         22:0           56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38		////	01:47	03:17	20:52	22:18	////
60°         01:36         03:06         04:00         20:09         21:03         22:3           N 58°         02:08         03:21         04:11         19:59         20:48         22:0           56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:		////			20:35		////
N 58°         02:08         03:21         04:11         19:59         20:48         22:0           56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:0					-		23:23
56°         02:31         03:34         04:20         19:50         20:35         21:3           54°         02:49         03:45         04:28         19:42         20:24         21:2           52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:02         18:09         18:30         18:5           5 10°         05:26         05:52         06:1	60°	01:36	03:06	04:00	20:09	21:03	22:30
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	N 58°	02:08	03:21	04:11	19:59	20:48	22:00
52°         03:04         03:55         04:35         19:35         20:14         21:0           50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:02         18:09         18:30         18:5           5 10°         05:26         05:52         06:13         17:58         18:19         18:4           20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:3	56°	02:31	03:34	04:20	19:50	20:35	21:38
50°         03:16         04:04         04:41         19:29         20:06         20:5           45°         03:41         04:22         04:55         19:15         19:48         20:2           N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:02         18:09         18:30         18:5           S 10°         05:26         05:52         06:13         17:58         18:19         18:4           20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:39         17:36         18:1           35°         05:50         06:20         06:47         17:2	54°	02:49	03:45	04:28	19:42	20:24	21:20
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	52°	03:04	03:55	04:35	19:35	20:14	21:06
N 40°         04:00         04:36         05:06         19:04         19:34         20:1           35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:02         18:09         18:30         18:5           S 10°         05:26         05:52         06:13         17:58         18:19         18:4           20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:39         17:32         17:57         18:2           35°         05:50         06:20         06:47         17:25         17:51         18:2           40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:0	50°	03:16	04:04	04:41	19:29	20:06	20:53
35°         04:16         04:48         05:16         18:55         19:22         19:5           30°         04:28         04:58         05:24         18:47         19:12         19:4           20°         04:48         05:15         05:38         18:33         18:56         19:2           N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:02         18:09         18:30         18:5           S 10°         05:26         05:52         06:13         17:58         18:19         18:4           20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:39         17:32         17:57         18:2           35°         05:50         06:20         06:47         17:25         17:51         18:2           40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:06         17:06         17:36         18:1	45°	03:41	04:22	04:55	19:15	19:48	20:28
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		04:00	04:36	05:06	19:04	19:34	20:10
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	35°	04:16	04:48	05:16	18:55	19:22	19:55
N 10°         05:03         05:29         05:51         18:20         18:42         19:0           0°         05:16         05:41         06:02         18:09         18:30         18:5           S 10°         05:26         05:52         06:13         17:58         18:19         18:4           20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:39         17:36         17:57         18:2           35°         05:50         06:20         06:47         17:25         17:51         18:2           40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:06         17:06         17:36         18:1		04:28	04:58	05:24	18:47	19:12	19:42
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		04:48	05:15	05:38	18:33	18:56	19:23
S 10°         05:26         05:52         06:13         17:58         18:19         18:4           20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:39         17:32         17:57         18:2           35°         05:50         06:20         06:47         17:25         17:51         18:2           40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:06         17:06         17:36         18:1		05:03	05:29	05:51	18:20	18:42	19:08
20°         05:36         06:03         06:25         17:46         18:09         18:3           30°         05:46         06:14         06:39         17:32         17:57         18:2           35°         05:50         06:20         06:47         17:25         17:51         18:2           40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:06         17:06         17:36         18:1	0°	05:16	05:41	06:02	18:09	18:30	18:55
30°         05:46         06:14         06:39         17:32         17:57         18:2           35°         05:50         06:20         06:47         17:25         17:51         18:2           40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:06         17:06         17:36         18:1	S 10°	05:26	05:52	06:13	17:58	18:19	18:45
35°   05:50   06:20   06:47   17:25   17:51   18:2   40°   05:55   06:27   06:56   17:16   17:44   18:1   45°   06:00   06:35   07:06   17:06   17:36   18:1		05:36	06:03	06:25	17:46	18:09	18:35
40°         05:55         06:27         06:56         17:16         17:44         18:1           45°         06:00         06:35         07:06         17:06         17:36         18:1		05:46	06:14	06:39			18:26
45° 06:00 06:35 07:06 17:06 17:36 18:1		05:50	06:20	06:47	17:25	17:51	18:21
		05:55	06:27	06:56	17:16		18:16
C EO 0 06.06 06.44 07.19 16.E3 17.39 19.0	45°	06:00	06:35	07:06	17:06	17:36	18:11
	<b>S</b> 50°	06:06	06:44	07:18	16:53	17:28	18:06
							18:04
		06:10	06:53		16:41	17:19	18:01
		06:13	06:57	07:38	16:34	17:14	17:59
							17:56
<b>S</b> 60°   06:19 07:09 07:55   16:17 17:03 17:5	<b>S</b> 60°	06:19	07:09	07:55	16:17	17:03	17:53

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-99%
08	05:43	05:38	12:06	23:53	11:27	
09	05:34	05:30	12:05	-:-	12:18	
10	05:25	05:21	12:05	00:43	13:07	

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

h	Aries	Venus	Mars	Jupiter	Saturn
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	319° 42.86	216°6.12 N21°51.12	137°12.67 \$00°32.75	214°43.36 N22°39.40	317°36.23
1	334° 45.33	231°5.43 50.98	152° 13.71 33.40	229°45.27 39.35	332°38.80 43.02
2	349° 47.79	246°4.74 50.84	167° 14.75 34.05	244°47.18 39.30	347°41.36 43.07
3	4° 50.25	261°4.04 · · 50.69	182°15.79 · · 34.70	259°49.09 · · 39.25	2°43.93 · · 43.13
4	19° 52.72	276°3.35 50.55	197°16.83 35.35	274°51.01 39.20	17°46.49 43.18
5	34°55.18	291°2.65 50.40	212° 17.86 36.00	289°52.92 39.15	32°49.06 43.23
6	49° 57.65	306°1.96 N21°50.26	227°18.90 \$00°36.65	304°54.83 N22°39.10	47°51.62 S01°43.29
7	65°0.11	321°1.26 50.11	242°19.94 37.30	319°56.74 39.05	62°54.19 43.34
8	80°2.57	336°0.57 49.96	257°20.98 37.95	334°58.65 39.00	77°56.76 43.40
9	95°5.04	350°59.87 · · 49.81	272°22.02 · · 38.60	350°0.56 · · 38.96	92°59.32 · · 43.45
10	110°7.50	5°59.18 49.66	287°23.05 39.25	5°2.47 38.91	108°1.89 43.51
11	125°9.97	20° 58.48 49.51	302°24.09 39.90	20°4.38 38.86	123°4.46 43.56
12	140° 12.43	35°57.79 N21°49.36	317°25.13 \$00°40.55	35°6.30 N22°38.81	138°7.02 <b>S</b> 01°43.62
13	$155^{\circ}14.89$	50°57.09 49.21	332°26.16 41.20	50°8.21 38.76	153°9.59 43.67
14	$170^{\circ}17.36$	65°56.39 49.05	347° 27.20 41.85	65°10.12 38.71	168°12.16 43.72
15	$185^{\circ}19.82$	80°55.70 · · 48.90	2°28.24 · · 42.50	80°12.03 · · 38.66	183°14.72 · · 43.78
16	$200^{\circ}22.29$	95°55.00 48.74	17°29.27 43.15	95°13.94 38.61	198°17.29 43.83
17	$215^{\circ}24.75$	110°54.31 48.58	32°30.31 43.80	110°15.86 38.56	213°19.86 43.89
18	230° 27.21	125°53.61 N21°48.42	47°31.35 <b>S</b> 00°44.45	125°17.77 N22°38.51	228°22.43 <b>S</b> 01°43.94
19	245°29.68	140°52.92 48.26	62°32.38 45.10	140°19.68 38.46	243°24.99 44.00
20	260°32.14	155°52.22 48.10	77°33.42 45.75	155°21.59 38.41	258°27.56 44.05
21	275°34.61	170°51.53 · · 47.94	92°34.46 • • 46.40	170°23.51 · · 38.37	273°30.13 · · 44.11
22	290°37.07	185°50.83 47.78	107° 35.49 47.05	185°25.42 38.32	288°32.70 44.16
23	305°39.54	200°50.13 47.62	122°36.53 47.70	200°27.33 38.27	303°35.27 44.22
Merr	pass. 02:41	ν-0.7' d-0.1' m-3.98	$\nu 1.0' \ d0.6' \ m1.62$	ν1.9' d-0.0' m-1.94	ν2.6' d0.1' m0.75
- IVICI.	7433. 02.41	- 0.7 d 0.1 iii 3.30			
	_				
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	320°42.00	215°49.44 N21°47.45	137°37.56 \$00°48.35	215°29.25 N22°38.22	318°37.84 <b>S</b> 01°44.27
1	335°44.46	230° 48.74 47.28	152°38.60 49.01	230°31.16 38.17	333°40.40 44.33
2	350° 46.93	245° 48.05 47.12	167°39.64 49.66	245°33.07 38.12	348°42.97 44.39
3	5°49.39	260°47.35 · · 46.95	182°40.67 · · 50.31	260°34.99 · · 38.07	3°45.54 · · 44.44
4	20°51.86	275° 46.65 46.78	197°41.71 50.96	275°36.90 38.02	18°48.11 44.50
5	35°54.32	290°45.96 46.61	212°42.74 51.61	290°38.81 37.97	33°50.68 44.55
6	50°56.78	305°45.26 N21°46.44	227°43.78 \$00°52.26	305°40.73 N22°37.92	48°53.25 S01°44.61
7	65°59.25	320°44.57 46.27	242°44.81 52.91	320°42.64 37.87	63°55.82 44.66
8	81°1.71	335° 43.87 46.09	257°45.85 53.56	335°44.56 37.82	78°58.39 44.72
9	96°4.18	350°43.17 · · 45.92	272°46.88 · · 54.21	350°46.47 · · 37.77	94°0.96 · · 44.77
10	111°6.64	5° 42.48 45.74	287° 47.92 54.86	5°48.38 37.72	109°3.53 44.83
11	126°9.10	20°41.78 45.57	302°48.95 55.51	20°50.30 37.67	124°6.10 44.89
12	141° 11.57	35°41.08 N21°45.39	317°49.98 \$00°56.16	35°52.21 N22°37.62 50°54.13 37.57	139°8.67 S01°44.94 154°11.24 45.00
13	156° 14.03 171° 16.50	50°40.39 45.21 65°39.69 45.03	332°51.02 56.81 347°52.05 57.46		
14					
15	186° 18.96 201° 21.42	80°38.99 · · 44.85 95°38.30 44.67	2°53.09 · · 58.12 17°54.12 58.77	80°57.96 · · 37.47 95°59.87 37.42	184°16.38 · · 45.11 199°18.95 45.17
16 17	201 21.42 216°23.89	95 38.30 44.67 110°37.60 44.49	17°54.12 58.77 32°55.15 00°59.42	95°59.87 37.42 111°1.79 37.37	199°18.95 45.17 214°21.52 45.22
18	231° 26.35	125°36.90 N21°44.30	47°56.19 S01°0.07	111 1.79 37.37 126°3.70 N22°37.32	214 21.32 43.22 229°24.09 \$01°45.28
19	246° 28.82	140°36.21 44.12	62°57.22 0.72	141° 5.62 37.28	244°26.66 45.33
20	240 26.62 261°31.28	155°35.51 43.93	77°58.26 1.37	141 5.02 57.26 156° 7.53 37.23	259°29.23 45.39
21	276° 33.74	170°34.81 · · 43.75	92°59.29 · · 2.02	171° 9.45 · · 37.18	274°31.80 · · 45.45
22	291°36.21	185°34.12 43.56	108°0.32 2.67	186°11.37 37.13	289°34.37 45.50
23	306° 38.67	200°33.42 43.37	123°1.36 3.32	201°13.28 37.08	304°36.95 45.56
Mer.p	pass. 02:37	$\nu$ -0.7′ <i>d</i> -0.2′ m-3.98	$ u 1.0' \ d0.7' \ m1.62$	$\nu 1.9' \; d\text{-}0.0' \; \text{m-}1.94$	$ u 2.6' \ d0.1' \ m0.74$
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	321°41.14	215°32.72 N21°43.18	138°2.39	216°15.20 N22°37.03	319°39.52 S01°45.62
1	336° 43.60	230°32.03 42.99	153°3.42 4.63	231°17.11 36.98	334°42.09 45.67
2	351°46.06	245°31.33 42.80	168°4.45 5.28	246°19.03 36.93	349°44.66 45.73
3	6°48.53	260°30.63 · · 42.60	183°5.49 · · 5.93	261°20.95 · · 36.88	4°47.23 · · 45.79
4	21°50.99	275°29.94 42.41	198°6.52 6.58	276°22.86 36.83	19°49.80 45.84 <b>A</b>
5	$36^{\circ}53.46$	290°29.24 42.22	213°7.55 7.23	291°24.78 36.78	34°52.38 45.90
6	51°55.92	305°28.54 N21°42.02	228°8.58 <b>S</b> 01°7.88	306°26.70 N22°36.73	49°54.95 <b>S</b> 01°45.96
7	66°58.38	320°27.84 41.82	243°9.62 8.53	321°28.61 36.68	64°57.52 46.01
8	82°0.85	335°27.15 41.62	258°10.65 9.18	336°30.53 36.63	80°0.09 46.07
9	97°3.31	350°26.45 · · 41.42	273°11.68 · · 9.84	351°32.45 · · 36.58	95°2.67 · · 46.13
10	112°5.78	5°25.75 41.22	288°12.71 10.49	6°34.36 36.53	110°5.24 46.18
11	127°8.24	20°25.06 41.02	303°13.74 11.14	21°36.28 36.48	125°7.81 46.24
12	142° 10.70	35°24.36 N21°40.82	318°14.78 <b>S</b> 01°11.79	36°38.20 N22°36.43	140°10.39
13	157° 13.17	50°23.66 40.62	333°15.81 12.44	51°40.12 36.38	155°12.96 46.36
14	172° 15.63	65°22.97 40.41	348°16.84 13.09	66°42.03 36.33	170°15.53 46.41
15	187° 18.10	80°22.27 · · 40.21	3°17.87 · · 13.74	81°43.95 · · 36.28	185°18.11 · · 46.47 A
16	202°20.56	95°21.57 40.00	18°18.90 14.40	96°45.87 36.22	200°20.68 46.53
17	217°23.03	110°20.87 39.79	33°19.93 15.05	111°47.79 36.17	215°23.25 46.58
18	232°25.49	125°20.18 N21°39.58	48°20.96 S01°15.70	126°49.71 N22°36.12	230°25.83 S01°46.64
19	247°27.95	140°19.48 39.37	63°21.99 16.35	141°51.62 36.07	245°28.40 46.70
20	262°30.42	155°18.78 39.16	78°23.02 17.00	156°53.54 36.02	260°30.98 46.76
21	277°32.88	170°18.08 · · 38.95	93°24.05 · · 17.65	171°55.46 · · 35.97	275°33.55 · · 46.81
22	292°35.35	185°17.39 38.74	108°25.08 18.31	186°57.38 35.92	290°36.12 46.87
23	307°37.81	200°16.69 38.52	123°26.11 18.96	201°59.30 35.87	305°38.70 46.93
Mer.p	pass. 02:33	ν-0.7' d-0.2' m-3.97	$\nu 1.0' \ d0.7' \ m1.62$	ν1.9' d-0.0' m-1.94	ν2.6' d0.1' m0.74

Alpheratz	Alpheratz		
Ankaa 353°6.34 -42°9.73 Schedar 349°30.14 56°40.54 Diphda 348°46.58 -17°50.55 Achernar 335°19.55 -57°6.05 Hamal 327°50.54 23°35.02 Polaris 313°46.54 89°22.01 Acamar 314°5.61 4°11.73 Menkar 314°5.61 4°11.73 Menkar 314°5.61 4°11.53 Mirfak 308°27.58 49°56.96 Aldebaran 290°39.17 16°33.69 Rigel 281°3.55 -8°10.14 Capella 280°21.39 46°1.30 Bellatrix 278°1.44 228°37.71 Alnilam 275°37.41 -1°10.99 Betelgeuse 270°51.76 7°24.81 Canopus 263°52.58 -52°42.25 Sirius 258°26.07 -16°44.88 Adhara 255°5.79 -29°0.19 Procyon 244°50.61 5°9.66 Pollux 243°17.03 27°57.89 Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 221°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -111°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphacca 126°3.27 26°37.89 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.99 Indipter 256°13.27 26°37.89 Auria 170°55.57 14:48 Jupiter 256°13.84 Mer.pass Vega 80°32.56 38°4.85 Nunki 75°46.83 -22°19.39 Auria 176°51.55 49.49 Seturu 33°7.55.84 00:45  Aug 13 Wed SHA Mer.pass Aug 13 Wed SHA Mer.pass Aug 253°51.59 09:38 Auria 176°21.25 14:47 Jupiter 256°3.37 00:49  Aug 13 Wed SHA Mer.pass Aug 256°23.26 09:36 Aug 13 Wed SHA Mer.pass Aug 256°23.26 09:36 Aug 13 Wed SHA Mer.pass Aug 258°5.58 10.99 Aug 13 Wed SHA Mer.pass Aug 258°51.59 09:38 Aug 258°51.59 09:38 Aug 13°69.55.57 14:48 Aug 13 Wed SHA Mer.pass Aug 258°51.59 09:38 Aug 13°69.55.57 14:49 Aug 13 Wed SHA Mer.pass	,pc. a cz	357°34 00	29° 13 92
Schedar 349° 30.14 56° 40.54 Diphda 348° 46.58 -17° 50.55 Achernar 348° 46.58 -17° 50.55 Achernar 335° 19.55 -57° 6.05 Hamal 327° 50.54 23° 35.02 Polaris 313° 46.54 89° 22.01 Acamar 316° 11.36 -40° 11.77 Menkar 314° 5.61 4° 11.53 Mirfak 308° 27.58 49° 56.96 Aldebaran 290° 39.17 16° 33.69 Rigel 281° 3.55 -8° 10.14 Capella 280° 21.39 46° 1.30 Bellatrix 278° 22.52 6° 22.48 Elnath 278° 1.44 28° 37.71 Alnilam 275° 37.41 -1° 10.99 Betelgeuse 270° 51.76 7° 24.81 Canopus 263° 52.58 -52° 42.25 Sirius 258° 26.07 -16° 44.88 Adhara 255° 5.79 -29° 0.19 Procyon 244° 50.61 5° 9.66 Pollux 243° 17.03 27° 57.89 Avior 234° 15.19 -59° 35.33 Suhail 222° 46.41 -43° 32.06 Miaplacidus 221° 39.17 -69° 49.26 Alphard 217° 47.59 -8° 46.08 Regulus 207° 34.22 11° 50.63 Dubhe 193° 40.95 61° 36.94 Denebola 182° 22.69 Alkaid 175° 43.31 -17° 41.05 Acrux 173° 0.05 -63° 14.66 Gacrux 171° 51.50 -57° 15.58 Alioth 166° 12.81 55° 49.49 Spica 158° 21.92 -111° 17.69 Alkaid 152° 51.76 49° 11.37 Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Kochab 137° 19.85 74° 3.26 Zuben'ubi 136° 55.49 -60° 30.03 Atria 107° 8.61 -69° 46.4 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -49° 29° 29.90 Nunki 75° 46.33 -26° 15.88 Altair 61° 59.16 8° 56.69 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.90 Aug 12 Tue SHA Mer.pass Vega 80° 32.56 38° 48.59 Nunki 75° 45.37 -90.93 Auria 170° 55.57 14.48 Jupiter 255° 7.44 -90.93 Auria 170° 55.57 14.48 Jupiter 255° 7.44 -90.93 Auria 170° 55.57 14.48 Jupiter 256° 23.26 09.36 Mars 176° 21.25 1.447 Jupiter 254° 34.06 09.34 Saturn 357° 55.84 00:44	Ankaa		
Diphda 348°46.58 -17°50.55 Achernar 335°19.55 -57°6.05 Hamal 327°50.54 23°35.02 Polaris 313°46.54 89°22.01 Acamar 315°11.36 -40°11.77 Menkar 314°5.61 4°11.53 Mirfak 308°27.58 49°56.96 Aldebaran 290°39.17 16°33.69 Rigel 281°3.55 -8°10.14 Capella 280°21.39 46°1.30 Bellatrix 278°22.52 6°22.48 Elnath 278°1.44 28°37.71 Alnilam 275°37.41 -1°10.99 Betelgeuse 270°51.76 7°24.81 Canopus 263°52.58 -52°42.25 Sirius 258°26.07 -16°44.88 Adhara 255°5.79 -29°0.19 Procyon 244°50.61 5°9.66 Pollux 243°17.03 27°57.89 Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 211°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 1713°0.05 -63°14.66 Gacrux 1713°0.05 -63°14.66 Gacrux 1713°0.05 -63°14.66 Gacrux 1713°1.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -111°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Altair 61°59.16 8°5.29 Nunki 75°46.83 -22°15.88 Altair 61°59.16 8°5.29 Sepacock 53°4.34 -56°39.13 Deneb 49°22.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°2.25 Deneb 49°22.03 -15°45.40 Shaula 96°9.44 -37°7.42 Scheat 13°4.40 28°13.34 Haria 61°59.16 8°5.57 Hayanara 176°21.25 19°3.99 Scheat 13°4.40 28°13.34 Deneb 49°29.21 15°0.63 Aug 11 Mon SHA Mer.pass Venus 255°5.84 00:34 Saturn 35°55.83 00:44  Aug 12 Tue SHA Mer.pass Venus 255°5.84 00:34 Saturn 35°55.83 00:44  Aug 12 Tue SHA Mer.pass Aug 13°6°21.25 14:47 Jupiter 255°0.50 09:40 Saturn 35°55.83 00:41	!		
Achernar 335° 19.55 -57° 6.05 Hamal 327° 50.54 23° 35.02 Polaris 313° 46.54 89° 22.01 Acamar 315° 11.36 -40° 11.77 Menkar 314° 5.61 4° 11.53 Mirfak 308° 27.58 49° 56.96 Aldebaran 290° 39.17 16° 33.69 Rigel 281° 3.55 -8° 10.14 Capella 280° 21.39 46° 1.30 Bellatrix 278° 22.52 6° 22.48 Elnath 278° 1.44 28° 37.71 Alnilam 275° 37.41 -1° 10.99 Betelgeuse 270° 51.76 7° 24.81 Canopus 263° 52.58 -52° 42.25 Sirius 258° 26.07 -16° 44.88 Adhara 255° 5.79 -29° 0.19 Procyon 244° 50.61 5° 9.66 Pollux 243° 17.03 27° 57.89 Avior 234° 15.19 -59° 35.33 Suhail 222° 46.41 -43° 32.06 Miaplacidus 211° 39.17 -69° 49.26 Alphard 217° 47.59 -8° 46.08 Regulus 207° 34.22 11° 50.63 Dubhe 193° 40.95 61° 36.94 Denebola 182° 24.69 14° 25.86 Gienah 175° 43.31 -17° 41.05 Acrux 173° 0.05 -63° 14.66 Gacrux 171° 51.50 -57° 15.58 Alioth 166° 12.81 55° 49.49 Spica 158° 21.92 -11° 17.69 Alkaid 152° 51.76 49° 11.37 Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Kochab 137° 19.85 74° 3.26 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 29.89 Nunki 75° 46.83 -26° 15.88 Altair 61° 59.16 8° 50.20 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 9° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.01 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66  Aug 11 Mon SHA Mer.pass Venus 255° 5.79 14.48 Jupiter 255° 0.50 09.40 Saturn 357° 55.37 02:49  Aug 12 Tue SHA Mer.pass Venus 255° 5.57 14:48 Jupiter 255° 0.50 09.40 Saturn 357° 55.34 00:44			
Hamal   327°50.54   23°35.02   Polaris   313°46.54   89°22.01   Acamar   314°5.61   4°11.73   Menkar   314°5.61   4°11.53   Mirfak   308°27.58   49°56.96   Aldebaran   290°39.17   16°33.69   Rigel   281°3.55   -8°10.14   Capella   280°21.39   46°1.30   Bellatrix   278°1.44   28°37.71   Alnilam   275°37.41   -1°10.99   Betelgeuse   270°51.76   7°24.81   Canopus   258°26.07   -16°44.88   Adhara   255°5.79   -29°0.19   Procyon   244°50.61   5°9.66   Pollux   243°17.03   27°57.89   Avior   234°15.19   -59°35.33   Suhail   222°46.41   -43°32.06   Miaplacidus   221°39.17   -69°49.26   Alphard   217°47.59   -8°46.08   Regulus   207°34.22   11°50.63   Dubhe   193°40.95   61°36.94   256°66   Gacrux   173°0.05   -63°14.66   Gacrux   173°0.05   -63°14.66   Gacrux   173°0.05   -63°14.66   Gacrux   173°0.05   -63°14.66   Gacrux   171°51.50   -57°15.58   Alioth   166°12.81   55°49.49   Spica   158°21.92   -11°17.69   Alkaid   152°51.76   49°11.37   Hadar   148°35.50   -60°30.03   Menkent   147°57.15   -36°29.89   Arcturus   145°47.52   19°3.09   Rigil Kent   130°39.74   -60°56.72   Alphacca   126°3.27   26°37.89   26°29.39   Alphacca   126°3.27   26			
Polaris   313° 46.54   89° 22.01   Acamar   315° 11.36   -40° 11.77   Menkar   314° 5.61   4° 11.53   Mirfak   308° 27.58   49° 56.96   Aldebaran   290° 39.17   16° 33.69   Rigel   281° 3.55   -8° 10.14   Capella   280° 21.39   46° 1.30   Bellatrix   278° 22.52   6° 22.48   Elnath   278° 1.44   28° 37.71   Alnilam   275° 37.41   -1° 10.99   Betelgeuse   270° 51.76   7° 24.81   Canopus   263° 52.58   -52° 42.25   Sirius   258° 26.07   -16° 44.88   Adhara   255° 5.79   -29° 0.19   Procyon   244° 50.61   5° 9.66   Pollux   243° 17.03   27° 57.89   Avior   234° 15.19   -59° 35.33   Suhail   222° 46.41   -43° 32.06   Alphard   217° 47.59   -8° 46.08   T2° 41.05   Acrux   173° 0.05   -63° 44.06   Gacrux   171° 51.50   -57° 15.58   Alioth   166° 12.81   55° 49.49   Spica   158° 21.92   -11° 17.69   Alkaid   152° 51.76   49° 11.37   Hadar   148° 35.00   -60° 30.03   Menkent   147° 57.15   -36° 29.89   Arcturus   145° 47.52   19° 3.09   Rigil Kent.   139° 39.74   -60° 56.72   Kochab   137° 19.85   74° 3.26   Zuben'ubi   136° 55.49   -16° 8.92   Alphacca   126° 3.27   26° 37.89   Atria   107° 8.61   -69° 4.64   Sabik   102° 2.03   -15° 45.40   Shaula   96° 9.44   -37° 7.42   Rasalhague   95° 57.88   12° 32.60   Eltanin   90° 41.60   51° 29.31   Kaus Aust.   83° 31.55   -34° 22.38   Altair   107° 8.61   -69° 4.64   Sabik   102° 2.03   -15° 45.40   Shaula   96° 9.44   -37° 7.42   Rasalhague   95° 57.88   12° 32.60   Eltanin   90° 41.60   51° 29.31   Kaus Aust.   83° 31.55   -34° 22.38   Altair   107° 8.61   -69° 4.64   52° 57.88   Altair   107° 8.61   -69° 4.64   53° 57.89   Altair   107° 8.61   -69° 4.64   53° 57.89   40° 9.34   51° 29.31   50° 50.90   50° 50.90   50° 50.90   50° 50.90   50° 50.90   50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50   50° 50° 50° 50   50° 50° 50° 50° 50° 50° 50° 50° 50° 50°			
Acamar 315°11.36 -40°11.77 Menkar 314°5.61 4°11.53 Mirfak 308°27.58 49°56.96 Aldebaran 290°39.17 16°33.69 Rigel 281°3.55 -8°10.14 Capella 280°21.39 46°1.30 Bellatrix 278°22.52 6°22.48 Elnath 278°1.44 28°37.71 Alnilam 275°37.41 -1°10.99 Betelgeuse 270°51.76 7°24.81 Canopus 263°52.58 -52°42.25 Sirius 258°26.07 -16°44.88 Adhara 255°5.79 -29°0.19 Procyon 244°5.01 5°9.66 Pollux 243°17.03 27°57.89 Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 211°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Betelgeuse 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Carcux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -11°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Altair 61°59.16 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Latir 75°46.83 -26°15.88 Altair 61°59.16 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 51°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°0.066  Aug 11 Mon SHA Mer.pass Saturn 35°55.83 02:41  Aug 12 Tue SHA Mars 176°51.57 14:48 Jupiter 255°0.50 09:38 Mars 176°51.25 7 14:47 Jupiter 255°5.83 02:45  Aug 13 Wed SHA Mer.pass Saturn 35°55.83 02:41			
Menkar   314°5.61   4°11.53   Miríak   308°27.58   49°56.96   Aldebaran   290°31.7   16°33.69   Rigel   281°3.55   -8°10.14   Capella   280°21.39   46°1.30   Bellatrix   278°1.44   28°37.71   Alnilam   275°37.41   -1°10.99   Betelgeuse   270°51.76   7°24.81   Canopus   263°52.58   -52°42.25   Sirius   258°26.07   -16°44.88   Adhara   255°5.79   -29°0.19   Procyon   244°50.61   5°9.66   Pollux   243°17.33   27°57.89   Avior   234°15.19   -59°35.33   Suhail   222°46.41   -43°32.06   Miaplacidus   221°39.17   -69°49.26   Alphard   217°47.59   -8°46.08   Regulus   207°34.22   11°50.63   Dubhe   193°40.55   61°36.94   216°43.31   -17°41.05   Acrux   173°0.05   -63°14.66   Gacrux   171°51.50   -57°15.58   Alioth   166°12.81   55°49.49   Spica   158°21.92   -11°17.69   Alkaid   152°51.76   49°11.37   Hadar   148°35.50   -60°30.03   Menkent   147°57.15   -36°29.89   Atria   136°55.49   -16°8.92   Alphecca   126°3.27   26°37.89   Atria   107°8.61   -60°4.64   Sabik   102°2.03   -15°45.40   Shaula   96°9.44   -37°7.42   Rasalhague   95°57.88   12°32.60   Eltanin   90°41.60   51°29.31   Kaus Aust.   83°31.55   -34°22.38   Altria   107°8.61   -69°4.64   Sabik   102°2.03   -15°45.40   Shaula   96°9.44   -37°7.42   -69°4.64	Polaris		89°22.01
Mirfak Aldebaran 290° 39.17 16° 33.69 Rigel 281°3.55 -8° 10.14 Capella 280° 21.39 46° 1.30 Bellatrix 278° 22.52 6° 22.48 Elnath 278° 1.44 28° 37.71 Alnilam 275° 37.41 -1° 10.99 Betelgeuse 270° 51.76 7° 24.81 Canopus 263° 52.58 -52° 42.25 Sirius 258° 26.07 -16° 44.88 Adhara 255° 5.79 -29° 0.19 Procyon 244° 50.61 5° 9.66 Pollux 243° 17.03 27° 57.89 Avior 234° 15.19 -59° 35.33 Suhail 222° 46.41 -43° 32.06 Miaplacidus 221° 39.17 -69° 49.26 Alphard 217° 47.59 -8° 46.08 Regulus 207° 34.22 11° 50.63 Dubhe 193° 40.95 61° 36.94 Denebola 182° 24.69 14° 25.86 Gienah 175° 43.31 -17° 41.05 Acrux 173° 0.05 -63° 14.66 Gacrux 171° 51.50 -63° 14.66 Gacrux 171° 51.50 -63° 14.66 Gacrux 173° 0.05 -63° 14.60 Alkaid 152° 51.76 49° 11.37 Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Kochab 137° 19.85 74° 3.26 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 22.38 Vega 80° 32.56 38° 48.59 Nunki 75° 46.33 -26° 15.88 Altair 61° 59.16 8° 56.26 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 9° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 55° 5.57 -44 O9:37 Fomalhaut 55° 5.57 -50 Saturn 35° 55.84 09:49  Aug 12 Tue SHA Mer.pass Venus 256° 23.26 09:36 Mars 176° 21.25 14:47 Jupiter 255° 5.59 09:30 Mars 176° 21.25 14:47 Jupiter 255° 5.83 02:41  Aug 13 Wed SHA Mer.pass Nars 176° 21.25 14:47 Jupiter 254° 34.06 09:34 Saturn 357° 55.83 02:41	Acamar	315°11.36	-40°11.77
Aldebaran   290° 39.17   16° 33.69   Rigel   281° 3.55   -8° 10.14   280° 21.39   46° 1.30   Bellatrix   278° 1.44   28° 37.71   -1° 10.99   Betelgeuse   270° 51.76   7° 24.81   Canopus   263° 52.58   -52° 42.25   Sirius   258° 26.07   -16° 44.88   Adhara   255° 5.79   -29° 0.19   Procyon   244° 50.61   5° 9.66   Pollux   243° 17.03   27° 57.89   Avior   234° 15.19   -59° 35.33   Suhail   222° 46.41   -43° 32.06   Alphard   217° 47.59   -8° 46.08   Regulus   207° 34.22   11° 50.63   Dubhe   193° 40.95   61° 36.94   Denebola   Rofe 24.69   14° 25.86   Gienah   175° 43.31   -17° 41.05   Acrux   173° 0.05   -63° 14.66   Gacrux   171° 51.50   -57° 15.58   Alioth   166° 12.81   55° 49.49   Spica   158° 21.92   -11° 17.69   Alkaid   152° 51.76   49° 11.37   Hadar   148° 35.50   -60° 30.03   Menkent   147° 57.15   -36° 29.89   Arcturus   145° 47.52   19° 3.09   Rigil Kent   139° 39.74   -60° 56.72   Kochab   137° 19.85   74° 3.26   Zuben'ubi   136° 55.49   -16° 8.92   Alphecca   126° 3.27   26° 37.89   Antares   112° 15.09   -26° 29.39   Atria   107° 8.61   -69° 4.64   Sabik   102° 2.03   -15° 45.40   Shaula   96° 9.44   -37° 7.42   Rasalhague   95° 57.88   12° 32.60   Eltanin   90° 41.60   51° 29.31   Kaus Aust   83° 31.55   -34° 22.38   Altair   61° 59.16   8° 50.26   Peacock   53° 4.34   -56° 39.13   Deneb   49° 25.02   45° 22.38   Enif   33° 37.98   9° 59.64   Al Na'ir   27° 31.80   46° 50.07   Fomalhaut   15° 13.62   -29° 29.01   Scheat   13° 44.40   28° 13.34   Markab   13° 29.11   15° 20.66   Alug 11 Mon   SHA   Mer.pass   45° 47.25   09:36   Mars   177° 29.81   14:50   09:34   Mars   176° 51.37   09:34   14:50   09:34   35° 58.38   02:41   Alughter   255° 0.50   09:40   35° 55.84   02:45   Alughter   255° 0.50   09:40   35° 55.84   02:45   Alughter   256° 33.26   09:36   14:40   35° 55.34   02:45   Alughter   256° 23.26   09:36   14:40   35° 55.34   02:45   Alughter   256° 23.26   09:36   14:40   35° 55.34   02:45   Alughter   256° 33.35   02:45   Alughter   256° 33.35   02:41   Alughter   256° 33.35   02:41	Menkar	314°5.61	$4^{\circ}11.53$
Aldebaran   290° 39.17   16° 33.69   Rigel   281° 3.55   -8° 10.14   280° 21.39   46° 1.30   Bellatrix   278° 1.44   28° 37.71   -1° 10.99   Betelgeuse   270° 51.76   7° 24.81   Canopus   263° 52.58   -52° 42.25   Sirius   258° 26.07   -16° 44.88   Adhara   255° 5.79   -29° 0.19   Procyon   244° 50.61   5° 9.66   Pollux   243° 17.03   27° 57.89   Avior   234° 15.19   -59° 35.33   Suhail   222° 46.41   -43° 32.06   Alphard   217° 47.59   -8° 46.08   Regulus   207° 34.22   11° 50.63   Dubhe   193° 40.95   61° 36.94   Denebola   Rofe 24.69   14° 25.86   Gienah   175° 43.31   -17° 41.05   Acrux   173° 0.05   -63° 14.66   Gacrux   171° 51.50   -57° 15.58   Alioth   166° 12.81   55° 49.49   Spica   158° 21.92   -11° 17.69   Alkaid   152° 51.76   49° 11.37   Hadar   148° 35.50   -60° 30.03   Menkent   147° 57.15   -36° 29.89   Arcturus   145° 47.52   19° 3.09   Rigil Kent   139° 39.74   -60° 56.72   Kochab   137° 19.85   74° 3.26   Zuben'ubi   136° 55.49   -16° 8.92   Alphecca   126° 3.27   26° 37.89   Antares   112° 15.09   -26° 29.39   Atria   107° 8.61   -69° 4.64   Sabik   102° 2.03   -15° 45.40   Shaula   96° 9.44   -37° 7.42   Rasalhague   95° 57.88   12° 32.60   Eltanin   90° 41.60   51° 29.31   Kaus Aust   83° 31.55   -34° 22.38   Altair   61° 59.16   8° 50.26   Peacock   53° 4.34   -56° 39.13   Deneb   49° 25.02   45° 22.38   Enif   33° 37.98   9° 59.64   Al Na'ir   27° 31.80   46° 50.07   Fomalhaut   15° 13.62   -29° 29.01   Scheat   13° 44.40   28° 13.34   Markab   13° 29.11   15° 20.66   Alug 11 Mon   SHA   Mer.pass   45° 47.25   09:36   Mars   177° 29.81   14:50   09:34   Mars   176° 51.37   09:34   14:50   09:34   35° 58.38   02:41   Alughter   255° 0.50   09:40   35° 55.84   02:45   Alughter   255° 0.50   09:40   35° 55.84   02:45   Alughter   256° 33.26   09:36   14:40   35° 55.34   02:45   Alughter   256° 23.26   09:36   14:40   35° 55.34   02:45   Alughter   256° 23.26   09:36   14:40   35° 55.34   02:45   Alughter   256° 33.35   02:45   Alughter   256° 33.35   02:41   Alughter   256° 33.35   02:41	Mirfak	308°27.58	49°56.96
Rigel 281°3.55 -8°10.14 Capella 280°21.39 46°1.30 Bellatrix 278°22.52 6°22.48 Elnath 278°1.44 28°37.71 Alnilam 275°37.41 -1°10.99 Betelgeuse 270°51.76 7°24.81 Canopus 263°52.58 -52°42.25 Sirius 258°26.07 -16°44.88 Adhara 255°5.79 -29°0.19 Procyon 244°50.61 5°9.66 Pollux 243°17.03 27°57.89 Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 221°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -11°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 15°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°53.37 00:49  Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:49 Jupiter 255°0.50 09:40 Saturn 357°53.37 00:49			
Capella         280° 21.39         46° 1.30           Bellatrix         278° 22.52         6° 22.48           Elnath         278° 1.44         28° 37.71           Alnilam         270° 51.76         7° 24.81           Canopus         263° 52.58         -52° 42.25           Sirius         258° 26.07         -16° 44.88           Adhara         255° 5.79         -29° 0.19           Procyon         244° 50.61         5° 9.66           Pollux         243° 17.33         -75° 89           Avior         234° 15.19         -59° 35.33           Suhail         222° 46.41         -43° 32.06           Miaplacidus         221° 39.17         -69° 49.26           Alphard         217° 47.59         -8° 46.08           Regulus         207° 34.22         11° 50.63           Dubhe         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         17° 41.05           Acrux         173° 0.05         -63° 14.66           Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         218° 33.9         49°			
Bellatrix         278°2.52         6°22.48           Elnath         278°1.44         28°37.71           Alniilam         275°37.41         -1°10.99           Betelgeuse         270°51.76         7°24.81           Canopus         263°52.58         -52°42.25           Sirius         258°26.07         -16°4.48           Adhara         255°5.79         -29°0.19           Procyon         244°50.61         5°9.66           Pollux         233°17.03         27°57.89           Avior         234°17.03         27°57.89           Avior         234°17.59         -59°35.33           Subalial         222°46.41         -43°32.06           Mlaplacidus         221°39.17         -69°49.26           Alphard         217°47.59         -8°46.08           Regulus         207°34.22         11°50.63           Dubhe         193°40.95         61°36.94           Denebola         182°24.99         11°50.63           Accux         173°0.05         -63°14.66           Gacrux         171°51.50         -57°15.58           Aliaid         152°51.56         49°11.37           Hadra         148°35.50         -60°30.03			
Elnath			
Alnilam 275° 37.41 -1° 10.99 Betelgeuse 270° 51.76 7° 24.81 Canopus 263° 52.58 -52° 42.25 Sirirus 258° 26.07 -16° 44.88 Adhara 255° 5.79 -29° 0.19 Procyon 244° 50.61 5° 9.66 Pollux 243° 17.03 27° 57.89 Avior 234° 15.19 -59° 35.33 Suhail 222° 46.41 -43° 32.06 Miaplacidus 211° 39.17 -69° 49.26 Alphard 217° 47.59 -8° 46.08 Regulus 207° 34.22 11° 50.63 Dubhe 193° 40.95 61° 36.94 Denebola 182° 24.69 14° 25.86 Gienah 175° 43.31 -17° 41.05 Acrux 173° 0.05 -63° 14.66 Gacrux 171° 51.50 -57° 15.58 Alioth 166° 12.81 55° 49.49 Spica 158° 21.92 -11' 17.69 Alkaid 152° 51.76 49° 11.37 Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 22.38 Vega 80° 32.56 38° 48.59 Nunki 75° 46.83 -26° 15.88 Altair 61° 59.16 5° 29.21 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66  Aug 11 Mon SHA Mer.pass Venus 256° 23.26 09:36 Mars 176° 55.57 14.48 Jupiter 255° 0.50 09:40 Saturn 357° 53.37 02:49  Aug 12 Tue SHA Mer.pass Mars 176° 55.57 14:48 Jupiter 255° 0.50 09:40 Saturn 357° 55.84 02:45  Aug 13 Wed SHA Mer.pass Mars 176° 55.57 14:45 Jupiter 255° 5.58 09:40 Saturn 357° 55.83 02:41			
Betelgeuse         270° 51.76         7° 24.81           Canopus         263° 52.58         -52° 42.25           Sirius         258° 26.07         -16° 44.88           Adhara         255° 5.79         -29° 0.19           Procyon         244° 50.61         5° 9.66           Pollux         243° 17.03         27° 57.89           Avior         234° 15.19         -59° 35.33           Suhail         222° 46.41         -43° 32.06           Miaplacidus         221° 39.17         -69° 49.26           Alphard         217° 47.59         -8° 46.08           Regulus         207° 34.22         11° 50.63           Dubhe         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         -17° 41.05           Acrux         173° 0.05         -63° 14.66           Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15			
Canopus 263° 52.58 -52° 42.25 Sirius 258° 26.07 -16° 44.88 Adhara 255° 5.79 -29° 0.19 Procyon 244° 50.61 5° 9.66 Pollux 243° 17.03 27° 57.89 Avior 234° 15.19 -59° 35.33 Suhail 222° 46.41 -43° 32.06 Miaplacidus 210° 37.47.59 -8° 46.08 Regulus 207° 34.22 11° 50.63 Dubhe 193° 40.95 61° 36.94 Denebola 182° 24.69 14° 258.6 Gienah 175° 43.31 -17° 41.05 Acrux 173° 0.05 -63° 14.66 Gacrux 171° 51.50 -57° 15.58 Alioth 166° 12.81 55° 49.49 Spica 158° 21.92 -11° 17.69 Alkaid 152° 51.76 49° 11.37 Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Kochab 137° 19.85 74° 32.6 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 22.38 Vega 80° 32.56 38° 48.59 Nunki 75° 46.83 -26° 15.88 Altair 61° 59.16 8° 56.26 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 9° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.01 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66  Aug 11 Mon SHA Mer.pass Venus 256° 23.26 09.36 Mars 177° 29.81 14.50 Jupiter 255° 0.50 09.40 Saturn 357° 53.37 002.49  Aug 12 Tue SHA Wer.pass Mars 176° 55.57 14.48 Jupiter 255° 0.50 09.36 Mars 177° 29.81 14.50 Jupiter 255° 0.50 09.40 Saturn 357° 53.37 002.49  Aug 13 Wed SHA Mer.pass Venus 255° 7.84 09.37 Nars 176° 55.57 14.48 Jupiter 255° 0.50 09.34 Saturn 357° 55.84 002.45  Aug 13 Wed SHA Mer.pass Mars 176° 55.57 14.48 Jupiter 255° 0.50 09.30 Mars 176° 55.57 14.48 Jupiter 254° 47.25 09.37 Saturn 357° 55.84 002.45	Alnilam		
Sirius         258° 26.07         -16° 44.88           Adhara         255° 5.79         -29° 0.19           Procyon         244° 50.61         5° 9.66           Pollux         243° 17.03         27° 57.89           Avior         234° 15.19         -59° 35.33           Suhail         222° 46.41         -43° 32.06           Miaplacidus         217° 47.59         -8° 46.08           Regulus         207° 34.22         11° 50.63           Dubhe         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         -17° 41.05           Acrux         173° 0.05         -63° 14.66           Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15         -36° 29.89           Arcturus         145° 47.52         19° 3.09           Rigil Kent.         139° 39.74         -60° 56.72           Kochab         137° 19.85			
Adhara	Canopus	263°52.58	-52°42.25
Procyon 244°50.61 5°9.66 Pollux 243°17.03 27°57.89 Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 221°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -11°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.33 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 255°7.44 Jupiter 255°0.50 09.40  Aug 12 Tue SHA Venus 255°7.84 14:50 Jupiter 255°0.50 09.40  Aug 13 Wed SHA Mer.pass Venus 255°7.84 09:37 Mars 176°55.57 14:48 Jupiter 255°5.83 02:41  Aug 13 Wed SHA Venus 255°5.84 02:45  Aug 13 Wed SHA Venus 253°51.59 09:38 Mars 176°51.25 11:47 Jupiter 254°34.06 09:34 Aug 13 Wed SHA Venus 253°51.59 09:38 Mars 176°51.25 11:47 Jupiter 254°34.06 09:34 Aug 13 Wed SHA Venus 253°51.89 09:38 Mars 176°51.59.38 02:49		258°26.07	$-16^{\circ}44.88$
Procyon 244°50.61 5°9.66 Pollux 243°17.03 27°57.89 Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 221°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -11°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.33 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 255°7.44 Jupiter 255°0.50 09.40  Aug 12 Tue SHA Venus 255°7.84 14:50 Jupiter 255°0.50 09.40  Aug 13 Wed SHA Mer.pass Venus 255°7.84 09:37 Mars 176°55.57 14:48 Jupiter 255°5.83 02:41  Aug 13 Wed SHA Venus 255°5.84 02:45  Aug 13 Wed SHA Venus 253°51.59 09:38 Mars 176°51.25 11:47 Jupiter 254°34.06 09:34 Aug 13 Wed SHA Venus 253°51.59 09:38 Mars 176°51.25 11:47 Jupiter 254°34.06 09:34 Aug 13 Wed SHA Venus 253°51.89 09:38 Mars 176°51.59.38 02:49	Adhara	255°5.79	-29°0.19
Pollux 243°17.03 27°57.89 Avior 234°15.19 59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 221°3.77 6-69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -111°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 133°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°51.6 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 256°7.48 09:37 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°53.37 00:249  Aug 12 Tue SHA Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°55.84 00:45  Aug 13 Wed SHA Mer.pass Venus 255°7.83 00:41  Horizontal parallax Venus 176°21.25 14:47 Jupiter 254°34.06 09:34 Saturn 357°58.38 00:41			
Avior 234°15.19 -59°35.33 Suhail 222°46.41 -43°32.06 Miaplacidus 221°39.17 -69°49.26 Alphard 217°47.59 -8°46.08 Regulus 207°34.22 11°50.63 Dubhe 193°40.95 61°36.94 Denebola 182°24.69 14°25.86 Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -111°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°3974 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°51.6 3°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Lenif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 256°23.26 09:36 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°53.37 02:49  Aug 12 Tue SHA Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 253°51.59 09:38 Mars 176°55.57 14:48 Jupiter 255°5.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°55.84 02:45			
Suhail         222° 46.41         -43° 32.06           Miaplacidus         221° 39.17         -69° 49.26           Alphard         217° 47.59         -8° 46.08           Regulus         207° 34.22         11° 50.63           Dubhe         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         -17° 41.05           Acrux         173° 0.05         -63° 14.66           Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15         -36° 29.89           Arcturus         145° 47.52         19° 3.09           Rigil Kent.         139° 39.74         -60° 56.72           Kochab         137° 19.85         -46° 32.7           Actau         130° 39.74         -60° 56.72           Kochab         130° 55.49         -16° 8.92           Alphecca         126° 3.27         26° 37.89           Antare         112° 15.09			
Miaplacidus         221° 39.17         -69° 49.26           Alphard         217° 47.59         -8° 46.08           Regulus         207° 34.22         11° 50.63           Dubhe         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         -17° 41.05           Acrux         173° 0.05         -63° 14.66           Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15         -36° 29.89           Arcturus         145° 47.52         19° 3.09           Rigil Kent.         139° 39.74         -60° 56.72           Kochab         137° 19.85         -46° 20.30           Alphecca         126° 3.27         26° 37.89           Alphecca         112° 15.09         -26° 29.39           Atria         107° 8.61         -69° 4.64           Sabik         102° 2.03         -15° 45.40           Shaula         96° 9.44			
Alphard			
Regulus         207° 34.22         11° 50.63           Dubhe         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         -17° 41.05           Acrux         173° 0.05         -63° 14.66           Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15         -36° 29.89           Arcturus         145° 47.52         19° 3.09           Rigil Kent         139° 39.74         -60° 56.72           Kochab         137° 19.85         74° 3.26           Zuben'ubi         136° 55.49         -16° 89.2           Alphecca         126° 3.27         26° 37.89           Alphecca         126° 3.27         26° 37.89           Antares         1102° 15.09         -26° 29.39           Atria         107° 8.61         -69° 4.64           Sabik         102° 2.03         -15° 45.40           Shaula         96° 9.44 <t< td=""><td></td><td></td><td></td></t<>			
Dubhe Denebola         193° 40.95         61° 36.94           Denebola         182° 24.69         14° 25.86           Gienah         175° 43.31         -17° 41.05           Acrux         173° 0.55         -63° 14.66           Gacrux         171° 51.55         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15         -36° 29.89           Arcturus         145° 47.52         19° 3.09           Rigil Kent.         139° 39.74         -60° 56.72           Kochab         137° 19.85         74° 3.26           Zuben'ubi         136° 55.49         -16° 8.92           Alphecca         126° 3.27         26° 37.89           Alphecca         126° 3.27         26° 37.89           Alphecca         126° 3.27         26° 37.89           Alphecca         12° 15.09         -26° 29.39           Atria         102° 2.03         -15° 45.40           Shaula         96° 9.44         -37° 74.2           Rasalhague         95° 57.88<			
Denebola   182° 24.69   14° 25.86	Regulus		
Denebola   182° 24.69   14° 25.86	_	193°40.95	61°36.94
Gienah 175°43.31 -17°41.05 Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.92 -11°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 256°23.26 09:36 Mars 177°29.81 14:50 Jupiter 255°0.50 09:40 Saturn 357°55.34 09:37 Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 255°0.50 09:40 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 255°7.44 09:37 Aug 12 Tue SHA Mer.pass Venus 255°5.84 02:45  Aug 13 Wed SHA Mer.pass Venus 255°5.84 02:45  Aug 13 Wed SHA Mer.pass Venus 253°51.59 09:38 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45			
Acrux 173°0.05 -63°14.66 Gacrux 171°51.50 -57°15.58 Alioth 166°12.81 55°49.49 Spica 158°21.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.15 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon Yenus 256°23.26 09:36 Mars 177°29.81 14:50 Jupiter 255°0.50 09:40 Saturn 357°53.37 002:49  Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Mars 176°51.59 09:38 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Mars 176°51.59 09:38 Mars 176°21.25 14:47 Jupiter 254°47.25 09:37 Saturn 357°58.38 02:41			
Gacrux         171° 51.50         -57° 15.58           Alioth         166° 12.81         55° 49.49           Spica         158° 21.92         -11° 17.69           Alkaid         152° 51.76         49° 11.37           Hadar         148° 35.50         -60° 30.03           Menkent         147° 57.15         -36° 29.89           Arcturus         145° 47.52         19° 3.09           Rigil Kent.         139° 39.74         -60° 56.72           Kochab         137° 19.85         74° 3.26           Zuben'ubi         136° 55.49         -16° 8.92           Alphecca         126° 3.27         26° 37.89           Antares         112° 15.09         -26° 29.39           Atria         107° 8.61         -69° 4.64           Sabik         102° 2.03         -15° 45.40           Shaula         96° 9.44         -37° 7.42           Rasalhague         95° 57.88         12° 32.60           Eltanin         90° 41.60         51° 29.31           Kaus Aust.         83° 31.55         -34° 22.38           Altair         61° 59.16         8° 56.26           Peacock         53° 43.44         -56° 39.13           Deneb         49° 25.02			
Alioth 166°12.81 55°49.49 Spica 158°21.92 -11°17.69 Alkaid 152°51.76 49°11.37 Hadar 148°35.50 -60°30.03 Menkent 147°57.51 -36°29.89 Arcturus 145°47.52 19°3.09 Rigil Kent. 139°39.74 -60°56.72 Kochab 137°19.85 74°3.26 Zuben'ubi 136°55.49 -16°8.92 Alphecca 126°3.27 26°37.89 Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SH Mer.pass Venus 255°7.44 09:37 Mars 177°29.81 14:50 Jupiter 255°0.50 09:40 Saturn 357°53.37 02:49  Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 255°5.59 19:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 255°5.84 02:45			
Spica         158°21.92         -11°17.69           Alkaid         152°51.76         49°11.37           Hadar         148°35.50         -60°30.03           Menkent         147°57.15         -36°29.89           Arcturus         145°47.52         19°3.09           Rigil Kent.         139°39.74         -60°56.72           Kochab         137°19.85         74°3.26           Zuben'ubi         136°55.49         -16°8.92           Alphecca         126°3.27         26°37.89           Antares         112°15.09         -26°29.39           Atria         107°8.61         -69°4.64           Sabik         102°2.03         -15°45.40           Shaula         96°9.44         -37°7.42           Rasalhague         95°57.88         12°32.60           Eltanin         90°41.60         51°29.31           Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.33         -26°15.88           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38 <t< td=""><td>l</td><td></td><td></td></t<>	l		
Alkaid 152° 51.76 49° 11.37 Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Kochab 137° 19.85 74° 3.26 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 22.38 Vega 80° 32.56 38° 48.59 Nunki 75° 46.33 -26° 15.88 Altair 61° 59.16 8° 56.26 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 9° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.01 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66 Aug 11 Mon SHA Mer.pass Venus 255° 7.44 09:37 Mars 176° 55.57 14.48 Jupiter 255° 0.50 09:40 Saturn 357° 55.84 02:45 Aug 13 Wed Shaturn 357° 55.84 02:45 Aug 13 Wed Shaturn 255° 5.84 02:45 Aug 13 Wed Shaturn 255° 5.83 02:41 Horizontal parallax Venus 537° 58.38 02:41 Horizontal parallax Venus 176° 21.25 14:47 Jupiter 254° 34.06 09:34 54.06 09:34 550 58.38 02:41 Horizontal parallax Venus 537° 58.38 02:41	l .		
Hadar 148° 35.50 -60° 30.03 Menkent 147° 57.15 -36° 29.89 Arcturus 145° 47.52 19° 3.09 Rigil Kent. 130° 37.4 -60° 56.72 Kochab 137° 19.85 74° 3.26 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 22.38 Vega 80° 32.56 38° 48.59 Nunki 75° 46.83 -26° 15.88 Altair 61° 59.16 8° 56.26 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 9° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.01 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66 Mars 177° 29.81 14.50 Mars 176° 55.57 14.48 Jupiter 255° 0.50 09:40 Saturn 357° 53.37 02:49 Aug 12 Tue 255° 7.44 09:37 Mars 176° 55.57 14:448 Jupiter 255° 5.50 09:40 Saturn 357° 55.84 02:45 Aug 13 Wenus 255° 7.84 09:37 Saturn 255° 5.84 02:45 Aug 13 Wenus 255° 5.83 02:41 Aug 14 Aug 14 Aug 150 09:34 Aug 15 Aug 16° 21.25 14:47 Aug 150 09:34 Aug 150 09:34 Aug 176° 5.83 02:41 Aug 150 09:34 Aug 176° 5.83 02:41 Aug 150 09:34 Aug 150			
Menkent         147°57.15         -36°29.89           Arcturus         145°47.52         19°3.09           Rigil Kent.         139°39.74         -60°56.72           Kochab         137°19.85         74°3.26           Zuben'ubi         136°55.49         -16°8.92           Alphecca         126°3.27         26°37.89           Antares         112°15.09         -26°29.39           Atria         107°8.61         -69°4.64           Sabik         102°2.03         -15°45.40           Shaula         96°9.44         -37°7.42           Rasalhague         95°57.88         12°32.60           Eltanin         90°41.60         51°29.31           Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.83         -26°15.88           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°13.62         -29°29.01 <t< th=""><th>Alkaid</th><th></th><th></th></t<>	Alkaid		
Arcturus 145° 47.52 19° 3.09 Rigil Kent. 139° 39.74 -60° 56.72 Kochab 137° 19.85 74° 3.26 Zuben'ubi 136° 55.49 -16° 8.92 Alphecca 126° 3.27 26° 37.89 Antares 112° 15.09 -26° 29.39 Atria 107° 8.61 -69° 4.64 Sabik 102° 2.03 -15° 45.40 Shaula 96° 9.44 -37° 7.42 Rasalhague 95° 57.88 12° 32.60 Eltanin 90° 41.60 51° 29.31 Kaus Aust. 83° 31.55 -34° 22.38 Altair 61° 59.16 8° 56.26 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 95° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.01 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66  Aug 11 Mon Yenus 256° 23.26 Mars 177° 29.81 14:50 Jupiter 255° 5.37 Saturn 357° 55.37 Saturn 357° 55.84  Aug 12 Tue SHA Mer.pass Venus 255° 7.44 09:37 Mars 176° 55.57 14:48 Jupiter 254° 47.25 09:37 Saturn 357° 55.84  Aug 13 Wed SHA Mer.pass Venus 253° 51.59 09:38 Mars 176° 25.55 14:48 Jupiter 254° 47.25 09:37 Saturn 357° 55.84  Mer.pass Mars 176° 25.55 14:48 Jupiter 254° 47.25 09:37 Saturn 357° 55.84  Mer.pass Aug 13 Wed SHA Mer.pass Venus 253° 51.59 09:38 Mars 176° 25.25 14:47 Jupiter 254° 47.25 09:37 Saturn 357° 58.38 02:41  Horizontal parallax Venus 150° 58.38 02:41	Hadar	148°35.50	-60°30.03
Rigil Kent.         139°39.74         -60°56.72           Kochab         137°19.85         74°3.26           Zuben'ubi         136°55.49         -16°8.92           Alphecca         126°3.27         26°37.89           Antares         110°8.61         -69°4.64           Sabik         102°2.03         -15°45.40           Shaula         96°9.44         -37°7.42           Rasalhague         95°57.88         12°32.60           Eltanin         90°41.60         51°29.31           Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.83         -26°15.88           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°13.62         -29°29.01           Scheat         13°44.40         28°13.34           Markab         13°29.11         15°20.66           Aug 11 Mon         SHA         Mer.pass           Venus	Menkent	147°57.15	-36°29.89
Kochab         137° 19.85         74° 3.26           Zuben'ubi         136° 55.49         -16° 8.92           Alphecca         126° 3.27         26° 37.89           Antares         112° 15.09         -26° 29.39           Atria         107° 8.61         -69° 4.64           Sabik         102° 2.03         -15° 45.40           Shaula         96° 9.44         -37° 7.42           Rasalhague         95° 57.88         12° 32.60           Eltanin         90° 41.60         51° 29.31           Kaus Aust.         83° 31.55         -34° 22.38           Vega         80° 32.56         38° 48.59           Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         31° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass	Arcturus	145°47.52	19°3.09
Kochab         137° 19.85         74° 3.26           Zuben'ubi         136° 55.49         -16° 8.92           Alphecca         126° 3.27         26° 37.89           Antares         112° 15.09         -26° 29.39           Atria         107° 8.61         -69° 4.64           Sabik         102° 2.03         -15° 45.40           Shaula         96° 9.44         -37° 7.42           Rasalhague         95° 57.88         12° 32.60           Eltanin         90° 41.60         51° 29.31           Kaus Aust.         83° 31.55         -34° 22.38           Vega         80° 32.56         38° 48.59           Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         31° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass			-60°56.72
Zuben'ubi         136°55.49         -16°8.92           Alphecca         126°3.27         26°37.89           Antares         112°15.09         -26°29.39           Atria         107°8.61         -69°4.64           Sabik         102°2.03         -15°45.40           Shaula         96°9.44         -37°7.42           Rasalhague         95°57.88         12°32.60           Eltanin         90°41.60         51°29.31           Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.33         -26°15.88           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°13.62         -29°29.01           Scheat         13°44.40         28°13.34           Mars         177°29.81         14:50           Jupiter         256°23.26         09:36           Mars         177°29.81         14:50           Jupiter			
Alphecca	l .		
Antares 112°15.09 -26°29.39 Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°57.88 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 256°23.26 09:36 Mars 177°29.81 14:50 Jupiter 255°0.50 09:40 Saturn 357°53.37 02:49  Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 253°51.59 09:38 Mars 176°21.25 14:47 Jupiter 254°47.25 09:37 Saturn 357°58.38 02:41  Horizontal parallax Venus 176°21.25 14:47			
Atria 107°8.61 -69°4.64 Sabik 102°2.03 -15°45.40 Shaula 96°9.44 -37°7.42 Rasalhague 95°5.78 12°32.60 Eltanin 90°41.60 51°29.31 Kaus Aust. 83°31.55 -34°22.38 Vega 80°32.56 38°48.59 Nunki 75°46.83 -26°15.88 Altair 61°59.16 8°56.26 Peacock 53°4.34 -56°39.13 Deneb 49°25.02 45°22.38 Enif 33°37.98 9°59.64 Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon SHA Mer.pass Venus 256°23.26 09:36 Mars 177°29.81 14:50 Jupiter 255°0.50 09:40 Saturn 357°53.37 00:49  Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 253°51.59 09:38 Mars 176°21.25 14:47 Jupiter 254°47.25 09:37 Saturn 357°58.38 02:41  Horizontal parallax Venus 150°2.125			
Sabik         102°2.03         -15°45.40           Shaula         96°9.44         -37°7.42           Rasalhague         95°57.88         12°32.60           Eltanin         90°41.60         51°29.31           Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.83         -26°15.88           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°13.62         -29°29.01           Scheat         13°44.40         28°13.34           Markab         13°29.11         15°20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256°23.26         09:36           Mars         177°29.81         14:50           Jupiter         255°0.50         09:40           Saturn         255°1.44         09:37           Mars         176°55.57         14:48           Jupiter         256°25.74<			
Shaula         96°9.44         -37°7.42           Rasalhague         95°57.88         12°32.60           Eltanin         90°41.60         51°29.31           Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.83         -26°15.86           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°1.62         -29°29.01           Scheat         13°44.40         28°13.34           Markab         13°29.11         15°20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256°23.26         09:36           Mars         177°29.81         14:50           Jupiter         255°0.50         09:40           Saturn         357°53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255°7.44         09:37           Mars         176°55.57			
Rasalhague         95° 57.88         12° 32.60           Eltanin         90° 41.60         51° 29.31           Kaus Aust.         83° 31.55         -34° 22.38           Vega         80° 32.56         38° 48.59           Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         13° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256° 23.26         09:36           Jupiter         255° 0.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Mars         176° 55.57         14:48           Jupiter         255° 7.44         09:37           Satu			
Eltanin         90° 41.60         51° 29.31           Kaus Aust.         83° 31.55         -34° 22.38           Vega         80° 32.56         38° 48.59           Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         13° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256° 23.26         09:36           Mars         177° 29.81         14:50           Jupiter         255° 0.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Jupiter         255° 7.44         09:37           Saturn         357° 55.84         02:45           Aug 13 Wed<	Shaula		
Kaus Aust.         83°31.55         -34°22.38           Vega         80°32.56         38°48.59           Nunki         75°46.83         -26°15.88           Altair         61°59.16         8°56.26           Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°13.62         -29°29.01           Scheat         13°44.40         28°13.34           Markab         13°29.11         15°20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256°23.26         09:36           Mars         177°29.81         14:50           Jupiter         255°0.50         09:40           Saturn         357°53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255°7.44         09:37           Mars         176°55.57         14:48           Jupiter         254°47.25         09:37           Saturn         357°55.84         02:45           Aug 13 Wed         SHA         <	Dacalhague	95°57.88	
Vega         80° 32.56         38° 48.59           Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         13° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256° 23.26         09:36           Mars         177° 29.81         14:50           Jupiter         255° 0.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Mars         176° 55.57         14:48           Jupiter         254° 47.25         09:37           Saturn         357° 55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         2	Nasainague		
Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         13° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256° 23.26         09:36           Mars         177° 29.81         14:50           Jupiter         255° 5.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Jupiter         256° 47.25         09:37           Saturn         357° 55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253° 51.59         09:38           Mars         176° 21.25         14:47           Jupiter         2		90°41.60	51°29.31
Nunki         75° 46.83         -26° 15.88           Altair         61° 59.16         8° 56.26           Peacock         53° 4.34         -56° 39.13           Deneb         49° 25.02         45° 22.38           Enif         33° 37.98         9° 59.64           Al Na'ir         27° 31.80         -46° 50.07           Fomalhaut         15° 13.62         -29° 29.01           Scheat         13° 44.40         28° 13.34           Markab         13° 29.11         15° 20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256° 23.26         09:36           Mars         177° 29.81         14:50           Jupiter         255° 5.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Jupiter         256° 47.25         09:37           Saturn         357° 55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253° 51.59         09:38           Mars         176° 21.25         14:47           Jupiter         2	Eltanin		
Altair 61° 59.16 8° 56.26 Peacock 53° 4.34 -56° 39.13 Deneb 49° 25.02 45° 22.38 Enif 33° 37.98 9° 59.64 Al Na'ir 27° 31.80 -46° 50.07 Fomalhaut 15° 13.62 -29° 29.01 Scheat 13° 44.40 28° 13.34 Markab 13° 29.11 15° 20.66  Aug 11 Mon SHA Mer.pass Venus 256° 23.26 09:36 Mars 177° 29.81 14:50 Jupiter 255° 0.50 09:40 Saturn 357° 53.37 02:49  Aug 12 Tue SHA Mer.pass Venus 255° 7.44 09:37 Mars 176° 55.57 14:48 Jupiter 254° 47.25 09:37 Saturn 357° 55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 253° 51.59 09:38 Mars 176° 21.25 14:47 Jupiter 254° 34.06 09:34 Saturn 357° 58.38 02:41  Horizontal parallax Venus 0.1	Eltanin Kaus Aust.	83°31.55	-34°22.38
Peacock         53°4.34         -56°39.13           Deneb         49°25.02         45°22.38           Enif         33°37.98         9°59.64           Al Na'ir         27°31.80         -46°50.07           Fomalhaut         15°13.62         -29°29.01           Scheat         13°44.40         28°13.34           Markab         13°29.11         15°20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256°23.26         09:36           Jupiter         255°0.50         09:40           Saturn         357°53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255°7.44         09:37           Jupiter         255°7.44         09:37           Jupiter         255°5.57         14:48           Jupiter         255°5.54         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax <tr< th=""><th>Eltanin Kaus Aust. Vega</th><th>83°31.55 80°32.56</th><th>-34°22.38 38°48.59</th></tr<>	Eltanin Kaus Aust. Vega	83°31.55 80°32.56	-34°22.38 38°48.59
Deneb	Eltanin Kaus Aust. Vega Nunki	83°31.55 80°32.56 75°46.83	-34°22.38 38°48.59 -26°15.88
Refir	Eltanin Kaus Aust. Vega Nunki Altair	83°31.55 80°32.56 75°46.83 61°59.16	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26
Al Na'ir 27°31.80 -46°50.07 Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon 256°23.26 09:36 Mars 177°29.81 14:50 Jupiter 255°5.37 09:49  Aug 12 Tue SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°53.37 02:45  Aug 13 Wed SHA Mer.pass Venus 255°7.44 09:37 Mars 176°55.57 14:48 Jupiter 254°47.25 09:37 Saturn 357°55.84 02:45  Aug 13 Wed SHA Mer.pass Venus 253°51.59 09:38 Mars 176°21.25 14:47 Jupiter 254°34.06 09:34 Saturn 357°58.38 02:41  Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13
Fomalhaut 15°13.62 -29°29.01 Scheat 13°44.40 28°13.34 Markab 13°29.11 15°20.66  Aug 11 Mon 256°23.26 09:36 Mars 177°29.81 14:50 Jupiter 255°5.37 09:49  Aug 12 Tue SHA 09:37 Mars 176°55.57 14:48 Jupiter 256°47.25 09:37 Saturn 357°53.37 02:49  Aug 13 Wed SHA 09:37 Saturn 256°47.25 09:37 Saturn 256°47.25 09:37 Saturn 256°47.25 09:37 Saturn 256°47.25 09:38 Mars 176°25.84 09:38 Mars 176°21.25 14:47 Jupiter 254°34.06 09:34 Saturn 357°58.38 02:41  Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°22.38
Scheat Markab         13° 44.40         28° 13.34           Markab         13° 29.11         15° 20.66           Aug 11 Mon Venus Venus 256° 23.26         Mer.pass 09:36         09:36           Mars 17° 29.81         14:50         09:40           Jupiter 255° 0.50         09:40         09:40           Saturn 357° 53.37         02:49           Aug 12 Tue Venus 255° 7.44         Mer.pass 176° 55.57         14:48           Jupiter 254° 47.25         09:37         357° 55.84         02:45           Aug 13 Wed Venus 253° 51.59         Mer.pass 176° 21.25         09:38           Mars 176° 21.25         14:47         47           Jupiter 254° 34.06         09:34           Saturn 357° 58.38         02:41           Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64
Markab         13°29.11         15°20.66           Aug 11 Mon         SHA         Mer.pass           Venus         256°23.26         09:36           Mars         177°29.81         14:50           Jupiter         255°0.50         09:40           Saturn         357°53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255°7.44         09:37           Jupiter         254°47.25         09:37           Saturn         357°55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°22.38 9°59.64 -46°50.07
Aug 11 Mon         SHA (90.32)         Mer.pass (90.36)           Venus (256° 23.26)         09:36         09:36           Mars (177° 29.81)         14:50         09:40           Jupiter (255° 0.50)         09:49           Aug 12 Tue (Mars)         SHA (90.37)         Mer.pass (90.37)           Venus (255° 7.44)         09:37         14:48           Jupiter (254° 47.25)         09:37         55.84         02:45           Aug 13 Wed (Venus)         SHA (Mer.pass)         Mer.pass (90.38)         Mer.pass (90.38)           Venus (253° 51.59)         09:38         176° 21.25         14:47         14:47           Jupiter (254° 34.06)         09:34         53.7° 58.38         02:41           Horizontal parallax (Venus)         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°22.38 9°59.64 -46°50.07 -29°29.01
Venus         256° 23.26         09:36           Mars         177° 29.81         14:50           Jupiter         255° 0.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Jupiter         254° 47.25         09:37           Saturn         357° 55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253° 51.59         09:38           Mars         176° 21.25         14:47           Jupiter         254° 34.06         09:34           Saturn         357° 58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34
Venus         256° 23.26         09:36           Mars         177° 29.81         14:50           Jupiter         255° 0.50         09:40           Saturn         357° 53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255° 7.44         09:37           Jupiter         254° 47.25         09:37           Saturn         357° 55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253° 51.59         09:38           Mars         176° 21.25         14:47           Jupiter         254° 34.06         09:34           Saturn         357° 58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34
Mars         177°29.81         14:50           Jupiter         255°0.50         09:40           Saturn         357°53.37         02:49           Aug 12 Tue         SHA         Mer.pass           Venus         255°7.44         09:37           Mars         176°55.57         14:48           Jupiter         254°47.25         09:37           Saturn         357°55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66
Jupiter Saturn         255°0.50 357°53.37         09:40 09:40 09:40 09:49           Aug 12 Tue Venus Venus Venus Jupiter Saturn         SHA 255°7.44 09:37 176°55.57         14:48 09:37 14:48 09:37 14:48 09:37 14:48 09:37 14:48 09:37 14:48 09:37 14:47 14:48 09:37°55.84 09:34 15.69 14:47	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass
Saturn         357°53.37         02:49           Aug 12 Tue         SHA (99:37)         Mer.pass           Venus         255°7.44         09:37           Mars         176°55.57         14:48           Jupiter         254°47.25         09:37           Saturn         357°55.84         02:45           Aug 13 Wed         SHA (Mer.pass)         Wer.pass)           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36
Aug 12 Tue         SHA Venus 255°7.44 09:37 176°55.57 14:48 254°47.25 09:37 24:5           Mars Saturn 357°55.84 02:45           Aug 13 Wed Venus 253°51.59 Mars 176°21.25 14:47 Jupiter 254°34.06 29:34 264°34.06 29:34 264°34.06 29:34 264°34.06 29:34 264°34.06 264°34°34.06 264°34.06 264°34.06 264°34.06 264°34.06 264°34.06 264°34°34.06 264°34°34.06 264°34°34.06 264°34°34°34°34°34°34°34°34°34°34°34°34°34	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50
Venus         255°7.44         09:37           Mars         176°55.57         14:48           Jupiter         254°47.25         09:37           Saturn         357°55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81 255° 0.50	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40
Venus         255°7.44         09:37           Mars         176°55.57         14:48           Jupiter         254°47.25         09:37           Saturn         357°55.84         02:45           Aug 13 Wed         SHA         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81 255° 0.50	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40
Mars     176° 55.57     14:48       Jupiter     254° 47.25     09:37       Saturn     357° 55.84     02:45       Aug 13 Wed     SHA     Mer.pass       Venus     253° 51.59     09:38       Mars     176° 21.25     14:47       Jupiter     254° 34.06     09:34       Saturn     357° 58.38     02:41       Horizontal parallax       Venus:     0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81 255° 0.50 357° 53.37	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40 02:49
Saturn   254°47.25   09:37     Saturn   257°55.84   02:45     Aug 13 Wed   SHA   Wer.pass     Venus   253°51.59   09:38     Mars   176°21.25   14:47     Jupiter   254°34.06   09:34     Saturn   357°58.38   02:41     Horizontal   parallax   Venus:   0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40 02:49 Mer.pass
Saturn         357°55.84         02:45           Aug 13 Wed         SHA Ver.pass         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81 255° 0.50 357° 53.37 SHA 255° 7.44	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40 02:49 Mer.pass 09:37
Aug 13 Wed         SHA         Mer.pass           Venus         253°51.59         09:38           Mars         176°21.25         14:47           Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81 255° 0.50 357° 53.37 SHA 255° 7.44 176° 55.57	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40 02:49 Mer.pass 09:37 14:48
Venus 253°51.59 09:38 Mars 176°21.25 14:47 Jupiter 254°34.06 09:34 Saturn 357°58.38 02:41  Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Jupiter Supiter Supiter Supiter	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40 02:49 Mer.pass 09:37 14:48 09:37
Venus 253°51.59 09:38 Mars 176°21.25 14:47 Jupiter 254°34.06 09:34 Saturn 357°58.38 02:41  Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Jupiter Supiter Supiter Supiter	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66 Mer.pass 09:36 14:50 09:40 02:49 Mer.pass 09:37 14:48 09:37
Mars 176°21.25 14:47 Jupiter 254°34.06 09:34 Saturn 357°58.38 02:41  Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 255°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 12:45
Jupiter         254°34.06         09:34           Saturn         357°58.38         02:41           Horizontal parallax           Venus:         0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed	83° 31.55 80° 32.56 75° 46.83 61° 59.16 53° 4.34 49° 25.02 33° 37.98 27° 31.80 15° 13.62 13° 44.40 13° 29.11 SHA 256° 23.26 177° 29.81 255° 0.50 357° 53.37 SHA 255° 7.44 176° 55.57 254° 47.25 357° 55.84 SHA	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass
Saturn 357°58.38 02:41  Horizontal parallax  Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Venus	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38
Horizontal parallax Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59 176°21.25	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°52.38 9°59.64 -46°50.07 -29°29.01 28°13.34 15°20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass
Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59 176°21.25	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66  Mer.pass 09.36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38 14:47 09:34
Venus: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars Jupiter Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 <b>SHA</b> 256°23.26 177°29.81 255°0.50 357°53.37 <b>SHA</b> 255°7.44 176°55.57 254°47.25 357°55.84 <b>SHA</b> 253°51.59 176°21.25 254°34.06	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66  Mer.pass 09.36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38 14:47 09:34
	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars Jupiter Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59 176°21.25 254°34.06 357°58.38	-34° 22.38 38° 48.59 -26° 15.88 8° 56.26 -56° 39.13 45° 22.38 9° 59.64 -46° 50.07 -29° 29.01 28° 13.34 15° 20.66  Mer.pass 09.36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38 14:47 09:34
Mars: 0.1	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars Jupiter Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59 176°21.25 254°34.06 357°58.38 stal parallax	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°22.38 9°59.64 -46°50.07 -29°29.01 28°13.34 15°20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38 14:47 09:34 02:41
	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars Jupiter Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59 176°21.25 254°34.06 337°58.38 stal parallax Venus:	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°22.38 9°59.64 -46°50.07 -29°29.01 28°13.34 15°20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38 14:47 09:34 02:41
	Eltanin Kaus Aust. Vega Nunki Altair Peacock Deneb Enif Al Na'ir Fomalhaut Scheat Markab  Aug 11 Mon Venus Mars Jupiter Saturn  Aug 12 Tue Venus Mars Jupiter Saturn  Aug 13 Wed Venus Mars Jupiter Saturn	83°31.55 80°32.56 75°46.83 61°59.16 53°4.34 49°25.02 33°37.98 27°31.80 15°13.62 13°44.40 13°29.11 SHA 256°23.26 177°29.81 255°0.50 357°53.37 SHA 255°7.44 176°55.57 254°47.25 357°55.84 SHA 253°51.59 176°21.25 254°34.06 337°58.38 stal parallax Venus:	-34°22.38 38°48.59 -26°15.88 8°56.26 -56°39.13 45°22.38 9°59.64 -46°50.07 -29°29.01 28°13.34 15°20.66  Mer.pass 09:36 14:50 09:40 02:49  Mer.pass 09:37 14:48 09:37 02:45  Mer.pass 09:38 14:47 09:34 02:41

Stars SHA

Dec

	h	Su	n	Moon				
	Mon	GHA	Dec	GHA	ν	Dec	d	HP
	0	178°40.98	N15° 15.05	338°0.28	12.2'	S08°35.72	-16.0'	58.5'
	1	193°41.08	14.31	352°31.49	12.2'	08° 19.70	-16.1'	58.5'
	2	208°41.18	13.57	7°2.72	12.3'	08°3.63	-16.1'	58.5'
	3	223°41.28	• • 12.83	21°33.97	12.3'	07° 47.52	-16.2'	58.6'
	4	238°41.38	12.08	36°5.25	12.3'	07°31.35	-16.2'	58.6'
	5	253°41.49	11.34	50°36.55	12.3'	$07^{\circ}15.15$	-16.3'	58.6'
	6	268°41.59	$N15^{\circ}10.60$	65°7.87	12.3'	S06°58.89	-16.3'	58.6'
	7	283°41.69	9.85	79°39.21	12.4'	06°42.60	-16.3'	58.6'
	8	298°41.79	9.11	94° 10.57	12.4'	06°26.26	-16.4'	58.6'
	9	313°41.90	• • 8.36	108°41.94	12.4'	06°9.89	-16.4'	58.7'
	10	328°42.00	7.62	123° 13.33	12.4'	05°53.47	-16.5'	58.7'
	11	343°42.10	6.87	137° 44.74	12.4'	05°37.02	-16.5'	58.7'
	12	358°42.21	N15°6.13	152°16.16	12.4'	S05°20.53	-16.5'	58.7'
	13	13°42.31	5.38	166°47.60	12.4'	05°4.01	-16.6'	58.7'
	14	28°42.41	4.63	181° 19.04	12.5'	04° 47.45	-16.6'	58.7'
	15	43°42.52	• • 3.88	195°50.50	12.5'	04°30.87	-16.6'	58.8'
	16	58°42.62	3.14	210°21.97	12.5'	04° 14.25	-16.6'	58.8'
	17	73°42.73	2.39	224°53.44	12.5'	03°57.61	-16.7'	58.8'
	18	88°42.83	N15°1.64	239°24.92	12.5'	503°40.94	-16.7'	58.8'
	19	103°42.94	0.89	253°56.41	12.5'	03°24.24	-16.7'	58.8'
	20	118°43.04	15°0.14	268° 27.90	12.5'	03°7.52	-16.7'	58.8'
	21	133°43.15	14°59.39	282°59.40	12.5'	02°50.78	-16.8'	58.8'
	22	148°43.25	58.64	297°30.90	12.5'	02°34.02	-16.8'	58.9'
	23	163°43.36	57.89	312°2.40	12.5'	02°17.24	-16.8'	58.9'
		SD = 15.8'	d = -0.7'		SI	D = 16.0'		
	Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
	0	178°43.47	N14°57.14	326° 33.90	12.5'	S02°0.44	-16.8'	58.9'
	1	193°43.57	56.39	341°5.40	12.5'	01°43.62	-16.8'	58.9'
	2	208°43.68	55.63	355° 36.89	12.5'	01°26.79	-16.8'	58.9'
	3	223°43.79	• • 54.88	10°8.39	12.5'	01°9.95	-16.9'	58.9'
	4	238°43.90	54.13	24°39.88	12.5'	00°53.09	-16.9'	58.9'
	5	253°44.00	53.38	39°11.36	12.5'	00°36.22	-16.9'	58.9'
	6	268°44.11	N14°52.62	53°42.83	12.5'	S00° 19.35	-16.9'	59.0'
	7	283°44.22	51.87	68° 14.30	12.5'	S00°2.47	-16.9'	59.0'
	8	298°44.33	51.11	82°45.75	12.4'	N00°14.42	16.9'	59.0'
	9	313°44.44	• • 50.36	97° 17.20	12.4'	00°31.32	16.9'	59.0'
	10	328°44.54	49.60	111°48.63	12.4'	00°48.21	16.9'	59.0'
	11	343°44.65	48.85	126°20.05	12.4'	01°5.11	16.9'	59.0'
	12	358°44.76	N14°48.09	140°51.45	12.4'	N01°22.01	16.9'	59.0'
	13	13°44.87 28°44.98	47.34	155° 22.84	12.4'	01°38.90	16.9'	59.0'
	14	28°44.98 43°45.09	46.58	169° 54.21 184° 25.56	12.4'	01°55.80 02°12.68	16.9'	59.1'
	15	43°45.09 58°45.20	45.82	184° 25.56 198° 56.89	12.3'	02°12.68 02°29.57	16.9'	59.1' 59.1'
	16	73°45.31	45.06 44.30	213° 28.20	12.3' 12.3'	02 29.57 02°46.44	16.9' 16.9'	59.1'
	17 18	73 45.31 88°45.42	44.30 N14°43.55	213 28.20 227°59.49	12.3'	N03°3.31	16.9	59.1
	19	103°45.53	42.79	242° 30.75	12.3	03°20.16	16.9	59.1'
	20	118° 45.65	42.79	242 30.73 257°1.99	12.2'	03°20.10	16.8	59.1'
	21	133°45.76	· · 41.27	257 1.99 271°33.20	12.2'	03°53.83	16.8	59.1'
	22	133 45.70 148°45.87	40.51	271 33.20 286°4.39	12.2'	03 55.65 04°10.64	16.8	59.1'
	23	163°45.98	39.75	300° 35.54	12.1'	04°10.04	16.8	59.1
	23			300 35.54		* * = * * * * * * * * * * * * * * * * *	10.0	59.1
		SD = 15.8'	d = -0.8'		SI	D = 16.1'		
,	Wed	GHA	Dec	GHA	ν	Dec	d	НР
	0	178°46.09	N14°38.99	315°6.67	12.1'	N04° 44.21	16.8'	59.1
	1	193°46.20	38.22	329°37.76	12.1'	05°0.97	16.7	59.2'
	2	208°46.32	37.46	344°8.82	12.0'	05° 17.71	16.7	59.2
	3	223°46.43	36.70	358° 39.84	12.0'	05°34.42	16.7	59.2'
	4	238°46.54	35.94	13° 10.83	12.0'	05°51.11	16.7	59.2
	5	253°46.66	35.17	27°41.79	11.9'	06°7.77	16.6'	59.2'
	6	268°46.77	N14°34.41	42°12.70	11.9'	N06°24.40	16.6'	59.2'
	7	283°46.88	33.65	56° 43.58	11.8'	06°41.01	16.6'	59.2'
	8	298°47.00	32.88	71° 14.41	11.8'	06° 57.58	16.5	59.2'
	9	313°47.11	32.12	85° 45.21	11.8'	07°14.12	16.5	59.2'
	10	328°47.23	31.35	100° 15.96	11.7'	07°30.63	16.5	59.2'
	11	343°47.34	30.59	114°46.67	11.7'	07°47.10	16.4	59.2
	12	358°47.45	N14°29.82	129° 17.33	11.6'	N08°3.53	16.4	59.2
		330 71.73			11.6'	08° 19.93	16.4	59.2'
	13	13°47.57	29.05	143°47.94	11.0			
	13 14		29.05 28.29	143° 47.94 158° 18.51	11.5'	08° 36.29	16.3'	59.2'
		13°47.57						59.2' 59.2'
	14	13°47.57 28°47.68	28.29	$158^{\circ}18.51$	11.5'	08°36.29	16.3'	
	14 15	13°47.57 28°47.68 43°47.80	28.29 •• 27.52	158° 18.51 172° 49.02	11.5' 11.5'	08° 36.29 08° 52.60	16.3' 16.3'	59.2'
	14 15 16	13°47.57 28°47.68 43°47.80 58°47.92	28.29 •• 27.52 26.75	158° 18.51 172° 49.02 187° 19.49	11.5' 11.5' 11.4'	08° 36.29 08° 52.60 09° 8.87	16.3' 16.3' 16.2'	59.2' 59.2'
	14 15 16 17	13°47.57 28°47.68 43°47.80 58°47.92 73°48.03	28.29 •• 27.52 26.75 25.98	158° 18.51 172° 49.02 187° 19.49 201° 49.90	11.5' 11.5' 11.4' 11.4'	08° 36.29 08° 52.60 09° 8.87 09° 25.09	16.3' 16.3' 16.2' 16.2'	59.2' 59.2' 59.3'
	14 15 16 17 18	13° 47.57 28° 47.68 43° 47.80 58° 47.92 73° 48.03 88° 48.15	28.29 •• 27.52 26.75 25.98 N14°25.22	158° 18.51 172° 49.02 187° 19.49 201° 49.90 216° 20.26	11.5' 11.5' 11.4' 11.4' 11.3'	08° 36.29 08° 52.60 09° 8.87 09° 25.09 N09° 41.27	16.3' 16.3' 16.2' 16.2' 16.1'	59.2' 59.2' 59.3' 59.3'
	14 15 16 17 18 19	13°47.57 28°47.68 43°47.80 58°47.92 73°48.03 88°48.15 103°48.26	28.29 · · 27.52 26.75 25.98 N14° 25.22 24.45	158° 18.51 172° 49.02 187° 19.49 201° 49.90 216° 20.26 230° 50.57	11.5' 11.5' 11.4' 11.4' 11.3' 11.3'	08° 36.29 08° 52.60 09° 8.87 09° 25.09 N09° 41.27 09° 57.40	16.3' 16.2' 16.2' 16.2' 16.1'	59.2' 59.2' 59.3' 59.3' 59.3'
	14 15 16 17 18 19 20	13°47.57 28°47.68 43°47.80 58°47.92 73°48.03 88°48.15 103°48.26 118°48.38	28.29 · 27.52 26.75 25.98 N14° 25.22 24.45 23.68	158° 18.51 172° 49.02 187° 19.49 201° 49.90 216° 20.26 230° 50.57 245° 20.82	11.5' 11.5' 11.4' 11.4' 11.3' 11.3' 11.2'	08° 36.29 08° 52.60 09° 8.87 09° 25.09 N09° 41.27 09° 57.40 10° 13.48	16.3' 16.2' 16.2' 16.1' 16.1' 16.0'	59.2' 59.2' 59.3' 59.3' 59.3' 59.3'
	14 15 16 17 18 19 20 21	13°47.57 28°47.68 43°47.80 58°47.92 73°48.03 88°48.15 103°48.26 118°48.38 133°48.50	28.29 · · 27.52 26.75 25.98 N14° 25.22 24.45 23.68 · · 22.91	158° 18.51 172° 49.02 187° 19.49 201° 49.90 216° 20.26 230° 50.57 245° 20.82 259° 51.02	11.5' 11.5' 11.4' 11.4' 11.3' 11.3' 11.2' 11.1'	08° 36.29 08° 52.60 09° 8.87 09° 25.09 N09° 41.27 09° 57.40 10° 13.48 10° 29.51	16.3' 16.2' 16.2' 16.1' 16.1' 16.0' 16.0'	59.2' 59.2' 59.3' 59.3' 59.3' 59.3' 59.3'
	14 15 16 17 18 19 20 21 22	13°47.57 28°47.68 43°47.80 58°47.92 73°48.03 88°48.15 103°48.26 118°48.38 133°48.50 148°48.62	28.29 · 27.52 26.75 25.98 N14° 25.22 24.45 23.68 · 22.91 22.14	158° 18.51 172° 49.02 187° 19.49 201° 49.90 216° 20.26 230° 50.57 245° 20.82 259° 51.02 274° 21.16	11.5' 11.4' 11.4' 11.3' 11.3' 11.2' 11.1' 11.1' 11.0'	08° 36.29 08° 52.60 09° 8.87 09° 25.09 N09° 41.27 09° 57.40 10° 13.48 10° 29.51 10° 45.48	16.3' 16.2' 16.2' 16.1' 16.1' 16.0' 16.0' 15.9'	59.2 59.3 59.3 59.3 59.3 59.3 59.3

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

Lat.		Moonris	e		Moonset	
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	20:46	20:09	19:27	06:10	08:33	10:58
<b>N</b> 70°	20:42	20:13	19:42	06:21	08:33	10:46
68°	20:38	20:17	19:54	06:30	08:32	10:36
66°	20:35	20:20	20:05	06:37	08:32	10:28
64°	20:33	20:23	20:13	06:43	08:32	10:22
62°	20:31	20:26	20:21	06:48	08:32	10:16
60°	20:29	20:28	20:27	06:53	08:31	10:11
N 58° 56°	20:27 20:26	20:30 20:32	20:33 20:38	06:57 07:00	08:31 08:31	10:07
54°	20:26	20:32	20:38	07:00	08:31	10:03 10:00
52°	20:23	20:35	20:42	07:03	08:31	09:57
50°	20:22	20:36	20:50	07:09	08:31	09:54
45°	20:20	20:39	20:59	07:14	08:31	09:48
<b>N</b> 40°	20:18	20:41	21:06	07:19	08:30	09:43
35°	20:16	20:43	21:12	07:23	08:30	09:38
30°	20:14	20:45	21:17	07:26	08:30	09:35
20°	20:12	20:48	21:27	07:32	08:30	09:28
N 10° 0°	20:09 20:07	20:51 20:54	21:35 21:43	07:37 07:42	08:30 08:29	09:22 09:17
_						
<b>S</b> 10° 20°	20:05 20:02	20:57 21:00	21:51 21:59	07:47 07:52	08:29 08:29	09:12 09:06
30°	20:02	21:04	22:09	07:52	08:28	09.00
35°	19:58	21:06	22:15	08:01	08:28	08:56
40°	19:56	21:08	22:21	08:04	08:28	08:52
45°	19:54	21:11	22:29	08:09	08:28	08:47
<b>S</b> 50°	19:52	21:14	22:38	08:13	08:27	08:41
52°	19:51	21:16	22:42	08:16	08:27	08:38
54°	19:49	21:17	22:47	08:18	08:27	08:36
56°	19:48	21:19	22:52	08:21	08:27	08:32
58°	19:46	21:21	22:58	08:24	08:26	08:29
<b>S</b> 60°	19:45	21:24	23:05	08:27	08:26	08:25

	Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-84%	
11	05:16	05:11	12:05	01:31	13:55		
12	05:06	05:01	12:05	02:18	14:42		
13	04:56	04:50	12:05	03:06	15:30		

### August 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	322°40.27	215°15.99 N21°38.31	138°27.14 <b>S</b> 01°19.61	217°1.22 N22°35.82	320°41.27 S01°46.99	Alpheratz 357°33.	99 29°13.93
1 2	337° 42.74 352° 45.20	230°15.30 38.09 245°14.60 37.88	153°28.17 20.26 168°29.20 20.91	232° 3.14 35.77 247° 5.06 35.72	335°43.85 47.04 350°46.42 47.10	Ankaa 353°6.	
3	7° 47.67	260°13.90 · · 37.66	183° 30.23 · · 21.56	262° 6.97 · · 35.67	5°49.00 · · 47.16	Schedar 349°30.	
4	22°50.13	275°13.20 37.44	198° 31.26 22.22	277°8.89 35.62	20°51.57 47.22	Diphda 348°46.	
5	$37^{\circ}52.59$	290° 12.51 37.22	213°32.29 22.87	292°10.81 35.57	35°54.15 47.28	Achernar 335°19. Hamal 327°50.	
6	52°55.06	305°11.81 N21°37.00	228°33.32 <b>S</b> 01°23.52	307°12.73 N22°35.52	50°56.73 <b>S</b> 01°47.33	Polaris 313°44.	
7	67° 57.52	320°11.11 36.77	243°34.35 24.17	322°14.65 35.47	65°59.30 47.39	Acamar 315°11.	
8 9	82°59.99 98°2.45	335°10.41 36.55 350°9.72 · · 36.33	258°35.38 24.82 273°36.41 •• 25.48	337°16.57 35.42 352°18.49 · · 35.37	81°1.88 47.45 96°4.45 · · 47.51	Menkar 314°5.	
10	113°4.91	5°9.02 36.10	288° 37.44 26.13	7°20.41 35.32	111°7.03 47.57	Mirfak 308°27.	
11	128°7.38	20°8.32 35.87	303°38.47 26.78	22°22.33 35.27	126°9.60 47.62	Aldebaran 290°39.	
12	143°9.84	35°7.62 N21°35.65	318°39.50 <b>S</b> 01°27.43	37°24.25 N22°35.22	141°12.18 <b>S</b> 01°47.68	Rigel 281°3. Capella 280°21.	
13	158° 12.31	50°6.93 35.42		52°26.17 35.17	156°14.76 47.74	Bellatrix 278°22.	
14 15	173° 14.77 188° 17.23	65°6.23 35.19 80°5.53 · · 34.96	348°41.55 28.74 3°42.58 •• 29.39	67°28.09 35.12 82°30.02 · · 35.06	171°17.33 47.80 186°19.91 · · 47.86	Elnath 278°1.	
16	203° 19.70	95°4.84 34.73	18°43.61 30.04	97°31.94 35.01	201°22.49 47.92	Alnilam 275°37.	
17	$218^{\circ}22.16$	110°4.14 34.49	33°44.64 30.69	112°33.86 34.96	216°25.06 47.98	Betelgeuse 270°51. Canopus 263°52.	
18	233°24.63	125°3.44 N21°34.26	48°45.67 <b>S</b> 01°31.34	127°35.78 N22°34.91	231°27.64 <b>S</b> 01°48.03	Sirius 258°26.	
19	248°27.09	140°2.74 34.03	63°46.69 32.00	142°37.70 34.86	246°30.22 48.09	Adhara 255°5.	
20 21	263°29.56 278°32.02	155°2.05 33.79 170°1.35 · · 33.55	78°47.72 32.65 93°48.75 · · 33.30	157°39.62 34.81 172°41.54 · · 34.76	261°32.80 48.15 276°35.37 • 48.21	Procyon 244°50.	60 5°9.66
22	293°34.48	185°0.65 33.31	108°49.78 33.95	187°43.46 34.71	291°37.95 48.27	Pollux 243°17.	
23	308°36.95	199°59.95 33.08	123°50.80 34.60	202°45.39 34.66	306°40.53 48.33	Avior 234°15. Suhail 222°46.	
Mer	pass. 02:29	ν-0.7' d-0.2' m-3.97	$\nu 1.0' \ d0.7' \ m1.62$	$\nu 1.9' \ d$ -0.1' m-1.94	ν2.6' d0.1' m0.73	Miaplacidus 221°39.	
- IVICI.	pass. 02.25	ν σ.ν α σ.2 m σ.σν	- VI.0 UO.7 IIII.02			Alphard 217°47.	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.	
0	323°39.41	214°59.26 N21°32.84	138°51.83 S01°35.26	217°47.31 N22°34.61	321°43.11 S01°48.39	Dubhe 193°40.	
1	338° 41.88	229°58.56 32.59	153°52.86 35.91	232°49.23 34.56	336°45.68 48.44	Denebola 182°24. Gienah 175°43.	
2	353°44.34	244°57.86 32.35	168°53.89 36.56	247°51.15 34.51	351°48.26 48.50	Acrux 173°0.	
3	8°46.80	259°57.17 · · 32.11	183°54.91 · · 37.21	262°53.07 · · 34.45	6°50.84 · · 48.56	Gacrux 171°51.	52 -57° 15.57
4 5	23° 49.27 38° 51.73	274°56.47 31.86 289°55.77 31.62	198°55.94 37.87 213°56.97 38.52	277°55.00 34.40 292°56.92 34.35	21°53.42 48.62 36°56.00 48.68	Alioth 166°12.	
6	53°54.20	304°55.07 N21°31.37	228°57.99 S01°39.17	307°58.84 N22°34.30	51°58.57 S01°48.74	Spica 158°21.	
7	68° 56.66	319°54.38 31.13	243°59.02 39.82	323°0.76 34.25	67°1.15 48.80	Alkaid 152°51. Hadar 148°35.	
8	83°59.12	334°53.68 30.88	259°0.04 40.48	338° 2.69 34.20	82°3.73 48.86	Menkent 147°57.	
9	99°1.59	349°52.98 · · 30.63	274°1.07 · · 41.13	353°4.61 · · 34.15	97°6.31 · · 48.92	Arcturus 145°47.	
10 11	114°4.05 129°6.52	4°52.29 30.38 19°51.59 30.13	289°2.10 41.78 304°3.12 42.43	8°6.53 34.10 23°8.46 34.05	112°8.89 48.98 127°11.47 49.04	Rigil Kent. 139°39.	
12	144°8.98	34°50.89 N21°29.87	319°4.15 S01°43.09	38°10.38 N22°34.00	142°14.05 S01°49.10	Kochab 137°19.	
13	$159^{\circ}11.45$	49°50.19 29.62	334°5.17 43.74	53°12.30 33.95	157°16.63 49.16	Zuben'ubi 136°55. Alphecca 126°3.	
14	174° 13.91	64°49.50 29.36	349°6.20 44.39	68°14.23 33.89	172°19.21 49.22	Antares 112°15.	
15	189° 16.37	79°48.80 · · 29.11	4°7.22 · · 45.04	83°16.15 · · 33.84	187°21.79 · · 49.27	Atria 107°8.	
16 17	204° 18.84 219° 21.30	94°48.10 28.85 109°47.41 28.59	19°8.25 45.70 34°9.27 46.35	98°18.07 33.79 113°20.00 33.74	202°24.37 49.33 217°26.95 49.39	Sabik 102°2.	
18	234°23.77	124°46.71 N21°28.34	49°10.30 S01°47.00	128°21.92 N22°33.69	232°29.53 S01°49.45	Shaula 96°9. Rasalhague 95°57.	
19	$249^{\circ}26.23$	139°46.01 28.08	64°11.32 47.65	143°23.85 33.64	247°32.11 49.51	Rasalhague 95°57. Eltanin 90°41.	
20	264°28.69	154°45.32 27.81		158°25.77 33.59	262°34.69 49.57	Kaus Aust. 83°31.	
21 22	279°31.16 294°33.62	169°44.62 · · 27.55 184°43.92 27.29	94°13.37 · · 48.96 109°14.40 49.61	173°27.69 · · · 33.54 188°29.62	277°37.27 · · 49.63 292°39.85 49.69	Vega 80°32.	
23	309°36.09	199°43.23 27.03		203°31.54 33.43	307°42.43 49.75	Nunki 75°46.	
		$\nu$ -0.7' d-0.2' m-3.97		$\frac{1.9' \text{ d-0.1' m-1.94}}{\nu}$	$\nu$ 2.6' d0.1' m0.73	Altair 61°59. Peacock 53°4.	
ivier.	pass. 02:25	ν-υ.τ α-υ.2 m-3.91	$_{-}$ $_{-}$ $^{ u1.0'}$ $^{d0.7'}$ m1.62	ν1.9 α-0.1 m-1.94	ν2.0 du.1 mu./3	Deneb 49°25.	
_						Enif 33°37.	
Sat 0	<b>GHA</b> 324°38.55	<b>GHA Dec</b> 214°42.53 N21°26.76	<b>GHA Dec</b> 139°16.45 \$01°50.92	<b>GHA Dec</b> 218°33.47 N22°33.38	<b>GHA Dec</b> 322°45.01 <b>S</b> 01°49.81	Al Na'ir 27°31.	
1	339°41.01	229°41.83 26.49		233°35.39 33.33	337°47.59 49.87	Fomalhaut 15°13.	
2	354° 43.48	244°41.14 26.23		248°37.32 33.28	352°50.17 49.93	Scheat 13°44. Markab 13°29.	
3	9°45.94	259°40.44 · · 25.96		263°39.24 · · 33.23	7°52.75 · · 49.99		
4	24°48.41	274°39.74 25.69		278°41.17 33.18	22°55.33 50.05	Aug 14 Thu SHA	Mer.pass
5 6	39°50.87 54°53.34	289°39.05 25.42 304°38.35 N21°25.15		293°43.09 33.13 308°45.02 N22°33.07	37°57.92 50.11 53°0.50 \$01°50.17	Venus 252°35. Mars 175°46.	
7	69°55.80	319° 37.65 24.87		323°46.95 33.02	68°3.08 50.23	Jupiter 254°20.	
8	84° 58.26	334°36.96 24.60		338°48.87 32.97	83°5.66 50.29	Saturn 358°1.	
9	$100^{\circ}0.73$	349°36.26 · · 24.33		353°50.80 · · 32.92	98°8.24 · · 50.36	Aug 15 Fri SHA	Mer.pass
10	115°3.19	4°35.56 24.05		8°52.72 32.87	113°10.83 50.42	Venus 251°19.	
11 12	130°5.66 145°8.12	19°34.87 23.77 34°34.17 N21°23.50		23°54.65 32.82 38°56.58 N22°32.77	128°13.41 50.48 143°15.99 \$01°50.54	Mars 175°12.	42 14:44
13	160° 10.58	49°33.47 23.22		53°58.50 32.71	158°18.57 50.60	Jupiter 254°7.	
14	175° 13.05	64°32.78 22.94		69°0.43 32.66	173°21.15 50.66	Saturn 358°3.	69 02:33
15	190° 15.51	79°32.08 · · 22.66		84°2.36 · · 32.61	188°23.74 · · 50.72	Aug 16 Sat SHA	Mer.pass
16	205°17.98	94°31.39 22.38		99°4.28 32.56	203°26.32 50.78	Venus 250°3.	
17 18	220°20.44 235°22.91	109°30.69 22.09 124°29.99 N21°21.81	34°33.84 2.02 49°34.86 502°2.67	114°6.21 32.51 129°8.14 N22°32.46	218°28.90 50.84 233°31.49 \$01°50.90	Mars 174°37. Jupiter 253°54.	
19	250°25.37	139°29.30 21.52		144°10.06 32.40	248°34.07 50.96	Saturn 358°6.	
20	$265^{\circ}27.83$	154°28.60 21.24	79°36.90 3.98	159°11.99 32.35	263°36.65 51.02		
21	280°30.30	169°27.91 · · 20.95		174°13.92 · · 32.30	278°39.24 · · 51.08	Horizontal parall Venu	
22 23	295°32.76 310°35.23	184°27.21 20.66 199°26.52 20.37		189°15.85 32.25 204°17.77 32.20	293°41.82 51.15 308°44.40 51.21	Ma	
		-					
ivier.	pass. 02:21	ν-0.7' d-0.3' m-3.97	$-\frac{\nu 1.0' \ d0.7' \ m1.62}{}$	ν1.9' d-0.1' m-1.95	ν2.6' d0.1' m0.72		

–	011010	+0.0721 Sec	Δι – ι ι	-011	_ +09.1119	500	
h	Su	n			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.85	N14°20.60	303°21.25	11.0'	N11°17.26	15.8'	59.3'
1	193°48.97	19.83	$317^{\circ}51.21$	10.9'	11°33.07	15.7'	59.3'
2	208°49.09	19.06	332°21.11	10.8'	11°48.81	15.7'	59.3'
3	223°49.20	• • 18.28	346°50.94	10.8'	12°4.50	15.6'	59.3'
4	238°49.32	17.51	1°20.70	10.7'	12°20.12	15.6'	59.3'
5	253°49.44 268°49.56	16.74 N14° 15.96	15°50.40 30°20.04	10.6'	12°35.68 N12°51.17	15.5'	59.3'
6 7	268 49.56 283°49.68	N14 15.96 15.19	30 20.04 44°49.60	10.6' 10.5'	13°6.59	15.4' 15.4'	59.3' 59.3'
8	298°49.80	14.42	59° 19.10	10.5	13°21.94	15.4	59.3'
9	313°49.92	• • 13.64	73°48.53	10.4	13°37.22	15.2'	59.3'
10	328°50.04	12.87	88° 17.89	10.3'	13°52.43	15.1'	59.3'
11	343°50.16	12.09	$102^{\circ}47.17$	10.2'	14°7.57	15.1'	59.3'
12	358°50.28	N14° 11.32	117° 16.38	10.1'	N14°22.63	15.0'	59.3'
13	13°50.40	10.54	131°45.52	10.1'	14°37.61	14.9'	59.3'
14	28°50.52	9.77	146°14.58	10.0'	14°52.51	14.8'	59.3'
15	43°50.64 58°50.76	• • 8.99	160° 43.57 175° 12.48	9.9' 9.8'	15°7.33 15°22.07	14.7' 14.7'	59.3'
16 17	73°50.88	8.21 7.43	175 12.48 189°41.31	9.8 9.8'	15 22.07 15°36.72	14.7 14.6'	59.3' 59.3'
18	88°51.01	7.43 N14°6.66	204° 10.06	9.6	N15°51.29	14.5	59.3
19	103°51.13	5.88	218°38.74	9.6'	16°5.77	14.4'	59.3'
20	118°51.25	5.10	233°7.33	9.5'	16° 20.16	14.3'	59.3'
21	133°51.37	• • 4.32	247°35.84	9.4'	16°34.46	14.2'	59.3'
22	148°51.49	3.54	262°4.27	9.3'	16°48.67	14.1'	59.3'
23	163°51.62	2.76	$276^{\circ}32.62$	9.3'	$17^{\circ}2.78$	14.0'	59.3'
	SD = 15.8'	d = -0.8'		ςr	0 = 16.2'		
				J.	10.2		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°51.74	$N14^{\circ}1.98$	291°0.89	9.2'	$N17^{\circ}16.80$	13.9'	59.3'
1	193°51.86	1.20	305°29.07	9.1'	17°30.72	13.8'	59.3'
2	208°51.99	14°0.42	319°57.16	9.0'	17° 44.54	13.7'	59.3'
3	223°52.11	13°59.64	334°25.17	8.9'	17°58.26	13.6'	59.3'
4 5	238°52.23 253°52.36	58.85 58.07	348°53.10 3°20.93	8.8' 8.8'	18° 11.87 18° 25.39	13.5' 13.4'	59.3' 59.3'
6	268° 52.48	N13° 57.29	3 20.93 17°48.69	8.7'	N18° 38.79	13.4	59.3
7	283°52.61	56.51	32° 16.35	8.6'	18° 52.09	13.2'	59.3'
8	298°52.73	55.72	46°43.92	8.5'	19°5.28	13.1'	59.3'
9	313°52.86	• • 54.94	61°11.41	8.4'	19° 18.36	13.0'	59.3'
10	328°52.98	54.16	75°38.81	8.3'	19°31.32	12.9'	59.3'
11	343°53.11	53.37	$90^{\circ}6.11$	8.2'	19°44.17	12.7'	59.3'
12	358°53.23	N13°52.59	104°33.33	8.1'	N19°56.91	12.6'	59.3'
13	13°53.36	51.80	119°0.46	8.0'	20°9.52	12.5'	59.3'
14	28°53.48 43°53.61	51.02 •• 50.23	133°27.50 147°54.44	7.9' 7.9'	20°22.02 20°34.40	12.4' 12.3'	59.3'
15 16	58°53.74	49.44	162°21.30	7.9 7.8'	20° 46.65	12.1	59.3' 59.3'
17	73°53.86	48.66	176°48.06	7.7'	20°58.78	12.0'	59.3
18	88°53.99	N13°47.87	191° 14.74	7.6'	N21°10.78	11.9'	59.3'
19	103°54.12	47.08	205°41.32	7.5'	21°22.66	11.7'	59.3'
20	118°54.25	46.29	220°7.81	7.4'	21°34.40	11.6'	59.3'
21	133°54.37	• • 45.50	234°34.21	7.3'	21°46.02	11.5'	59.2'
22	148°54.50	44.72	249°0.52	7.2'	21°57.50	11.3'	59.2'
23	163°54.63	43.93	263°26.73	7.1'	22°8.85	11.2'	59.2'
	SD = 15.8'	d = -0.8'		SE	0 = 16.2'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	178°54.76 193°54.89	N13°43.14 42.35	277°52.86 292°18.89	7.0' 6.9'	N22°20.07 22°31.14	11.1' 10.9'	59.2' 59.2'
2	193°54.89 208°55.01	42.35 41.56	292° 18.89 306° 44.84	6.9'	22° 42.08	10.9	59.2' 59.2'
3	200 55.01 223°55.14	40.77	300 44.64 321°10.69	6.8'	22° 52.88	10.6	59.2'
4	238°55.27	39.98	335°36.45	6.7'	23°3.54	10.7	59.2'
5	253°55.40	39.18	350°2.13	6.6'	23°14.05	10.4	59.2'
6	268°55.53	N13°38.39	4°27.71	6.5'	N23°24.42	10.2'	59.2'
7	283°55.66	37.60	$18^{\circ}53.21$	6.4'	23°34.64	10.1'	59.2'
8	298°55.79	36.81	33° 18.61	6.3'	23°44.71	9.9'	59.2'
9	313°55.92	• • 36.01	47°43.93	6.2'	23°54.63	9.8'	59.2'
10	328°56.05	35.22	62°9.16	6.1'	24°4.41	9.6'	59.2'
11 12	343°56.18 358°56.31	34.43 N13°33.63	76°34.31 90°59.37	6.1' 6.0'	24°14.03 N24°23.49	9.5' 9.3'	59.2' 59.2'
13	358 56.31 13°56.44	N13 33.63 32.84	90°59.37 105°24.34	5.9'	24° 32.80	9.3'	59.2' 59.2'
13	28°56.58	32.84 32.04	105 24.34 119°49.23	5.9 5.8'	24 32.80 24°41.96	9.2 9.0'	59.2'
15	43°56.71	• • 31.25	134° 14.04	5.7'	24° 50.95	8.8'	59.2'
16	58°56.84	30.45	148°38.76	5.6'	24°59.79	8.7'	59.1'
17	73°56.97	29.66	163°3.40	5.6'	25°8.46	8.5'	59.1'
18	88°57.10	N13°28.86	$177^{\circ}27.97$	5.5'	N25°16.98	8.3'	59.1'
19	103°57.24	28.06	191°52.45	5.4'	25°25.33	8.2'	59.1'
20	118°57.37	27.27	206° 16.85	5.3'	25°33.51	8.0'	59.1'
21	133°57.50	• • 26.47	220°41.18	5.3'	25°41.53	7.9'	59.1'
22	148°57.63	25.67	235°5.43	5.2'	25°49.38	7.7'	59.1'
23	163°57.77	24.87	249°29.61	5.1'	25°57.06	7.5'	59.1'
	SD = 15.8'	d = -0.8'		SE	0 = 16.2'		

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

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

	Sun			Moon		
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	75-53%
14	04:45	04:39	12:05	03:54	16:20	
15	04:33	04:27	12:04	04:46	17:13	
16	04:21	04:15	12:04	05:41	18:11	

### August 17, 18, 19 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
	325°37.69	214°25.82 N21°20.08	139°40.99 S02°6.59	219°19.70 N22°32.15	323°46.99 \$01°51.27
0 1	325 37.09 340°40.15	214 25.82 N21 20.08 229°25.12 19.79	154° 42.01 7.24	234°21.63 32.09	323 40.99 <b>S</b> 01 51.27 338°49.57 51.33
2	355° 42.62	244°24.43 19.50	169°43.03 7.90	249°23.56 32.04	353°52.16 51.39
3	10° 45.08	259°23.73 · · 19.21	184° 44.05 · · 8.55	264° 25.49 · · 31.99	8°54.74 · · 51.45
4	25° 47.55	274°23.04 18.91	199°45.07 9.20	279°27.42 31.94	23°57.32 51.51
5	40° 50.01	289°22.34 18.62	214°46.09 9.86	294°29.34 31.89	38°59.91 51.57
6	55° 52.48	304°21.65 N21°18.32	229°47.11 S02°10.51	309°31.27 N22°31.84	54°2.49 S01°51.64
7	70°54.94	319°20.95 18.02	244°48.13 11.16	324°33.20 31.78	69°5.08 51.70
8	85° 57.40	334°20.26 17.73	259°49.15 11.82	339°35.13 31.73	84°7.66 51.76
9	100°59.87	349°19.56 · · 17.43	274°50.17 · · 12.47	354°37.06 · · 31.68	99°10.25 · · 51.82
10	116°2.33	4°18.87 17.13	289°51.19 13.12	9°38.99 31.63	114°12.83 51.88
11	131°4.80	19° 18.17 16.82	304°52.21 13.78	24°40.92 31.58	129°15.42 51.94
12	146°7.26	34°17.48 N21°16.52	319°53.23 S02°14.43	39°42.85 N22°31.53	144°18.00 S01°52.00
13	161°9.73	49°16.78 16.22	334°54.25 15.08	54°44.78 31.47	159°20.59 52.07
14	176° 12.19	64°16.09 15.91	349°55.27 15.74	69°46.71 31.42	174°23.17 52.13
15	191° 14.65	79°15.39 · · 15.61	4°56.29 · · 16.39	84°48.64 · · 31.37	189°25.76 · · 52.19
16	206° 17.12	94°14.70 15.30	19°57.31 17.04	99°50.57 31.32	204°28.34 52.25
17	221°19.58	109°14.00 14.99	34°58.33 17.70	114°52.50 31.27	219°30.93 52.31
18	236°22.05	124°13.31 N21°14.69	49°59.35 <b>S</b> 02°18.35	129°54.43 N22°31.21	234°33.52 <b>S</b> 01°52.38
19	251°24.51	139°12.61 14.38	65°0.37 19.00	144°56.36 31.16	249°36.10 52.44
20	266°26.97	154°11.92 14.06	80°1.38 19.66	159°58.29 31.11	264°38.69 52.50
21	281°29.44	169°11.22 · · 13.75	95°2.40 · · 20.31	175°0.22 · · 31.06	279°41.28 · · 52.56
22	296°31.90	184°10.53 13.44	110°3.42 20.96	190°2.15 31.01	294°43.86 52.62
23	311°34.37	199°9.83 13.13	125°4.44 21.62	205°4.08 30.95	309°46.45 52.69
N/au -	02:17	ν-0.7' d-0.3' m-3.97	$\nu 1.0' \ d0.7' \ m1.62$	ν1.9' d-0.1' m-1.95	ν2.6' d0.1' m0.72
ivier.p	pass. 02:17	ν-0.7 d-0.3 m-3.97	ν1.0° d0.7° m1.62	ν1.9° <i>d</i> -0.1° m-1.95	ν2.6° d0.1° m0.72
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	326°36.83	214°9.14 N21°12.81	140°5.46 \$02°22.27	220°6.01 N22°30.90	324°49.03 <b>S</b> 01°52.75
1	341°39.30	229°8.45 12.49	155°6.47 22.93	235°7.94 30.85	339°51.62 52.81
2	356°41.76	244°7.75 12.18	170°7.49 23.58	250° 9.87 30.80	354°54.21 52.87
3	11°44.22	259°7.06 · · 11.86	185°8.51 · · 24.23	265°11.81 · · 30.75	9°56.80 · · 52.94
4	26°46.69	274°6.36 11.54	200°9.53 24.89	280°13.74 30.69	24°59.38 53.00
5	41°49.15	289°5.67 11.22	215° 10.54 25.54	295°15.67 30.64	40°1.97 53.06
6	56°51.62	304°4.98 N21°10.90	230°11.56 <b>S</b> 02°26.19	310°17.60 N22°30.59	55°4.56 S01°53.12
7	$71^{\circ}54.08$	319°4.28 10.58	245°12.58 26.85	325°19.53 30.54	70°7.15 53.19
8	86° 56.54	334°3.59 10.25	260°13.60 27.50	340°21.47 30.48	85°9.73 53.25
9	$101^{\circ}59.01$	349°2.90 · · 9.93	275°14.61 · · 28.15	355°23.40 · · 30.43	100°12.32 · · 53.31
10	$117^{\circ}1.47$	4°2.20 9.60	290°15.63 28.81	10°25.33 30.38	115°14.91 53.37
11	132°3.94	19°1.51 9.28	305°16.65 29.46	25°27.26 30.33	130°17.50 53.44
12	$147^{\circ}6.40$	34°0.82 N21°8.95	320°17.66 <b>S</b> 02°30.12	40°29.20 N22°30.28	145°20.09 <b>S</b> 01°53.50
13	162°8.87	49°0.12 8.62	335°18.68 30.77	55°31.13 30.22	160°22.67 53.56
14	177° 11.33	63°59.43 8.29	350°19.69 31.42	70°33.06 30.17	175°25.26 53.62
15	$192^{\circ}13.79$	78°58.74 · · 7.96	5°20.71 · · 32.08	85°34.99 · · 30.12	190°27.85 · · 53.69
16	207° 16.26	93°58.04 7.63	20°21.73 32.73	100°36.93 30.07	205°30.44 53.75
17	222° 18.72	108°57.35 7.30	35°22.74 33.38	115°38.86 30.01	220°33.03 53.81
18	237°21.19	123°56.66 N21°6.96	50°23.76 S02°34.04	130°40.79 N22°29.96	235°35.62 <b>S</b> 01°53.88
19	252°23.65	138°55.97 6.63	65°24.77 34.69	145°42.73 29.91	250°38.21 53.94
20	267°26.12	153°55.27 6.29	80°25.79 35.35	160°44.66 29.86	265°40.79 54.00
21	282°28.58	168°54.58 · · 5.96	95°26.80 · · 36.00	175°46.60 · · 29.80	280°43.38 · · 54.07
22	297°31.04	183°53.89 5.62	110°27.82 36.65	190°48.53 29.75	295°45.97 54.13
23	312°33.51	198°53.20 5.28	125°28.83 37.31	205°50.46 29.70	310°48.56 54.19
Mer.	pass. 02:13	ν-0.7' d-0.3' m-3.96	$\nu 1.0' \ d0.7' \ m1.62$	$\nu 1.9' \ d$ -0.1' m-1.95	ν2.6' d0.1' m0.71
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Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	327° 35.97	213°52.50 N21°4.94	140°29.85 S02°37.96	220°52.40 N22°29.65	325°51.15 \$01°54.26
1	342°38.44	228°51.81 4.60	155°30.86 38.62	235°54.33 29.60	340°53.74 54.32
2	357°40.90	243°51.12 4.26	170°31.88 39.27	250°56.27 29.54	355°56.33 54.38
3	12°43.36	258°50.43 · · 3.92	185°32.89 · · 39.92	265°58.20 · · 29.49	10°58.92 · · 54.45
4	27°45.83	273°49.74 3.57	200°33.91 40.58	281° 0.14 29.44	26°1.51 54.51
5	42°48.29	288°49.04 3.23	215°34.92 41.23	296°2.07 29.39	41°4.10 54.57
6	57°50.76	303°48.35 N21°2.88	230°35.93	311° 4.01 N22° 29.33	56°6.69 \$01°54.64
7	72°53.22	318° 47.66 2.53	245°36.95 42.54	326° 5.94 29.28	71°9.28 54.70
8	87°55.69 102°58.15	333°46.97 2.19 348°46.28 · · 1.84	260° 37.96 43.19 275° 38.97 · · 43.85	341°7.88 29.23 356°9.81 · · 29.18	86°11.87 54.76 101°14.46 · · 54.83
9	102°58.15 118°0.61				I A
10 11	118°0.61 133°3.08	3°45.59 1.49 18°44.90 1.13	290°39.99 44.50 305°41.00 45.15	11°11.75 29.12 26°13.68 29.07	116°17.05 54.89 131°19.65 54.95
	133° 3.08 148° 5.54	18°44.90 1.13 33°44.20 N21°0.78	300°42.01 \$02°45.81	41°15.62 N22°29.02	131°19.65 54.95 146°22.24 \$01°55.02
12 13	148°5.54 163°8.01	48°43.51 0.43	320°42.01 S02°45.81 335°43.03 46.46	41°15.62 N22°29.02 56°17.56 28.97	146°22.24 S01°55.02 161°24.83 55.08
13 14	163°8.01 178°10.47	48°43.51 0.43 63°42.82 21°0.08	350°44.04 47.12	71°19.49 28.91	161°24.83 55.08 176°27.42 55.15
	178° 10.47 193° 12.94	78°42.13 20°59.72	5°45.05 · · 47.77	86°21.43 · · 28.86	176°27.42 55.15 191°30.01 · · 55.21
15 16	193° 12.94 208° 15.40	93°41.44 59.36	20°46.07 48.43	101°23.37 28.81	206°32.60 55.27
17	208 15.40 223°17.86	93 41.44 59.30 108°40.75 59.01	35°47.08 49.08	101 23.37 28.81 116°25.30 28.75	200 32.00 55.27 221°35.19 55.34
18	223°17.86 238°20.33	123°40.06 N20°58.65	50°48.09 \$02°49.73	131°27.24 N22°28.70	236°37.79 \$01°55.40
19	250° 20.33° 253° 22.79	138°39.37 58.29	65°49.10 50.39	146°29.18 28.65	251°40.38 55.47
20	268°25.26	153°38.68 57.93	80°50.11 51.04	161°31.11 28.60	266°42.97 55.53
21	283°27.72	168°37.99 · · 57.57	95°51.13 · · 51.70	176°33.05 · · 28.54	281°45.56 · · 55.60
22	298°30.18	183°37.30 57.20	110°52.14 52.35	191°34.99 28.49	296°48.15 55.66
23	313°32.65	198°36.61 56.84	125° 53.15 53.00	206°36.92 28.44	311°50.75 55.72
Mer.p	pass. 02:09	$\nu$ -0.7′ <i>d</i> -0.3′ m-3.96	$ u 1.0' \ d0.7' \ m1.62$	$ u 1.9' \ d$ -0.1' m-1.95	$ u 2.6' \; d0.1' \; { m m0.71}$
					<del></del>

	SHA	Dec
Alpheratz	357°33.96	29°13.94
Ankaa	353°6.30	-42°9.74
Schedar	349°30.08 348°46.55	56° 40.57 -17° 50.55
Diphda Achernar	348 40.55 335°19.49	-17 50.55 -57°6.05
Hamal	327°50.49	23°35.03
Polaris	313°43.07	89°22.01
Acamar	$315^{\circ}11.30$	-40°11.77
Menkar	314°5.57	4°11.54
Mirfak Aldebaran	308°27.51 290°39.12	49°56.97 16°33.69
Rigel	290 39.12 281°3.51	-8° 10.13
Capella	280°21.33	46°1.29
Bellatrix	278°22.48	6°22.48
Elnath	278°1.39	28° 37.71
Alnilam Betelgeuse	275°37.37 270°51.72	-1°10.98 7°24.81
Canopus	263°52.53	-52°42.23
Sirius	258°26.03	-16°44.87
Adhara	255°5.75	-29°0.18
Procyon	244°50.58	5°9.66
Pollux Avior	243°17.00 234°15.16	27°57.88 -59°35.31
Suhail	234 15.16 222°46.39	-59 35.31 -43°32.03
Miaplacidus	221°39.15	-69°49.23
Alphard	217°47.58	-8°46.07
Regulus	207°34.22	11°50.62
Dubhe Denebola	193°40.97 182°24.70	61°36.91 14°25.85
Gienah	182 24.70 175°43.32	-17°41.04
Acrux	173°43.32	-63° 14.64
Gacrux	$171^{\circ}51.53$	-57° 15.56
Alioth	166°12.85	55°49.47
Spica	158°21.94 152°51.79	-11° 17.68 49° 11.36
Alkaid Hadar	152°51.79 148°35.55	-60°30.02
Menkent	147°57.17	-36°29.88
Arcturus	145°47.55	19°3.10
Rigil Kent.	139°39.78	-60°56.71
Kochab	137°19.97	74°3.25
Zuben'ubi Alphecca	136°55.51 126°3.30	-16°8.91 26°37.89
Antares	112° 15.12	-26°29.39
Atria	$107^{\circ}8.67$	-69°4.64
Sabik	102°2.05 96°9.46	-15°45.39 -37°7.42
Shaula Rasalhague	95°57.90	-37°7.42 12°32.61
Eltanin	90°41.64	51°29.33
Kaus Aust.	83°31.56	-34°22.38
Vega	80°32.58	38°48.62
Nunki	75°46.84 61°59.16	-26° 15.88 8° 56.28
Altair Peacock	53°4.34	-56°39.15
Deneb	49°25.02	45°22.41
Enif	33°37.97	9°59.66
Al Na'ir	27°31.79	-46°50.08
Fomalhaut Scheat	15°13.59 13°44.38	-29°29.01 28°13.37
Markab	13° 44.36 13° 29.08	26 13.37 15°20.68
	SHA	
Aug 17 Sun Venus	248°48.13	Mer.pass 09:43
Mars	174°3.30	14:40
Jupiter	253°42.01	09:21
Saturn	358°9.30	02:24
Aug 18 Mon	SHA	Mer.pass
Venus	247°32.31	09:44
Mars Jupiter	173°28.63 253°29.18	14:39 09:18
Saturn	358° 12.20	02:20
Aug 19 Tue	SHA	Mer.pass
Venus	246°16.53	09:45
Mars	$172^{\circ}53.88$	14:37
Jupiter	253°16.43 358°15.18	09:15
Saturn		02:16
Horizon	tal parallax Venus:	0.1
	venus: Mars:	0.1

Stars

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.90	N13°24.07	263°53.71	5.0'	N26°4.57	7.3'	59.1'
1 2	193°58.03 208°58.17	23.28 22.48	278°17.74 292°41.70	5.0' 4.9'	26°11.92 26°19.08	7.2' 7.0'	59.1' 59.1'
3	200 50.17 223°58.30	. 21.68	307° 5.59	4.9 4.8'	26°26.08	6.8	59.1'
4	238° 58.44	20.88	321°29.42	4.8'	26°32.90	6.6	59.1'
5	253° 58.57	20.08	335°53.17	4.7'	26°39.54	6.5'	59.0'
6	268°58.71 283°58.84	N13°19.27 18.47	350°16.87 4°40.50	4.6' 4.6'	N26°46.01 26°52.30	6.3' 6.1'	59.0' 59.0'
7 8	283 58.84 298°58.98	18.47	4 40.50 19°4.07	4.6 4.5'	26°58.41	5.9'	59.0'
9	313°59.11	• • 16.87	33°27.58	4.5'	27°4.35	5.8'	59.0'
10	328° 59.25	16.07	47°51.03	4.4'	27°10.10	5.6'	59.0'
11	343°59.38 358°59.52	15.26 N13°14.46	62°14.43 76°37.78	4.3' 4.3'	27°15.67 N27°21.05	5.4' 5.2'	59.0' 59.0'
12 13	358 59.52 13° 59.65	13.66	76°37.78 91°1.07	4.3'	27°26.26	5.2° 5.0°	59.0' 59.0'
14	28° 59.79	12.85	105°24.32	4.2'	27°31.28	4.8'	59.0'
15	43°59.93	•• 12.05	119°47.51	4.2'	27°36.11	4.6'	59.0'
16	59°0.06	11.25	134°10.66	4.1'	27°40.76	4.5'	58.9'
17 18	74°0.20 89°0.34	10.44 N13° 9.64	148°33.77 162°56.84	4.1' 4.0'	27°45.22 N27°49.49	4.3' 4.1'	58.9' 58.9'
19	104°0.48	8.83	102 30.84 177°19.87	4.0'	27°53.58	3.9'	58.9'
20	119°0.61	8.02	191°42.86	4.0'	27°57.48	3.7'	58.9'
21	134°0.75	• • 7.22	206°5.81	3.9'	28°1.19	3.5'	58.9'
22	149°0.89 164°1.03	6.41	220°28.74 234°51.63	3.9'	28°4.71 28°8.04	3.3'	58.9'
23		5.60	234 51.63	3.9'		3.1'	58.9'
	SD = 15.8'	d = -0.8'		SI	O = 16.1'		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°1.17	N13°4.80	249°14.50	3.8'	N28°11.18	2.9'	58.9'
1	194°1.31	3.99	263°37.34	3.8'	28°14.12	2.8'	58.8'
2	209°1.44 224°1.58	3.18 •• 2.37	278° 0.16 292° 22.96	3.8'	28°16.88 28°19.44	2.6' 2.4'	58.8'
3 4	224 1.58 239°1.72	1.56	292 22.96 306°45.74	3.8' 3.8'	28 19.44 28°21.82	2.4	58.8' 58.8'
5	254°1.86	13°0.75	321°8.51	3.8'	28°24.00	2.0'	58.8'
6	269°2.00	N12°59.94	335°31.26	3.7'	N28°25.98	1.8'	58.8'
7	284°2.14	59.13	349°54.01	3.7'	28°27.78	1.6'	58.8'
8 9	299°2.28 314°2.42	58.32 •• 57.51	4°16.74 18°39.47	3.7' 3.7'	28°29.38 28°30.79	1.4' 1.2'	58.8' 58.8'
10	329°2.56	56.70	33°2.20	3.7'	28°32.00	1.0'	58.7'
11	344°2.70	55.89	47°24.93	3.7'	28°33.03	0.8'	58.7'
12	359°2.85 14°2.99	N12°55.08	61°47.66	3.7'	N28°33.85	0.6'	58.7'
13 14	14°2.99 29°3.13	54.27 53.45	76°10.39 90°33.13	3.7' 3.8'	28°34.49 28°34.93	0.4' 0.2'	58.7' 58.7'
15	44°3.27	52.64	104°55.88	3.8'	28°35.18	0.1	58.7
16	59°3.41	51.83	$119^{\circ}18.65$	3.8'	28°35.24	-0.1'	58.7'
17	74°3.55	51.01	133°41.43	3.8'	28°35.10	-0.3'	58.7'
18 19	89°3.70 104°3.84	N12°50.20 49.39	148° 4.23 162° 27.05	3.8' 3.8'	N28°34.77 28°34.25	-0.5' -0.7'	58.6' 58.6'
20	119°3.98	48.57	176°49.89		28°33.54		58.6'
21	134°4.12	• • 47.76	191°12.75	3.9'	28°32.64	-1.1'	58.6'
22	149°4.27	46.94	205°35.65	3.9'	28°31.54	-1.3'	58.6'
23	164°4.41	46.13	219°58.57	4.0'	28°30.26	-1.5'	58.6'
	SD = 15.8'	d = -0.8'		SI	O = 16.1'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°4.55	N12°45.31	234°21.53	4.0'	N28°28.78	-1.7'	58.6'
1	194°4.70	44.49	248°44.52	4.0'	28°27.12	-1.9'	58.5'
2	209°4.84 224°4.99	43.68 •• 42.86	263°7.55 277°30.62	4.1' 4.1'	28°25.26 28°23.22	-2.0' -2.2'	58.5' 58.5'
4	239°5.13	42.04	291°53.74	4.2'	28°20.99	-2.4'	58.5'
5	254°5.27	41.22	$306^{\circ}16.90$	4.2'	$28^{\circ}18.57$	-2.6'	58.5'
6	269°5.42	N12°40.41	320°40.10	4.3'	N28°15.97	-2.8'	58.5'
7 8	284°5.56 299°5.71	39.59 38.77	335°3.36 349°26.67	4.3' 4.4'	28°13.18 28°10.20	-3.0' -3.2'	58.5' 58.4'
9	314°5.85	37.95	3°50.03	4.4 4.4'	28°7.05	-3.2' -3.3'	58.4'
10	329°6.00	37.13	$18^{\circ}13.45$	4.5'	28°3.70	-3.5'	58.4'
11	344°6.15	36.31	32°36.93	4.5'	28°0.18	-3.7'	58.4'
12 13	359°6.29 14°6.44	N12°35.49 34.67	47°0.47 61°24.07	4.6' 4.7'	N27°56.47 27°52.59	-3.9' -4.1'	58.4' 58.4'
13 14	14 ° 6.44 29 ° 6.58	34.67 33.85	61°24.07 75°47.74	4.7' 4.7'	27°52.59 27°48.52	-4.1 -4.2'	58.4' 58.4'
15	44°6.73	• • 33.03	90°11.47	4.8'	27°44.28	-4.4'	58.3'
16	59°6.88	32.21	104°35.27	4.9'	27°39.85	-4.6'	58.3'
17	74°7.02	31.38	118°59.15	4.9'	27°35.26	-4.8'	58.3'
18 19	89°7.17 104°7.32	N12°30.56 29.74	133°23.09 147°47.12	5.0' 5.1'	N27°30.48 27°25.53	-4.9' -5.1'	58.3' 58.3'
20	119°7.47	28.92	162°11.22	5.2'	27°20.41	-5.1 -5.3'	58.3
21	134°7.61	• • 28.09	176°35.39	5.3'	$27^{\circ}15.12$	-5.5'	58.2'
22	149°7.76	27.27	190°59.65	5.3'	27°9.65	-5.6'	58.2'
23	164°7.91	26.44	205°23.99	5.4'	27°4.02	-5.8'	58.2'
	SD = 15.8'	d = -0.8'		SI	O = 16.0'		

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

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

		Sun			Moon	
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
- 4,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	24-26
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	41-20%
17	04:08	04:02	12:04	06:41	19:11	
18	03:55	03:49	12:04	07:42	20:13	
10	03.42	03.35	12.04	08.44	21.14	

### August 20, 21, 22 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	328°35.11	213°35.92 N20°56.48	140°54.16	221°38.86 N22°28.39	326°53.34 S01°55.79	
1	343°37.58	228°35.23 56.11	155°55.17 54.31	236°40.80 28.33	341°55.93 55.85	Alpheratz 357°33.94
2	358° 40.04	243°34.54 55.74	170°56.18 54.97	251°42.74 28.28	356°58.52 55.92	Ankaa 353° 6.28
3	13° 42.51	258°33.85 · · 55.38	185°57.20 · · 55.62	266°44.68 · · 28.23	12°1.12 · · 55.98	Schedar 349°30.05
4	28° 44.97	273°33.16 55.01	200°58.21 56.27	281°46.61 28.17	27°3.71 56.05	Diphda 348°46.52
5	43° 47.43	288° 32.47 54.64	215°59.22 56.93	296°48.55 28.12	42°6.30 56.11	Achernar 335°19.45
6	58° 49.90	303°31.79 N20°54.27	231°0.23 S02°57.58	311°50.49 N22°28.07	57°8.89 S01°56.18	Hamal 327°50.46
7	73°52.36	318°31.10 53.90	246°1.24 58.24	326°52.43 28.02	72°11.49 56.24	Polaris 313°41.34
8	88° 54.83	333°30.41 53.52	261°2.25 58.89	341°54.37 27.96	87°14.08 56.30	Acamar 315°11.27
9	103°57.29	348°29.72 · · 53.15	276°3.26 02°59.54	356°56.31 · · 27.91	102°16.67 · · 56.37	Menkar 314° 5.54
10	118°59.75	3°29.03 52.78	291°4.27 03°0.20	11°58.25 27.86	117°19.27 56.43	Mirfak 308°27.47
11	134°2.22	18°28.34 52.40	306°5.28 0.85	27°0.19 27.81	132°21.86 56.50	Aldebaran 290°39.09
12	149°4.68	33°27.65 N20°52.02	321°6.29 <b>S</b> 03°1.51	42°2.12 N22°27.75	147°24.46	Rigel 281° 3.48
13	164°7.15	48°26.97 51.65	336°7.30 2.16	57°4.06 27.70	162°27.05 56.63	Capella 280°21.29
14	179°9.61	63°26.28 51.27	351°8.31 2.82	72°6.00 27.65	177°29.64 56.69	Bellatrix 278°22.45
15	194°12.08	78°25.59 · · 50.89	6°9.32 · · 3.47	87°7.94 · · 27.59	192°32.24 · · 56.76	Elnath 278° 1.36
16	209° 14.54	93°24.90 50.51	21°10.33 4.12	102°9.88 27.54	207°34.83 56.82	Alnilam 275°37.35
17	224° 17.00	108°24.21 50.12	36°11.34 4.78	117°11.82 27.49	222°37.43 56.89	Betelgeuse 270°51.69
18	239° 19.47	123°23.53 N20°49.74	51°12.34 <b>S</b> 03°5.43	132°13.76 N22°27.43	237°40.02 S01°56.95	Canopus 263°52.50 Sirius 258°26.01
19	254°21.93	138°22.84 49.36	66° 13.35 6.09	147°15.70 27.38	252°42.62 57.02	
20	269°24.40	153°22.15 48.97	81°14.36 6.74	162°17.64 27.33	267°45.21 57.08	Adhara 255° 5.73 Procyon 244° 50.56
21	284°26.86	168°21.46 · · 48.59	96°15.37 · · 7.40	177°19.58 · · 27.28	282°47.80 · · 57.15	Pollux 243°16.98
22	299°29.32	183°20.78 48.20	111°16.38 8.05	192°21.53 27.22	297°50.40 57.22	Avior 234°15.14
23	314°31.79	198°20.09 47.81	126° 17.39 8.70	207°23.47 27.17	312°52.99 57.28	Suhail 222°46.38
Marr	pass. 02:05	$\nu$ -0.7' d-0.4' m-3.96	ν1.0' d0.7' m1.62	ν1.9' d-0.1' m-1.96	$\nu 2.6' \ d0.1' \ m0.71$	Miaplacidus 221°39.14
10161.	Jass. 02.03	ν-0.1 α-0.4 III-3.90	V1.0 d0.7 III1.02	ν1.9 d-0.1 III-1.90	- V2.0 U0.1 III0.71	Alphard 217°47.57
						Regulus 207°34.20
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.96
0	$329^{\circ}34.25$	213°19.40 N20°47.42	141°18.40 <b>S</b> 03°9.36	222°25.41 N22°27.12	327°55.59 <b>S</b> 01°57.35	Denebola 182°24.69
1	344°36.72	228° 18.72 47.03	156° 19.40 10.01	237°27.35 27.06	342°58.19 57.41	Gienah 175°43.32
2	359°39.18	243°18.03 46.64	171°20.41 10.67	252°29.29 27.01	358°0.78 57.48	Acrux 173 45.52
3	14°41.65	258° 17.34 · · 46.25	186°21.42 · · 11.32	267°31.23 · · 26.96	13°3.38 · · 57.54	Gacrux 171°51.54
4	29°44.11	273°16.66 45.86	201°22.43 11.97	282°33.17 26.90	28°5.97 57.61	Alioth 166°12.86
5	44° 46.57	288° 15.97 45.46	216°23.43 12.63	297°35.11 26.85	43°8.57 57.67	Spica 158°21.94
6	59°49.04	303°15.29 N20°45.07	231°24.44 <b>S</b> 03°13.28	312°37.06 N22°26.80	58°11.16 <b>S</b> 01°57.74	Alkaid 152°51.81
7	74°51.50	318° 14.60 44.67	246°25.45 13.94	327°39.00 26.75	73°13.76 57.80	Hadar 148°35.56
8	89°53.97	333°13.91 44.27	261°26.46 14.59	342°40.94 26.69	88°16.36 57.87	Menkent 147°57.17
9	104°56.43	348°13.23 · · 43.88	276°27.46 · · 15.25	357°42.88 · · 26.64	103°18.95 · · 57.94	Arcturus 145°47.55
10	119°58.89	3°12.54 43.48	291°28.47 15.90	12°44.82 26.59	118°21.55 58.00	Rigil Kent. 139°39.80
11	135°1.36	18°11.86 43.08	306°29.48 16.55	27°46.77 26.53	133°24.14 58.07	Kochab 137°20.03
12	150°3.82	33°11.17 N20°42.67	321°30.48 <b>S</b> 03°17.21	42°48.71 N22°26.48	148°26.74 S01°58.13	Zuben'ubi 136°55.51
13	165°6.29	48° 10.49 42.27	336°31.49 17.86	57°50.65 26.43	163°29.34 58.20	Alphecca 126°3.30
14	180°8.75	63°9.80 41.87	351°32.50 18.52	72°52.60 26.37	178°31.93 58.27	Antares 112° 15.12
15	195°11.22	78°9.12 · · 41.47	6°33.50 · · 19.17	87°54.54 · · 26.32	193°34.53 · · 58.33	Atria 107° 8.69
16	210° 13.68	93°8.43 41.06	21°34.51 19.83	102°56.48 26.27	208°37.13 58.40	Sabik 102° 2.06
17	225°16.14	108°7.75 40.65	36°35.51 20.48	117°58.43 26.21	223°39.72 58.46	Shaula 96° 9.47
18	240° 18.61	123°7.06 N20°40.25	51°36.52 S03°21.13	133°0.37 N22°26.16	238°42.32 S01°58.53	Rasalhague 95°57.91
19	255°21.07	138°6.38 39.84	66° 37.52 21.79	148° 2.31 26.11	253°44.92 58.60	Eltanin 90°41.66
20	270°23.54	153°5.70 39.43	81°38.53 22.44	163° 4.26 26.05	268°47.52 58.66	Kaus Aust. 83°31.56
21	285°26.00	168°5.01 · · 39.02	96°39.53 · · 23.10	178° 6.20 · · 26.00	283°50.11 · · 58.73	Vega 80°32.59
22	300°28.46	183°4.33 38.61	111°40.54 23.75	193°8.15 25.95	298°52.71 58.80	Nunki 75°46.84
23	315°30.93	198°3.64 38.19	126°41.54 24.41	208°10.09 25.89	313°55.31 58.86	Altair 61°59.16
Mer.p	pass. 02:01	$\nu$ -0.7' d-0.4' m-3.96	$ u 1.0' \ d0.7' \ m1.62$	$ u 1.9' \; d ext{-}0.1' \;  ext{m-}1.96$	$ u 2.6' \ d0.1' \ m0.70$	Peacock 53°4.33
						Deneb 49°25.02
	CILA	CIIA D	CIIA D	CIIA D	CIIA D	Enif 33°37.96
Fri	<b>GHA</b> 330°33.39	<b>GHA Dec</b> 213°2.96 N20°37.78	<b>GHA Dec</b> 141° 42.55 \$03° 25.06	<b>GHA Dec</b> 223°12.03 N22°25.84	<b>GHA Dec</b> 328°57.91 <b>S</b> 01°58.93	Al Na'ir 27°31.77
0 1	330 33.39 345°35.86	213°2.96 N20°37.78 228°2.28 37.37	156°43.55 25.71	238°13.98 25.79	344°0.51 58.99	Fomalhaut 15°13.58
2	0°38.32	243°1.60 36.95	171° 44.56 26.37	253°15.92 25.73	359°3.10 59.06	Scheat 13°44.36
3	15° 40.78	258°0.91 · · 36.53	186° 45.56 · · 27.02	268°17.87 · · 25.68	14°5.70 · · 59.13	Markab 13°29.07
4	30°43.25	273°0.23 36.12	201° 46.57 27.68	283°19.81 25.63	29°8.30 59.19	Aug 20 Wed SHA
5	45° 45.71	287°59.55 35.70	216° 47.57 28.33	298°21.76 25.57	44°10.90 59.26	Venus 245° 0.81
6	60°48.18	302°58.86 N20°35.28	231°48.58 \$03°28.99	313°23.70 N22°25.52	59°13.50 S01°59.33	Mars 172°19.05
7	75°50.64	317°58.18 34.86	246°49.58 29.64	328°25.65 25.47	74°16.10 59.39	Jupiter 253°3.75
8	90°53.11	332°57.50 34.44	261°50.58 30.29	343°27.59 25.41	89°18.69 59.46	Saturn 358°18.22
9	105°55.57	347°56.82 · · 34.01	276°51.59 · · 30.95	358°29.54 · · 25.36	104°21.29 · · 59.53	
10	120°58.03	2°56.14 33.59	291°52.59 31.60	13°31.49 25.31	119°23.89 59.59	Aug 21 Thu SHA
11	136°0.50	17°55.45 33.17	306°53.59 32.26	28°33.43 25.25	134°26.49 59.66	Venus 243°45.15
12	151°2.96	32°54.77 N20°32.74	321°54.60 S03°32.91	43°35.38 N22°25.20	149°29.09 S01°59.73	Mars 171°44.14
13	166°5.43	47°54.09 32.31	336°55.60 33.57	58°37.33 25.15	164°31.69 59.80	Jupiter 252°51.15
14	181°7.89	62°53.41 31.89	351°56.60 34.22	73°39.27 25.09	179°34.29 59.86	Saturn 358°21.34
15	196° 10.35	77°52.73 · · 31.46	6°57.60 · · 34.87	88°41.22 · · 25.04	194°36.89 01°59.93	Aug 22 Fri SHA
16	211° 12.82	92°52.05 31.03	21°58.61 35.53	103°43.17 24.99	209°39.49 02°0.00	Venus 242°29.57
17	226° 15.28	107°51.37 30.60	36°59.61 36.18	118°45.11 24.93	224°42.09 0.06	Mars 171° 9.16
18	241° 17.75	122°50.69 N20°30.17	52°0.61 <b>S</b> 03°36.84	133°47.06 N22°24.88	239°44.69	Jupiter 252°38.64
19	256° 20.21	137°50.01 29.73	67°1.61 37.49	148°49.01 24.82	254°47.29 0.20	Saturn 358°24.52
20	271°22.67	152°49.33 29.30	82°2.62 38.15	163°50.95 24.77	269°49.89 0.27	
21	$286^{\circ}25.14$	167°48.65 · · 28.87	97°3.62 · · 38.80	178°52.90 · · 24.72	284°52.49 · · 0.33	Horizontal parallax
22	301°27.60	182°47.97 28.43	112°4.62 39.45	193°54.85 24.66	299°55.09 0.40	Venus:
23	$316^{\circ}30.07$	197°47.29 27.99	127°5.62 40.11	208°56.80 24.61	314°57.69 0.47	Mars:
Merr	pass. 01:57	ν-0.7' d-0.4' m-3.96	ν1.0' d0.7' m1.62	ν1.9' d-0.1' m-1.96	$\nu 2.6' \ d0.1' \ m0.70$	
		- U U U U U U U U U U U U U U U U U U U		ν 1.5 G U.1 III-1.5U	ν Σ.Ο αΟ.Ι IIIΟ.ΙΟ	

	SHA	Dec
Alpheratz	357°33.94	29°13.96
Ankaa	353°6.28	-42°9.74
Schedar	349°30.05	56°40.59
Diphda Achernar	348°46.52 335°19.45	-17°50.54 -57°6.05
Hamal	327°50.46	23°35.04
Polaris	$313^{\circ}41.34$	89°22.02
Acamar	315°11.27	-40°11.76
Menkar	314°5.54 308°27.47	4°11.55 49°56.98
Mirfak Aldebaran	308 27.47 290°39.09	49 56.98 16°33.70
Rigel	281°3.48	-8°10.12
Capella	$280^{\circ}21.29$	$46^{\circ}1.30$
Bellatrix	278°22.45	6°22.49
Elnath Alnilam	278°1.36 275°37.35	28°37.72 -1°10.98
Betelgeuse	270°51.69	7°24.81
Canopus	263°52.50	-52°42.22
Sirius	258°26.01	-16°44.87
Adhara Procyon	255° 5.73 244° 50.56	-29°0.17 5°9.67
Pollux	244° 30.30 243° 16.98	27°57.88
Avior	$234^{\circ}15.14$	-59°35.29
Suhail	222°46.38	-43°32.02
Miaplacidus	221°39.14 217°47.57	-69°49.22 -8°46.07
Alphard Regulus	217°47.57 207°34.20	-8°46.07 11°50.62
Dubhe	193°40.96	61°36.89
Denebola	$182^{\circ}24.69$	$14^{\circ}25.85$
Gienah	175°43.32 173°0.10	-17°41.04 -63°14.63
Acrux Gacrux	173 0.10 171°51.54	-03 14.03 -57°15.55
Alioth	166°12.86	55°49.46
Spica	158°21.94	-11°17.68
Alkaid Hadar	152°51.81 148°35.56	49°11.35 -60°30.02
Menkent	146 55.50 147°57.17	-36°29.88
Arcturus	$145^{\circ}47.55$	19°3.09
Rigil Kent.	139°39.80	-60°56.71
Kochab Zuben'ubi	137°20.03 136°55.51	74°3.24 -16°8.91
Alphecca	126°3.30	26°37.89
Antares	112°15.12	-26°29.39
Atria Sabik	107°8.69 102°2.06	-69°4.65 -15°45.39
Shaula	96° 9.47	-37°7.43
Rasalhague	$95^{\circ}57.91$	$12^{\circ}32.61$
Eltanin Kaus Aust.	90°41.66 83°31.56	51°29.34 -34°22.39
Vega	80°32.59	-34 22.39 38°48.63
Nunki	75°46.84	-26°15.88
Altair	61°59.16	8°56.28
Peacock Deneb	53°4.33 49°25.02	-56°39.16 45°22.43
Deneb Enif	49 25.02 33°37.96	45 22.43 9°59.67
Al Na'ir	27°31.77	-46°50.09
Fomalhaut	15°13.58	-29°29.01
Scheat	13°44.36 13°29.07	28°13.38 15°20.69
Markab		15 20.09
Aug 20 Wed	SHA	Mer.pass
Venus Mars	245°0.81 172°19.05	09:46 14:35
Jupiter	253°3.75	09:12
Saturn	358°18.22	02:12
Aug 21 Thu	SHA	Mer.pass
Venus	$243^{\circ}45.15$	09:47
Mars	171°44.14 252°51.15	14:34
Jupiter Saturn	252°51.15 358°21.34	09:09 02:08
Aug 22 Fri	SHA	Mer.pass
Venus	242°29.57	09:48
Mars	$171^{\circ}9.16$	14:32
Jupiter	252°38.64	09:06
Saturn	358°24.52	02:04
Horizon	ital parallax	0.1
	Venus: Mars:	0.1 0.1
1		

Dec

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°8.06	N12°25.62	$219^{\circ}48.42$	5.5'	N26°58.22	-6.0'	58.2'
1	194°8.21	24.80	234°12.92	5.6'	26°52.25	-6.1'	58.2'
2	209°8.36 224°8.51	23.97 •• 23.14	248°37.52 263°2.20	5.7' 5.8'	26°46.12 26°39.82	-6.3' -6.5'	58.2' 58.1'
4	239° 8.65	22.32	277°26.98	5.9'	26°33.35	-6.6'	58.1'
5	254°8.80	21.49	291°51.84	6.0'	$26^{\circ}26.73$	-6.8'	58.1'
6	269°8.95	N12°20.67	306°16.80	6.1'	N26°19.95	-6.9'	58.1'
7 8	284° 9.10 299° 9.25	19.84 19.01	320°41.85 335°7.00	6.1' 6.2'	26°13.01 26°5.91	-7.1' -7.3'	58.1' 58.1'
9	314° 9.40	. 18.19	349°32.24	6.3'	25°58.65	-7.4'	58.0'
10	329° 9.55	17.36	3°57.58	6.4'	25°51.24	-7.6'	58.0'
11	344° 9.70	16.53	18°23.02	6.5'	25°43.68	-7.7'	58.0'
12 13	359° 9.86 14° 10.01	N12°15.70 14.87	32°48.56 47°14.20	6.6' 6.7'	N25°35.96 25°28.10	-7.9' -8.0'	58.0' 58.0'
14	29°10.16	14.04	61°39.94	6.8'	25°20.09	-8.2'	58.0'
15	44°10.31	• • 13.21	76°5.78	6.9'	25°11.93	-8.3'	57.9'
16	59°10.46	12.38	90°31.72	7.0'	25°3.62	-8.4'	57.9'
17	74°10.61 89°10.76	11.55 N12°10.72	104°57.77 119°23.93	7.2'	24°55.17 N24°46.58	-8.6'	57.9'
18 19	89°10.76 104°10.92	N12 10.72 9.89	119°23.93 133°50.19	7.3' 7.4'	24° 37.85	-8.7' -8.9'	57.9' 57.9'
20	119°11.07	9.06	148°16.55	7.5	24° 28.98	-0.9 -9.0'	57.8'
21	134°11.22	• • 8.23	162°43.03	7.6'	24°19.97	-9.1'	57.8'
22	149°11.37	7.40	177°9.61	7.7'	24°10.83	-9.3'	57.8'
23	164°11.53	6.57	191°36.30	7.8'	24°1.55	-9.4'	57.8'
	SD = 15.8'	d = -0.8'		SI	O = 15.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.68	N12°5.73	$206^{\circ}3.09$	7.9'	N23°52.14	-9.5'	57.8'
1	194°11.83	4.90	220°30.00	8.0'	23°42.60	-9.7'	57.7'
2	209°11.99	4.07	234°57.01	8.1'	23°32.93	-9.8'	57.7'
3 4	224°12.14 239°12.30	· · 3.23 2.40	249°24.13 263°51.37	8.2' 8.3'	23°23.13 23°13.21	-9.9' -10.0'	57.7' 57.7'
5	254°12.45	1.56	278°18.71	8.5'	23°3.16	-10.2'	57.7'
6	269°12.60	N12°0.73	292°46.16	8.6'	N22°52.99	-10.3'	57.6'
7	284°12.76	11°59.90	307°13.72	8.7'	22°42.70	-10.4'	57.6'
8 9	299°12.91 314°13.07	59.06 •• 58.22	321°41.40 336°9.18	8.8' 8.9'	22°32.29 22°21.76	-10.5' -10.6'	57.6' 57.6'
10	329°13.22	57.39	350° 37.08	9.0'	22°11.11	-10.6' -10.8'	57.6'
11	344°13.38	56.55	5°5.08	9.1'	22°0.35	-10.9'	57.5'
12	359°13.53	N11°55.72	19°33.19	9.2'	N21°49.48	-11.0'	57.5'
13 14	14°13.69 29°13.85	54.88 54.04	34°1.42 48°29.75	9.3' 9.4'	21°38.50 21°27.41	-11.1' -11.2'	57.5' 57.5'
14 15	29 13.85 44°14.00	. 53.20	48 29.75 62°58.20	9.4 9.6'	21 27.41 21°16.21	-11.2 -11.3'	57.5'
16	59°14.16	52.37	77°26.75	9.7'	21°4.90	-11.4'	57.4'
17	74°14.31	51.53	$91^{\circ}55.42$	9.8'	$20^{\circ}53.49$	-11.5'	57.4'
18	89°14.47	N11°50.69	106°24.19	9.9'	N20°41.98	-11.6'	57.4'
19 20	104°14.63 119°14.79	49.85 49.01	120°53.07 135°22.06	10.0' 10.1'	20°30.37 20°18.66	-11.7'	57.4' 57.4'
21	134°14.94	• • 48.17	149°51.16	10.1	20°6.85	-11.0 -11.9'	57.4°
22	149°15.10	47.33	164°20.37	10.3'	19°54.94	-12.0'	57.3'
23	164°15.26	46.49	178°49.68	10.4'	19°42.94	-12.1'	57.3'
	SD = 15.8'	d = -0.8'		SI	O = 15.8'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°15.42	N11°45.65	193°19.10	10.5'	N19°30.85	-12.2'	57.3'
1 2	194°15.57 209°15.73	44.81 43.97	207°48.63 222°18.26	10.6' 10.7'	19°18.66 19°6.39	-12.3' -12.4'	57.2' 57.2'
3	209°15.73 224°15.89	43.97 · · 43.13	222°18.26 236°48.00	10.7	19° 6.39 18° 54.03	-12.4 -12.4'	57.2'
4	239°16.05	42.29	251°17.84	10.0	18°41.58	-12.5'	57.2
5	254°16.21	41.45	265°47.79	11.1'	18°29.05	-12.6'	57.2'
6	269°16.37 284°16.53	N11°40.60 39.76	280°17.84 294°47.99	11.2'	N18°16.43 18°3.74	-12.7'	57.1'
7 8	284°16.53 299°16.69	39.76 38.92	294°47.99 309°18.25	11.3' 11.4'	18°3.74 17°50.96	-12.8' -12.9'	57.1' 57.1'
9	314°16.85	38.07	323°48.60	11.5'	17°38.11	-12.9'	57.1
10	329°17.01	37.23	338°19.06	11.6'	17°25.17	-13.0'	57.0'
11	344°17.17	36.39	352°49.62	11.7'	17°12.17	-13.1'	57.0'
12 13	359°17.33 14°17.49	N11°35.54 34.70	7°20.27 21°51.03	11.8' 11.9'	N16°59.09 16°45.93	-13.2' -13.2'	57.0' 57.0'
13 14	29°17.65	33.85	36°21.88	11.9'	16°32.71	-13.2 -13.3'	57.0'
15	44°17.81	• • 33.01	50°52.83	12.0'	16°19.42	-13.4'	56.9'
16	59°17.97	32.16	65°23.87	12.1'	16°6.06	-13.4'	56.9'
17	74°18.13 89°18.29	31.32 N11°30.47	79°55.01 94°26.25	12.2' 12.3'	15°52.64 N15°39.15	-13.5'	56.9'
18 19	89° 18.29 104° 18.45	N11°30.47 29.62	94°26.25 108°57.58	12.4'	N15°39.15 15°25.59	-13.6' -13.6'	56.9' 56.8'
20	119°18.61	28.78	123°29.00	12.5'	15°11.98	-13.7	56.8'
21	134°18.78	• • 27.93	$138^{\circ}0.51$	12.6'	14°58.30	-13.7'	56.8'
22	149°18.94	27.08	152°32.11	12.7'	14°44.57	-13.8'	56.8'
23	164°19.10	26.23	167°3.80	12.8'	14°30.78	-13.8'	56.7'
	SD = 15.8'	d = -0.8'		SI	O = 15.6'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	27-29	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	12-2%	
20	03:28	03:21	12:03	09:44	22:12		
21	03:13	03:06	12:03	10:39	23:05		
22	02:58	02:51	12:03	11:30	23:53		

h	Aries	Venu	us	M	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	331°32.53		N20°27.56	142°6.62	503°40.76	223°58.74	N22°24.56	330°0.29	<b>S</b> 02°0.53	A laste a sector		
1	346°34.99	227°45.93	27.12	157°7.62	41.42	239°0.69	24.50	345°2.89	0.60	Alpheratz	357°33.93	29°13.97
2	1°37.46	242°45.25	26.68	172°8.62	42.07	254°2.64	24.45	0°5.49	0.67	Ankaa Schedar	353°6.26 349°30.03	-42° 9.74 56° 40.60
3	$16^{\circ}39.92$	257°44.57	• • 26.24	$187^{\circ}9.63$	• • 42.73	269°4.59	• • 24.40	15°8.09	• • 0.74	Diphda	349° 30.03	-17°50.54
4	31°42.39	272°43.89	25.79	202°10.63	43.38	284°6.54	24.34	30°10.69	0.80	Achernar	335°19.42	-57° 6.06
5	46° 44.85	287°43.21	25.35	217°11.63	44.03	299°8.49	24.29	45°13.29	0.87	Hamal	327°50.44	23°35.05
6	61°47.32		N20°24.91	232°12.63	S03°44.69	314°10.44	N22°24.23	60°15.89	S02°0.94	Polaris	313°39.92	89°22.03
7	76°49.78	317°41.85	24.46	247°13.63	45.34	329°12.38	24.18	75°18.49	1.01	Acamar	315°11.25	-40°11.76
8	91°52.24	332°41.18	24.02	262°14.63	46.00	344°14.33	24.13	90°21.10	1.07	Menkar	314°5.52	4°11.56
9	106°54.71	347°40.50	• • 23.57	277°15.63	• • 46.65	359°16.28	• • 24.07	105°23.70	. 1.14	Mirfak	308°27.44	49°56.99
10	121°57.17	2°39.82	23.12	292°16.63 307°17.63	47.31	14°18.23	24.02	120°26.30 135°28.90	1.21	Aldebaran	290°39.07	16°33.70
11 12	136° 59.64 152° 2.10	17°39.14 32°38.46	22.67 N20°22.23	307 17.03 322° 18.63	47.96 \$03°48.61	29°20.18 44°22.13	23.97 N22°23.91	155° 26.90 150° 31.50	1.28 \$02°1.35	Rigel	281°3.46	-8°10.12
13	167°4.56	47°37.79	21.77	337° 19.63	49.27	59°24.08	23.86	165°34.10	1.41	Capella	280°21.26	46°1.30
14	182°7.03	62°37.11	21.32	352°20.63	49.92	74°26.03	23.81	180°36.71	1.48	Bellatrix	278°22.43	6°22.49
15	197°9.49	77°36.43	20.87	7°21.63	50.58	89°27.98	23.75	195°39.31	• • 1.55	Elnath	278°1.34	28°37.72
16	212° 11.96	92°35.76	20.42	22°22.62	51.23	104°29.93	23.70	210°41.91	1.62	Alnilam	275°37.32	-1°10.97
17	$227^{\circ}14.42$	107°35.08	19.96	37°23.62	51.89	119°31.88	23.64	$225^{\circ}44.51$	1.69	Betelgeuse	270°51.67	7°24.82
18	242°16.88	122°34.40	N20°19.51	52°24.62	S03°52.54	134°33.83	N22°23.59	240°47.11	S02°1.75	Canopus Sirius	263°52.48 258°25.99	-52°42.21 -16°44.86
19	$257^{\circ}19.35$	137°33.73	19.05	67°25.62	53.19	149°35.79	23.54	255°49.72	1.82	Adhara	255° 5.71	-10 44.80 -29°0.15
20	272°21.81	152°33.05	18.59	82°26.62	53.85	164°37.74	23.48	270°52.32	1.89	Procyon	244°50.54	5°9.67
21	287°24.28	167°32.37	• • 18.13	97°27.62	• • 54.50	179°39.69	• • 23.43	285°54.92	• • 1.96	Pollux	243°16.96	27°57.88
22	302°26.74	182°31.70	17.67	112°28.62	55.16	194°41.64	23.37	300°57.53	2.03	Avior	234°15.13	-59°35.28
23	317°29.20	197°31.02	17.21	127°29.61	55.81	209°43.59	23.32	316°0.13	2.09	Suhail	222°46.37	-43°32.01
Mer.	pass. 01:54	$\nu$ -0.7' d-0.4	1′ m-3.96	$\nu 1.0' \ d0.$	.7′ m1.62	$\nu 1.9' \ d-0$	.1′ m-1.96	$\nu$ 2.6′ d0.	1′ m0.69	Miaplacidus	221°39.14	-69°49.20
										Alphard	217°47.56	-8°46.06
•	CIIA	CHA		CIIA	Б	CIIA	Б	CIIA	Б	Regulus	$207^{\circ}34.21$	11°50.62
Sun	<b>GHA</b> 332°31.67	<b>GHA</b> 212°30.35	<b>Dec</b> N20°16.75	<b>GHA</b> 142°30.61	Dec	<b>GHA</b> 224° 45.54	Dec N22°23.27	<b>GHA</b> 331°2.73	<b>Dec</b> \$02°2.16	Dubhe	193°40.96	61°36.88
0 1	347°34.13	212 30.35 T	16.29	142 30.01 157°31.61	\$03°56.47 57.12	239°47.49	23.21	331 2.73 346°5.33	2.23	Denebola	182°24.69	14°25.85
2	2°36.60	242°29.00	15.82	172° 32.61	57.12 57.77	254°49.45	23.16	1°7.94	2.23	Gienah	175°43.32	-17°41.03
3	17°39.06	257°28.32	• 15.36	187° 33.60	• 58.43	269°51.40	23.11	16°10.54	• • 2.37	Acrux	173°0.12	-63°14.62
4	32°41.52	272°27.65	14.89	202°34.60	59.08	284°53.35	23.05	31°13.14	2.44	Gacrux	171°51.56	-57°15.54
5	47°43.99	287°26.97	14.43	217°35.60	03°59.74	299°55.30	23.00	46°15.75	2.51	Alioth	166°12.87	55°49.45
6	62°46.45		N20°13.96	232°36.60	S04°0.39	314°57.25	N22°22.94	61°18.35	S02°2.57	Spica	158°21.95	-11°17.68
7	77°48.92	$317^{\circ}25.62$	13.49	247° 37.59	1.04	329°59.21	22.89	76°20.96	2.64	Alkaid Hadar	152°51.82 148°35.59	49°11.34 -60°30.01
8	92°51.38	332°24.95	13.02	262°38.59	1.70	$345^{\circ}1.16$	22.84	91°23.56	2.71		146 35.59 147°57.19	-36°29.87
9	107°53.84	347°24.28	• • 12.55	277°39.59	• • 2.35	0°3.11	• • 22.78	$106^{\circ}26.16$	• • 2.78	Arcturus	145°47.56	19°3.09
10	122°56.31	2°23.60	12.08	292°40.58	3.01	15°5.07	22.73	121°28.77	2.85	Rigil Kent.	139°39.83	-60°56.70
11	137°58.77	17°22.93	11.61	307°41.58	3.66	30°7.02	22.67	136°31.37	2.92	Kochab	137°20.08	74° 3.23
12	153°1.24		N20°11.13	322°42.57	504°4.31	45°8.97	N22°22.62	151°33.98	S02°2.99	Zuben'ubi	136°55.53	-16°8.91
13	168°3.70	47°21.58	10.66	337°43.57	4.97	60°10.93	22.57	166°36.58	3.05	Alphecca	126°3.32	26°37.89
14	183°6.16	62°20.91	10.18	352°44.57	5.62	75°12.88	22.51	181°39.18	3.12	Antares	$112^{\circ}15.13$	-26°29.39
15	198°8.63	77°20.24	• • 9.70	7°45.56	• • 6.28	90°14.83	• • 22.46	196°41.79	3.19	Atria	107°8.73	-69°4.65
16 17	213° 11.09 228° 13.56	92°19.57 107°18.89	9.23 8.75	22°46.56 37°47.55	6.93 7.59	105°16.79 120°18.74	22.40 22.35	211°44.39 226°47.00	3.26 3.33	Sabik	102°2.07	-15°45.39
18	243° 16.02		N20° 8.27	52° 48.55	504°8.24	135°20.70	N22°22.30	241°49.60	502°3.40	Shaula	96°9.48	-37°7.43
19	258° 18.49	137° 17.55	7.79	67°49.54	8.89	150°22.65	22.24	256°52.21	3.47	Rasalhague	95°57.92	12°32.62
20	273°20.95	152° 16.88	7.31	82°50.54	9.55	165°24.61	22.19	271°54.81	3.54	Eltanin	90°41.68	51°29.34
21	288°23.41	167° 16.21	. 6.82	97°51.53	· · 10.20	180°26.56	22.13	286°57.42	3.61	Kaus Aust.	83°31.57	-34°22.39
22	303°25.88	182°15.54	6.34	112°52.53	10.86	195°28.52	22.08	302°0.02	3.68	Vega	80°32.60	38°48.63 -26°15.89
23	318°28.34	197°14.86	5.86	127°53.52	11.51	210°30.47	22.02	317°2.63	3.74	Nunki Altair	75°46.85 61°59.17	8°56.29
N/au =	pass. 01:50	$\nu$ -0.7' d-0.5	7 2.06	1 0/ 40	.7′ m1.62	2 0/ -/ 0	.1′ m-1.97	$\nu 2.6' d0.$	1/0 60	Peacock	53°4.33	-56°39.17
- Ivier.	Jass. 01.50	ν-0.1 α-0.5		$\nu_{1.0}$ $u_{0.}$	.7 1111.02	ν2.0 <b>u</b> -0	.1 111-1.97	ν2.0 do.		Deneb	49°25.03	45°22.44
										Enif	33°37.96	9°59.68
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.76	-46°50.10
0	333°30.81	212°14.19	N20°5.37		S04°12.16	225°32.43	N22°21.97	332°5.23	S02°3.81	Fomalhaut	$15^{\circ}13.56$	-29°29.02
1	348° 33.27	227°13.52	4.88	157°55.51	12.82	240°34.38	21.92	347°7.84	3.88	Scheat	13°44.35	28°13.39
2	3°35.73 18°38.20	242°12.85 257°12.18	4.40 · · 3.91	172°56.51 187°57.50	13.47 •• 14.13	255°36.34 270°38.29	21.86 •• 21.81	2°10.45 17°13.05	3.95 •• 4.02	Markab	13°29.06	15°20.70
4	33°40.66	272°11.51	3.42	202°58.49	14.13	285°40.25	21.75	32°15.66	4.02	Aug 23 Sat	SHA	Mer.pass
5	48°43.13	287° 10.84	2.93	202 58.49 217°59.49	15.43	300°42.20	21.75	47°18.26	4.09	0	241°14.08	09:49
6	63°45.59	302°10.17	N20° 2.44	233°0.48	S04°16.09	315°44.16	N22°21.65	62°20.87	\$02°4.23		170°34.09	14:31
7	78° 48.05	317°9.50	1.94	248°1.47	16.74	330°46.12	21.59	77°23.48	4.30		252°26.21	09:03
8	93°50.52	332°8.83	1.45	263°2.47	17.39	345°48.07	21.54	92°26.08	4.37	Saturn	$358^{\circ}27.76$	02:00
9	$108^{\circ}52.98$	$347^{\circ}8.17$	• • 0.96	278°3.46	•• 18.05	0°50.03	• • 21.48	107°28.69	• • 4.44	A 24 C.:	CHA	Ma: :
10	123°55.45	2°7.50	0.46	293°4.45	18.70	15°51.99	21.43	122°31.29	4.51	Aug 24 Sun	<b>SHA</b> 239°58.68	Mer.pass 09:50
11	138° 57.91	17°6.83	19°59.96	308°5.45	19.36	30°53.94	21.38	137°33.90	4.58		239 58.08 169°58.94	14:29
12	154°0.37		N19°59.47	323°6.44	S04°20.01	45°55.90	N22°21.32	152°36.51	S02°4.65	Jupiter		09:00
13	169°2.84	47°5.49	58.97	338°7.43	20.66	60°57.86	21.27	167°39.11	4.72	Saturn	358°31.06	01:55
14	184°5.30	62°4.82	58.47	353°8.42	21.32	75°59.82	21.21	182°41.72	4.79			
15	199°7.77	77°4.16	• • 57.97	8°9.42	• • 21.97	91°1.77	• • 21.16	197°44.33	4.86	Aug 25 Mon	SHA	Mer.pass
16	214° 10.23	92°3.49	57.47 56.06	23°10.41	22.63	106°3.73	21.10	212°46.94	4.93		238°43.39	09:51
17 18	229° 12.69 244° 15.16	107°2.82 122°2.15	56.96 N19°56.46	38°11.40 53°12.39	23.28 \$04°23.93	121°5.69 136°7.65	21.05 N22°21.00	227°49.54 242°52.15	5.00 \$02°5.07		169°23.71	14:27
18 19	244 15.16 259° 17.62	122 2.15 F	55.96	68° 13.38	24.59	150 7.05 151° 9.61	20.94	242 52.15 257°54.76	5.14	Jupiter Saturn	252°1.62	08:57
20	274°20.09	152°0.82	55.45	83° 14.37	25.24	166°11.56	20.89	272°57.37	5.21	Saturn	358°34.43	01:51
21	289°22.55	167°0.15	• • 54.94	98° 15.37	• • 25.90	181°13.52	20.83	287°59.97	5.28	Horizo	ntal parallax	
22	304°25.01	181°59.49	54.44	113° 16.36	26.55	196°15.48	20.78	303°2.58	5.35		Venus:	0.1
23	$319^{\circ}27.48$	$196^{\circ}58.82$	53.93	128° 17.35	27.20	211°17.44	20.72	318°5.19	5.42		Mars:	0.1
Merr	pass. 01:46	ν-0.7′ d-0.5	5′ m-3 05	ν1 0' d0	.7′ m1.62	ν2 Ω' d.Ω	.1′ m-1.97	$\nu$ 2.6′ d0.	1′ m0 68			
14101.		- J.1 u-0.5				- 2.0 U-0	1.31					

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°19.26	N11°25.39	$181^{\circ}35.59$	12.9'	$N14^{\circ}16.94$	-13.9'	56.7'
1	194°19.43	24.54	196°7.45	13.0'	14°3.04	-14.0'	56.7'
2	209°19.59 224°19.75	23.69 •• 22.84	210°39.41 225°11.45	13.0' 13.1'	13°49.08 13°35.08	-14.0' -14.1'	56.7' 56.7'
4	239°19.91	21.99	239° 43.58	13.2'	13° 21.03	-14.1'	56.6'
5	254°20.08	21.14	$254^{\circ}15.79$	13.3'	$13^{\circ}6.92$	-14.1'	56.6'
6	269°20.24	N11°20.29	268° 48.08	13.4'	N12°52.78	-14.2'	56.6'
7 8	284°20.41 299°20.57	19.44 18.59	283°20.45 297°52.91	13.5' 13.5'	12°38.58 12°24.34	-14.2' -14.3'	56.6' 56.5'
9	314°20.73	17.74	312°25.44	13.6'	12° 10.06	-14.3'	56.5
10	329°20.90	16.89	326°58.06	13.7'	11°55.73	-14.4'	56.5'
11	344°21.06	16.04 N11° 15.19	341°30.75 356°3.52	13.8'	11°41.37 N11°26.96	-14.4'	56.5'
12 13	359°21.23 14°21.39	14.33	350 3.52 10°36.36	13.8' 13.9'	11°12.52	-14.4' -14.5'	56.4' 56.4'
14	29°21.56	13.48	25°9.28	14.0'	10°58.04	-14.5'	56.4'
15	44°21.72	• • 12.63	39° 42.27	14.1'	10°43.53	-14.5'	56.4'
16 17	59°21.89 74°22.05	11.78 10.92	54° 15.33 68° 48.46	14.1' 14.2'	10°28.98 10°14.40	-14.6' -14.6'	56.3' 56.3'
18	89°22.22	N11° 10.07	83°21.66	14.3'	N09°59.79	-14.6'	56.3
19	104°22.39	9.21	97°54.94	14.3'	09°45.15	-14.7'	56.3'
20	119°22.55	8.36	112°28.28	14.4'	09°30.48	-14.7'	56.3'
21 22	134°22.72 149°22.89	· · 7.51 6.65	127°1.68 141°35.15	14.5' 14.5'	09°15.78 09°1.05	-14.7' -14.8'	56.2' 56.2'
23	149 22.89 164°23.05	5.80	141 35.15 156°8.69	14.5 14.6'	09 1.05 08°46.30	-14.8'	56.2'
	SD = 15.8'	d = -0.8'			D = 15.5'		
				JI			
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°23.22 194°23.39	N11°4.94 4.08	170° 42.29 185° 15.95	14.7' 14.7'	N08° 31.53 08° 16.73	-14.8' -14.8'	56.2' 56.1'
2	194 23.39 209°23.55	4.08 3.23	185° 15.95 199° 49.67	14.7	08° 16.73	-14.8'	56.1
3	224°23.72	2.37	214° 23.45	14.8'	07° 47.07	-14.9'	56.1'
4	239°23.89	1.51	228° 57.29	14.9'	07°32.21	-14.9'	56.1'
5 6	254°24.06 269°24.23	11°0.66 N10°59.80	243°31.19 258°5.14	15.0' 15.0'	07°17.34 N07°2.44	-14.9' -14.9'	56.0' 56.0'
7	284°24.39	58.94	272°39.15	15.1'	06° 47.53	-14.9'	56.0'
8	299°24.56	58.09	287° 13.22	15.1'	06°32.61	-14.9'	56.0'
9	314°24.73	• • 57.23	301°47.33	15.2'	06° 17.67	-15.0'	56.0'
10 11	329°24.90 344°25.07	56.37 55.51	316°21.50 330°55.72	15.2' 15.3'	06°2.72 05°47.75	-15.0' -15.0'	55.9' 55.9'
12	359°25.24	N10° 54.65	345°29.99	15.3'	N05°32.78	-15.0'	55.9'
13	14°25.41	53.79	0°4.30	15.4'	$05^{\circ}17.80$	-15.0'	55.9'
14	29°25.58	52.93	14°38.67 29°13.08	15.4'	05°2.81 04°47.81	-15.0'	55.8'
15 16	44°25.75 59°25.92	· · 52.07 51.21	43° 47.53	15.5' 15.5'	04°47.81 04°32.80	-15.0' -15.0'	55.8' 55.8'
17	74°26.09	50.35	58° 22.03	15.5'	04° 17.80	-15.0'	55.8'
18	89°26.26	N10°49.49	72°56.57	15.6'	N04°2.78	-15.0'	55.7'
19 20	104°26.43 119°26.60	48.63 47.77	87°31.15 102°5.77	15.6' 15.7'	03°47.77 03°32.75	-15.0'	55.7' 55.7'
21	134°26.77	• • 46.90	116° 40.43	15.7'	03° 17.73	-15.0'	55.7'
22	149°26.94	46.04	$131^{\circ}15.13$	15.7'	$03^{\circ}2.71$	-15.0'	55.7'
23	164°27.11	45.18	145°49.87	15.8'	02°47.69	-15.0'	55.6'
	SD = 15.8'	d = -0.9'		SI	O = 15.3'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	179°27.28	N10°44.32	160°24.64	15.8'	N02°32.67	-15.0'	55.6'
1	194°27.45	43.45	174°59.45	15.8'	02°17.66	-15.0'	55.6'
2	209°27.63 224°27.80	42.59 •• 41.73	189°34.29 204°9.16	15.9' 15.9'	02°2.65 01°47.64	-15.0' -15.0'	55.6' 55.5'
3 4	224 27.80 239°27.97	40.86	204 9.16 218° 44.06	15.9' 15.9'	01°47.64 01°32.64	-15.0' -15.0'	55.5'
5	254°28.14	40.00	233° 18.99	16.0'	$01^{\circ}17.65$	-15.0'	55.5'
6	269°28.31	N10° 39.14	247°53.96	16.0'	N01°2.66	-15.0'	55.5'
7 8	284°28.49 299°28.66	38.27 37.41	262°28.95 277°3.96	16.0' 16.0'	00°47.69 00°32.72	-15.0' -15.0'	55.5' 55.4'
9	314°28.83	36.54	277 3.90 291°39.00	16.1'	00° 32.72	-13.0 -14.9'	55.4'
10	329°29.01	35.68	$306^{\circ}14.07$	16.1'	$N00^{\circ}2.82$	-14.9'	55.4'
11	344°29.18	34.81	320°49.16	16.1'	\$00°12.11 \$00°27.03	14.9'	55.4'
12 13	359°29.35 14°29.53	N10°33.94 33.08	335°24.27 349°59.40	16.1' 16.2'	500°27.03 00°41.94	14.9' 14.9'	55.3' 55.3'
14	29°29.70	32.21	4°34.55	16.2	00°56.83	14.9	55.3'
15	44°29.87	• • 31.34	19°9.73	16.2'	01°11.71	14.9'	55.3'
16	59°30.05	30.48	33°44.91	16.2'	01°26.56 01°41.40	14.8'	55.3'
17 18	74°30.22 89°30.40	29.61 N10°28.74	48°20.12 62°55.34	16.2' 16.2'	01°41.40 S01°56.23	14.8' 14.8'	55.2' 55.2'
19	104°30.57	27.87	77° 30.58	16.2'	02°11.03	14.8	55.2'
20	119°30.75	27.00	92°5.82	16.3'	02°25.81	14.8'	55.2'
21 22	134°30.92 149°31.10	· · 26.13 25.27	106° 41.08 121° 16.36	16.3' 16.3'	02°40.58 02°55.32	14.7' 14.7'	55.2' 55.1'
23	149 31.10 164°31.27	25.27 24.40	121 10.30 135°51.64	16.3'	02 55.32 03°10.03	14.7'	55.1'
_	SD = 15.8'	d = -0.9'			D = 15.2'		
					_ 10.2		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	0-2	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-3%	
23	02:43	02:35	12:03	12:16	-:-		
24	02:27	02:19	12:02	13:00	00:38		
25	02:11	02:03	12:02	13:41	01:21		

h	Aries	Venus	Mars	Jupiter	Saturn
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	334°29.94	211°58.16 N19°53.42	143°18.34 S04°27.86	226°19.40 N22°20.67	333°7.80 S02°5.49
1	349°32.41	226° 57.49 52.91	158°19.33 28.51	241°21.36 20.62	348°10.40 5.56
2	4°34.87	241°56.82 52.40	173° 20.32 29.16	256°23.32 20.56	3°13.01 5.63
3	19°37.33	256°56.16 · · 51.89	188°21.31 · · 29.82	271°25.28 · · 20.51	18°15.62 · · 5.70
4	34°39.80	271°55.49 51.37	203°22.30 30.47	286°27.24 20.45	33°18.23 5.77
5	49°42.26	286°54.83 50.86	218°23.29 31.13	301°29.20 20.40	48°20.84 5.84
6	64°44.73	301°54.16 N19°50.34	233°24.28 S04°31.78	316°31.16 N22°20.34	63°23.45 S02°5.91
7	79°47.19	316°53.50 49.83	248°25.27 32.43	331°33.12 20.29	78°26.05 5.98
8	94°49.65	331°52.84 49.31	263°26.26 33.09	346°35.08 20.23	93°28.66 6.05
9	109°52.12	346°52.17 · · 48.79	278°27.25 · · 33.74	1°37.04 · · 20.18	108°31.27 · · 6.12
10	124° 54.58	1°51.51 48.27	293°28.24 34.39	16°39.00 20.13	123°33.88 6.19
11	139° 57.05	16°50.84 47.75	308° 29.23 35.05	31°40.96 20.07	138°36.49 6.26
12	154° 59.51	31°50.18 N19°47.23	323°30.22 S04°35.70	46°42.92 N22°20.02	153°39.10 S02°6.33
13	170°1.97	46°49.52 46.71	338° 31.21 36.35	61°44.88 19.96	168°41.71 6.40
13	170 1.97 185°4.44	61°48.86 46.19	353°32.19 37.01	76°46.84 19.91	183°44.32 6.47
15	200°6.90	76°48.19 · · 45.66	8°33.18 · · 37.66	91°48.80 · · 19.85	198°46.93 · · 6.54
	200 0.90 215°9.37	91°47.53 45.14	23°34.17 38.31	106°50.76 19.80	
16	215 9.57 230° 11.83				
17			38°35.16 38.97		
18	245° 14.29	121°46.21 N19°44.09	53°36.15 S04°39.62	136°54.69 N22°19.69	243°54.75 S02°6.75
19	260° 16.76	136°45.54 43.56	68°37.14 40.28	151°56.65 19.64	258°57.36 6.82
20	275° 19.22	151°44.88 43.03	83°38.12 40.93	166°58.61 19.58	273°59.97 6.89
21	290°21.69	166°44.22 · · 42.50	98°39.11 · · 41.58	182°0.57 · · 19.53	289°2.58 · · 6.96
22	305°24.15	181°43.56 41.97	113°40.10 42.24	197°2.54 19.47	304°5.19 7.04
23	320°26.61	196°42.90 41.44	128°41.09 42.89	212°4.50 19.42	319°7.80 7.11
Mer.	pass. 01:42	ν-0.7' d-0.5' m-3.95	ν1.0′ d0.7′ m1.62	ν2.0′ d-0.1′ m-1.97	ν2.6' d0.1' m0.68
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
vvea 0	<b>GПА</b> 335°29.08	211° 42.24 N19° 40.91	143°42.07 S04°43.54	227° 6.46 N22° 19.36	334°10.41 S02°7.18
1	355° 29.08 350° 31.54	211°42.24 N19°40.91 226°41.58 40.37	143°42.07 \$04°43.54 158°43.06 44.20	242° 8.43 19.31	334°10.41 S02°7.18 349°13.02 7.25
2	5°34.01 20°36.47			257°10.39 19.25 272°12.35 · · 19.20	4°15.63 7.32
3			188° 45.03 · · 45.50		19°18.25 · · 7.39
4	35° 38.94	271°39.60 38.76	203°46.02 46.16	287°14.31 19.14	34°20.86 7.46
5	50°41.40	286°38.94 38.23	218° 47.01 46.81	302°16.28 19.09	49°23.47 7.53
6	65°43.86	301°38.28 N19°37.69	233°47.99 <b>S</b> 04°47.46	317°18.24 N22°19.04	64°26.08 S02°7.60
7	80°46.33	316°37.62 37.15	248°48.98 48.12	332°20.21 18.98	79°28.69 7.67
8	95°48.79	331°36.96 36.61	263°49.97 48.77	347°22.17 18.93	94°31.30 7.75
9	110°51.26	346°36.30 · · 36.07	278°50.95 · · 49.42	2°24.13 · · 18.87	109°33.91 · · 7.82
10	125°53.72	1°35.65 35.52	293°51.94 50.08	17°26.10 18.82	124°36.52 7.89
11	140°56.18	16°34.99 34.98	308°52.92 50.73	32°28.06 18.76	139°39.13 7.96
12	155° 58.65	31°34.33 N19°34.44	323°53.91 <b>S</b> 04°51.38	47°30.03 N22°18.71	154°41.74
13	$171^{\circ}1.11$	46° 33.67 33.89	338°54.89 52.04	62°31.99 18.65	169°44.36 8.10
14	186°3.58	61°33.01 33.35	353°55.88 52.69	77°33.96 18.60	184°46.97 8.17
15	201°6.04	76°32.36 · · 32.80	8°56.86 · · 53.34	92°35.92 · · 18.54	199°49.58 · · 8.24
16	$216^{\circ}8.50$	91°31.70 32.25	23°57.85 54.00	107°37.89 18.49	214°52.19 8.32
17	231° 10.97	106°31.04 31.70	38° 58.83 54.65	122°39.85 18.43	229°54.80 8.39
18	246°13.43	121°30.39 N19°31.15	53°59.82 <b>S</b> 04°55.30	137°41.82 N22°18.38	244°57.41 S02°8.46
19	261°15.90	136°29.73 30.60	69°0.80 55.95	152°43.79 18.33	260°0.03 8.53
20	$276^{\circ}18.36$	151°29.07 30.05	84°1.79 56.61	167°45.75 18.27	275°2.64 8.60
21	291°20.82	166°28.42 · · 29.50	99°2.77 · · 57.26	182°47.72 · · 18.22	290°5.25 · · 8.67
22	306°23.29	181°27.76 28.94	114°3.75 57.91	197°49.68 18.16	305°7.86 8.74
23	321°25.75	196°27.11 28.39	129°4.74 58.57	212°51.65 18.11	320°10.47 8.82
Mer.p	pass. 01:38	$\nu$ -0.7' d-0.5' m-3.95	ν1.0' d0.7' m1.62	ν2.0' d-0.1' m-1.98	ν2.6' d0.1' m0.67
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec
0	336°28.22	211°26.45 N19°27.83	144°5.72 <b>S</b> 04°59.22	227°53.62 N22°18.05	335°13.09 <b>S</b> 02°8.89
1	351°30.68	226°25.80 27.27	159°6.70 04°59.87	242°55.58 18.00	350°15.70 8.96
2	6°33.14	241°25.14 26.72	174°7.69 05°0.53	257°57.55 17.94	5°18.31 9.03
3	21°35.61	256°24.49 · · 26.16	189°8.67 · · 1.18	272°59.52 · · 17.89	20°20.92 · · 9.10
4	36°38.07	271°23.84 25.60	204°9.65 1.83	288° 1.49 17.83	35°23.54 9.17
5	51°40.54	286°23.18 25.04	219° 10.64 2.48	303° 3.45 17.78	50°26.15 9.25
6	66°43.00	301°22.53 N19°24.48	234°11.62 <b>S</b> 05°3.14	318°5.42 N22°17.72	65°28.76
7	81°45.46	316°21.87 23.91	249°12.60 3.79	333°7.39 17.67	80°31.38 9.39
8	96° 47.93	331°21.22 23.35	264° 13.58 4.44	348° 9.36 17.61	95°33.99 9.46
9	111°50.39	346°20.57 · · 22.78	279°14.57 · · 5.10	3°11.33 · · 17.56	110°36.60 · · 9.53
10	126°52.86	1°19.92 22.22	294° 15.55 5.75	18°13.29 17.50	125°39.22 9.61
11	141°55.32	16° 19.26 21.65	309° 16.53 6.40	33°15.26 17.45	140°41.83 9.68
12	156° 57.79	31°18.61 N19°21.09	324°17.51 \$05°7.05	48°17.23 N22°17.40	155°44.44 S02°9.75
13	172°0.25	46°17.96 20.52	339°18.49 7.71	63°19.20 17.34	170°47.06 9.82
14	187°2.71	61°17.31 19.95	354°19.47 8.36	78°21.17 17.29	185°49.67 9.89
15	202°5.18	76°16.66 · · 19.38	9°20.46 · · 9.01	93°23.14 · · 17.23	200°52.28 · · 9.97
16	217°7.64	91°16.01 18.81	24°21.44 9.67	108°25.11 17.18	215°54.90 10.04
17	232° 10.11	106°15.35 18.23	39°22.42 10.32	123°27.08 17.12	230°57.51 10.11
18	247° 12.57	121°14.70 N19°17.66	54°23.40 S05°10.97	138°29.05 N22°17.07	246°0.13 S02°10.18
19	262° 15.03	136°14.05 17.09	69°24.38 11.62	153°31.02 17.01	261°2.74 10.25
20	202 15.05 277° 17.50	151°13.40 16.51	84°25.36 12.28	168°32.99 16.96	276°5.35 10.33
21	277 17.50 292° 19.96	166°12.75 · · 15.94	99°26.34 · · 12.93	183°34.96 · · 16.90	291°7.97 · · 10.40
22	307° 22.43	181°12.10 15.36	114°27.32 13.58	198°36.93 16.85	306°10.58 10.47
23	307 22.43 322°24.89	196°11.45 14.78	114 27.32 13.36 129°28.30 14.23	213°38.90 16.79	321°13.20 10.54
23	322 24.89				
Mer.p	pass. 01:34	$\nu$ -0.7′ <i>d</i> -0.6′ m-3.95	$\nu 1.0' \ d0.7' \ m1.62$	$ u 2.0' \ d$ -0.1' m-1.98	$ u 2.6' \ d0.1' \ \text{m}0.67$

	SHA	Dec
Alpheratz	357°33.92	29°13.98
Ankaa Schedar	353° 6.24 349° 30.01	-42°9.75 56°40.62
Diphda	348°46.49	-17°50.54
Achernar	335°19.39	-57°6.07
Hamal	327°50.43	23°35.06
Polaris	313°38.48 315°11.23	89°22.04 -40°11.76
Acamar Menkar	314°5.50	4°11.56
Mirfak	308°27.41	49°57.00
Aldebaran	290°39.05	16°33.71
Rigel Capella	281°3.45 280°21.24	-8°10.11 46°1.30
Bellatrix	278°22.41	6°22.50
Elnath	278°1.32	28°37.72
Alnilam	275°37.31	-1°10.97
Betelgeuse	270°51.65	7°24.82
Canopus Sirius	263°52.45 258°25.98	-52°42.20 -16°44.85
Adhara	255° 5.70	-29°0.15
Procyon	244°50.53	5°9.67
Pollux	243°16.95	27°57.87
Avior	234°15.12 222°46.37	-59°35.26 -43°31.99
Suhail Miaplacidus	222°46.37 221°39.13	-43°31.99 -69°49.19
Alphard	217°47.56	-8°46.06
Regulus	$207^{\circ}34.20$	11°50.62
Dubhe	193°40.96	61°36.86
Denebola	182°24.70 175°43.33	14°25.85 -17°41.02
Gienah Acrux	175 43.33 173°0.14	-17 41.02 -63°14.61
Gacrux	171°51.57	-57°15.53
Alioth	$166^{\circ}12.89$	55°49.44
Spica	158°21.96	-11°17.68
Alkaid	152°51.84 148°35.62	49°11.33 -60°30.00
Hadar Menkent	148 35.02 147°57.21	-36°29.86
Arcturus	145°47.58	19°3.09
Rigil Kent.	$139^{\circ}39.87$	-60°56.70
Kochab	137°20.13	74°3.23
Zuben'ubi Alphecca	136°55.54 126°3.34	-16°8.90 26°37.89
Antares	120 3.34 112°15.15	-26°29.39
Atria	107°8.78	-69°4.66
Sabik	102°2.08	-15°45.39
Shaula Rasalhague	96° 9.50 95° 57.93	-37°7.43 12°32.62
Eltanin	90°41.70	51°29.35
Kaus Aust.	83°31.59	-34°22.40
Vega	80°32.62	38°48.64
Nunki	75°46.86	-26°15.89
Altair Peacock	61°59.18 53°4.35	8°56.29 -56°39.18
Deneb	49°25.04	45°22.45
Enif	33°37.96	9°59.68
Al Na'ir	27°31.76	-46°50.11
Fomalhaut Scheat	15°13.56 13°44.35	-29°29.02 28°13.40
Scneat Markab	13°44.35 13°29.06	28° 13.40 15° 20.71
Aug 26 Tue Venus	<b>SHA</b> 237°28.21	Mer.pass 09:53
Mars	168°48.40	14:26
Jupiter	251°49.46	08:54
Saturn	358°37.85	01:47
Aug 27 Wed	SHA	Mer.pass
Venus Mars	236°13.16 168°12.99	09:54 14:24
Jupiter	251°37.38	08:50
Saturn	358°41.34	01:43
Aug 28 Thu	SHA	Mer.pass
Venus	$234^{\circ}58.24$	09:55
	$167^{\circ}37.50$	14:23
Mars		00.47
Mars Jupiter	251°25.40	08:47
Mars Jupiter Saturn	358°44.87	01:39
Mars Jupiter Saturn	358°44.87	01:39
Mars Jupiter Saturn	358°44.87	

Stars

h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.45	N10°23.53	150°26.93	16.3'	S03°24.73	14.7'	55.1'
1	194°31.63	22.66	165°2.23	16.3'	03°39.40	14.6'	55.1'
2	209°31.80	21.79	179°37.53	16.3'	03°54.04	14.6'	55.1'
3	224°31.98	• • 20.92	194°12.84	16.3'	04°8.66	14.6'	55.0'
4	239°32.15	20.05	208°48.16	16.3'	04°23.25	14.6'	55.0'
5	254°32.33	19.17	223°23.47	16.3'	04°37.82	14.5'	55.0'
6	269°32.51 284°32.68	N10° 18.30 17.43	237°58.79 252°34.12	16.3' 16.3'	\$04°52.35 05°6.86	14.5' 14.5'	55.0' 55.0'
7 8	284 32.88 299°32.86	17.43 16.56	252 34.12 267°9.44	16.3	05 0.80 05°21.34	14.5 14.4'	55.0 54.9'
9	314°33.04	15.69	281° 44.76	16.3	05°35.78	14.4	54.9'
10	329°33.22	14.81	296°20.08	16.3'	05°50.20	14.4'	54.9'
11	344°33.39	13.94	310°55.40	16.3'	06°4.58	14.3'	54.9'
12	359°33.57	N10° 13.07	325°30.71	16.3'	S06° 18.93	14.3'	54.9'
13	14°33.75	12.20	$340^{\circ}6.02$	16.3'	06°33.24	14.3'	54.9'
14	29°33.93	11.32	354°41.32	16.3'	06°47.52	14.2'	54.8'
15	44°34.11 59°34.28	• • 10.45	9°16.61 23°51.90	16.3'	07°1.77 07°15.98	14.2' 14.2'	54.8' 54.8'
16 17	59 34.28 74°34.46	9.57 8.70	23 51.90 38°27.18	16.3' 16.3'	07 15.98 07°30.15	14.2 14.1'	54.8'
18	89°34.64	N10°7.82	53°2.44	16.3'	507°44.28	14.1	54.8'
19	104°34.82	6.95	67°37.70	16.2'	07°58.38	14.1'	54.7'
20	119°35.00	6.07	82°12.94	16.2'	08° 12.43	14.0'	54.7'
21	134°35.18	• • 5.20	96°48.18	16.2'	08°26.45	14.0'	54.7'
22	149°35.36	4.32	111°23.39	16.2'	08°40.42	13.9'	54.7'
23	164°35.54	3.45	125°58.59	16.2'	08°54.36	13.9'	54.7'
	SD = 15.8'	d = -0.9'		SE	0 = 15.0'		
\A/. I	CUA	D	CUA		D	.1	LID
Wed	<b>GHA</b> 179°35.72	<b>Dec</b> N10°2.57	<b>GHA</b> 140°33.78	u 16.2'	<b>Dec</b> \$09°8.25	d 13.8'	<b>HP</b> 54.7'
1	179 35.72 194°35.90	1.69	155°8.94	16.1	09° 22.09	13.8'	54.7'
2	209°36.08	10°0.82	169°44.09	16.1	09°35.90	13.8'	54.6'
3	224°36.26	09°59.94	184° 19.22	16.1'	09°49.66	13.7'	54.6'
4	239°36.44	59.06	198°54.33	16.1'	10°3.37	13.7'	54.6'
5	254°36.62	58.19	213°29.42	16.1'	10° 17.04	13.6'	54.6'
6	269°36.80	N09°57.31	228°4.49	16.0'	S10°30.66	13.6'	54.6'
7	284°36.98	56.43	242°39.53	16.0'	10°44.24	13.5'	54.6'
8 9	299°37.16 314°37.34	55.55 •• 54.67	257°14.55 271°49.54	16.0' 16.0'	10°57.76 11°11.24	13.5' 13.4'	54.5' 54.5'
10	329°37.52	53.79	271 49.54 286°24.51	15.9'	11 11.24 11°24.66	13.4	54.5'
11	344°37.71	52.91	300° 59.45	15.9'	11° 24.00 11° 38.04	13.3'	54.5
12	359°37.89	N09° 52.03	315°34.36	15.9'	S11°51.36	13.3'	54.5'
13	14°38.07	51.15	330°9.25	15.9'	12°4.64	13.2'	54.5'
14	29°38.25	50.27	344°44.10	15.8'	$12^{\circ}17.86$	13.2'	54.5'
15	44°38.43	• • 49.39	359° 18.93	15.8'	12°31.02	13.1'	54.5'
16	59°38.62	48.51	13°53.72	15.8'	12°44.14	13.1'	54.4'
17 18	74°38.80 89°38.98	47.63 N09° 46.75	28°28.48 43°3.20	15.7' 15.7'	12°57.19 \$13°10.20	13.0' 12.9'	54.4' 54.4'
19	104°39.17	45.87	43 3.20 57°37.89	15.7'	13°23.14	12.9'	54.4'
20	119°39.35	44.99	72° 12.55	15.6'	13°36.03	12.8'	54.4'
21	134°39.53	• • 44.11	86° 47.17	15.6'	13°48.86	12.8'	54.4'
22	149°39.72	43.22	101°21.75	15.5'	14°1.63	12.7'	54.4'
23	164°39.90	42.34	$115^{\circ}56.30$	15.5'	$14^{\circ}14.34$	12.7'	54.4'
	SD = 15.8'	d = -0.9'		SE	0 = 14.9'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.08	N09°41.46	130°30.80	15.5'	\$14°26.99	12.6'	54.3'
1	194°40.27	40.57	145°5.27	15.4'	$14^{\circ}39.58$	12.5'	54.3'
2	209°40.45	39.69	159°39.69	15.4'	14°52.11	12.5'	54.3'
3	224°40.64	38.81	174°14.08	15.3'	15°4.58	12.4'	54.3'
4	239°40.82	37.92 37.04	188°48.42	15.3'	15° 16.98	12.3'	54.3'
5 6	254°41.00 269°41.19	37.04 N09° 36.15	203°22.72 217°56.97	15.3' 15.2'	15°29.32 \$15°41.60	12.3' 12.2'	54.3' 54.3'
7	284°41.37	35.27	217 50.97 232°31.18	15.2'	15°53.81	12.2	54.3'
8	299°41.56	34.39	247°5.35	15.1'	16°5.95	12.1'	54.3'
9	314°41.74	33.50	261°39.46	15.1'	16° 18.03	12.0'	54.3'
10	329°41.93	32.61	$276^{\circ}13.53$	15.0'	$16^{\circ}30.04$	11.9'	54.3'
11	344°42.12	31.73	290°47.56	15.0'	16°41.98	11.9'	54.2'
12	359°42.30	N09°30.84	305°21.53	14.9'	S16°53.85	11.8'	54.2'
13	14°42.49	29.96	319°55.46	14.9'	17°5.65	11.7'	54.2'
14 15	29°42.67 44°42.86	29.07 •• 28.18	334°29.33 349°3.15	14.8' 14.8'	17° 17.38 17° 29.04	11.7' 11.6'	54.2' 54.2'
15 16	59°43.05	27.30	3 <sup>o</sup> 36.93	14.8 14.7'	17 29.04 17°40.62	11.5	54.2'
17	74°43.23	26.41	18° 10.64	14.7'	17° 52.14	11.4	54.2'
18	89°43.42	N09° 25.52	32°44.31	14.6'	\$18°3.58	11.4'	54.2'
19	104°43.61	24.63	47° 17.92	14.6'	18° 14.94	11.3'	54.2'
20	119°43.79	23.75	$61^{\circ}51.48$	14.5'	$18^{\circ}26.23$	11.2'	54.2'
21	134°43.98	• • 22.86	76°24.98	14.4'	18° 37.45	11.1'	54.2'
22	149°44.17 164°44.36	21.97	90°58.43 105°31.82	14.4' 14.3'	18° 48.59 18° 59.65	11.1'	54.2'
23		21.08	105-31.82			11.0'	54.2'
	SD = 15.8'	d = -0.9'		SE	0 = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.	Pass.	Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	3-5	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	8-21%	
26	01:54	01:46	12:02	14:22	02:02		
27	01:37	01:28	12:01	15:03	02:42		
28	01:20	01:11	12:01	15:45	03:24		

## August 29, 30, 31 UT (Fri., Sat., Sun.)

h	Aries	Venu	us	M	ars	Jup	oiter	Sat	urn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	337°27.35		N19°14.20	144° 29.28	\$05°14.89	228°40.87	N22°16.74	336°15.81	502°10.62	Almhauata	357°33.91	29°13.99
1	$352^{\circ}29.82$	$226^{\circ}10.16$	13.62	$159^{\circ}30.26$	15.54	243°42.84	16.68	351°18.43	10.69	Alpheratz Ankaa	357 33.91 353°6.23	-42°9.75
2	7°32.28	241°9.51	13.04	174°31.24	16.19	258°44.81	16.63	6°21.04	10.76	Schedar	349° 29.99	56°40.63
3	22°34.75	256°8.86	• 12.46	189°32.22	• • 16.84	273°46.78	• • 16.57	21°23.66	• • 10.83	Diphda	348°46.48	-17°50.54
4	37° 37.21	271°8.21	11.88	204°33.20	17.50	288°48.75	16.52	36°26.27	10.90	Achernar	335°19.37	-57°6.07
5 6	52° 39.67 67° 42.14	286°7.56 301°6.92	11.29 N19°10.71	219°34.18 234°35.16	18.15 \$05°18.80	303°50.72 318°52.69	16.46 N22° 16.41	51°28.89 66°31.50	10.98 S02°11.05	Hamal	327°50.41	23°35.07
7	82°44.60	316°6.27	10.12	249°36.13	19.45	333°54.67	16.35	81°34.12	11.12	Polaris	313°36.84	89°22.04
8	97°47.07	331°5.62	9.54	264°37.11	20.11	348°56.64	16.30	96°36.73	11.20	Acamar	315°11.20	-40°11.76
9	112°49.53	346°4.97	• 8.95	279°38.09	• • 20.76	3°58.61	• • 16.24	111°39.35	• • 11.27	Menkar Mirfak	314°5.48 308°27.38	4°11.56 49°57.00
10	$127^{\circ}52.00$	1°4.33	8.36	294°39.07	21.41	19°0.58	16.19	126°41.96	11.34	Aldebaran	290°39.03	16°33.71
11	142°54.46	16°3.68	7.77	309°40.05	22.06	34°2.56	16.13	141°44.58	11.41	Rigel	281°3.43	-8°10.11
12	157° 56.92	31°3.03	N19°7.18	324°41.03	S05°22.72	49° 4.53	N22°16.08	156°47.20	S02°11.49	Capella	280°21.21	46°1.30
13 14	172°59.39 188°1.85	46°2.39 61°1.74	6.59 6.00	339°42.00 354°42.98	23.37 24.02	64° 6.50 79° 8.47	16.02 15.97	171°49.81 186°52.43	11.56 11.63	Bellatrix	278°22.39	$6^{\circ}22.50$
15	203°4.32	76°1.10	. 5.41	9°43.96	24.67	94°10.45	15.91	201°55.04	11.70	Elnath	278°1.29	28°37.72
16	218°6.78	91°0.45	4.81	24°44.94	25.32	109°12.42	15.86	216°57.66	11.78	Alnilam	275°37.29	-1°10.96
17	233°9.24	105°59.81	4.22	39°45.91	25.98	124°14.39	15.80	232°0.27	11.85	Betelgeuse	270°51.63	7°24.82
18	$248^{\circ}11.71$	120°59.16	N19° 3.62	54°46.89	S05°26.63	139°16.37	N22° 15.75	247°2.89	S02°11.92	Canopus Sirius	263°52.43 258°25.96	-52°42.19 -16°44.85
19	263°14.17	135°58.52	3.03	69°47.87	27.28	154°18.34	15.69	262°5.51	12.00	Adhara	255° 5.68	-29°0.14
20	278° 16.64	150°57.88	2.43	84°48.84	27.93	169°20.31	15.64	277°8.12	12.07	Procyon	244°50.52	5°9.67
21	293° 19.10	165° 57.23	1.83	99°49.82	• • 28.58	184°22.29	15.58	292°10.74	12.14	Pollux	243°16.93	27°57.87
22 23	308° 21.56 323° 24.03	180°56.59 195°55.94	1.23 0.63	114°50.80 129°51.77	29.24 29.89	199°24.26 214°26.24	15.53 15.47	307°13.36 322°15.97	12.21 12.29	Avior	$234^{\circ}15.09$	-59°35.25
							-			Suhail	222°46.36	-43°31.98
Mer.	pass. 01:30	$\nu$ -0.6' d-0.6	5′ m-3.95	$\nu 1.0' d0$	.7′ m1.62	$\nu 2.0' \ d-0$	.1' m-1 $.98$	$\nu$ 2.6′ d0	$.1^\prime$ m0.66	Miaplacidus	221°39.11	-69°49.17
										Alphard	217°47.55	-8°46.05
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207°34.20 193°40.97	11°50.62 61°36.85
0	$338^{\circ}26.49$		$N19^{\circ}0.03$	$144^{\circ}52.75$	S05°30.54	229°28.21	N22°15.42	337°18.59	502°12.36	Denebola	182° 24.70	14°25.84
1	353°28.96	225°54.66	18°59.43	159°53.73	31.19	244°30.19	15.36	352°21.21	12.43	Gienah	175°43.34	-17°41.02
2	8°31.42	240°54.02	58.82	174°54.70	31.84	259°32.16	15.31	7°23.82	12.51	Acrux	173°0.16	-63°14.59
3	23° 33.89 38° 36.35	255°53.37	57.61	189°55.68	· · 32.50 33.15	274°34.14 289°36.11	15.25	22°26.44 37°29.06	• • 12.58	Gacrux	$171^{\circ}51.58$	$-57^{\circ}15.51$
4 5	53° 38.81	270°52.73 285°52.09	57.01 57.01	204° 56.65 219° 57.63	33.80	304°38.09	15.20 15.14	52°31.67	12.65 12.73	Alioth	166°12.91	55°49.42
6	68°41.28		N18°56.40	234°58.60	S05°34.45	319°40.06	N22° 15.09	67°34.29	S02°12.80	Spica	158°21.97	-11°17.67
7	83°43.74	315°50.81	55.79	249°59.58	35.10	334°42.04	15.03	82°36.91	12.87	Alkaid	152°51.86 148°35.64	49°11.33 -60°29.99
8	98°46.21	330°50.17	55.18	265°0.55	35.76	349°44.01	14.98	97°39.53	12.95	Hadar Menkent	146 55.04 147°57.22	-36°29.86
9	113°48.67	345°49.53	• • 54.57	280°1.53	• • 36.41	4°45.99	•• 14.92	112°42.14	• • 13.02	Arcturus	145°47.59	19°3.09
10	128°51.13	0°48.89	53.96	295°2.50	37.06	19°47.97	14.87	127°44.76	13.09	Rigil Kent.	139°39.89	-60°56.69
11	143° 53.60	15° 48.25	53.35 N18°52.74	310°3.48 325°4.45	37.71 \$05°38.36	34°49.94	14.81 N22°14.76	142°47.38	13.17 \$02°13.24	Kochab	$137^{\circ}20.19$	74°3.22
12 13	158° 56.06 173° 58.53	30°47.61 N 45°46.97	52.12	340°5.43	39.01	49°51.92 64°53.90	14.70	157°50.00 172°52.61	13.31	Zuben'ubi	136°55.56	-16°8.90
14	189°0.99	60°46.33	51.51	355°6.40	39.67	79°55.87	14.65	187°55.23	13.31	Alphecca	126°3.35	26°37.89
15	204°3.45	75° 45.69	• • 50.89	10°7.37	40.32	94°57.85	• • 14.59	202°57.85	. 13.46	Antares	112°15.17	-26°29.38
16	$219^{\circ}5.92$	90°45.05	50.28	25°8.35	40.97	109°59.83	14.54	218°0.47	13.53	Atria Sabik	107°8.82 102°2.10	-69°4.66 -15°45.39
17	234°8.38	105°44.41	49.66	40°9.32	41.62	125° 1.81	14.48	233°3.09	13.61	Shaula	96°9.52	-37°7.43
18	249° 10.85		N18°49.04	55° 10.29	S05°42.27	140°3.78	N22° 14.43	248°5.70	S02°13.68	Rasalhague	95°57.95	12°32.62
19	264° 13.31	135°43.13	48.42	70°11.27	42.92	155° 5.76	14.37	263°8.32	13.75	Eltanin	90°41.73	51°29.36
20 21	279° 15.78 294° 18.24	150°42.50 165°41.86	47.80 •• 47.18	85° 12.24 100° 13.21	43.57 •• 44.23	170°7.74 185°9.72	14.32 •• 14.26	278°10.94 293°13.56	13.83	Kaus Aust.	83°31.60	
22	309° 20.70	180°41.22	46.56	115° 14.18	44.23	200°11.70	14.21	308° 16.18	13.90	Vega	80°32.64	38°48.65
23	324° 23.17	195°40.58	45.94	130° 15.16	45.53	215°13.67	14.15	323°18.80	14.05	Nunki		-26°15.89
										Altair Peacock	61°59.19 53°4.36	8°56.30 -56°39.19
ivier.	pass. 01:26	$\nu$ -0.6' d-0.6	m-3.95	$\nu_{1.0}$ au	.7′ m1.62	ν2.0 a-0	.1′ m-1.99	ν2.0 αυ	.1′ m0.66	Deneb	49° 25.05	45°22.47
										Enif	33°37.96	9°59.69
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.76	-46°50.11
0	339° 25.63		N18°45.31	145°16.13	S05°46.18	230°15.65	N22°14.10	338°21.42	\$02°14.12	Fomalhaut	$15^{\circ}13.55$	-29°29.03
1 2	354°28.10 9°30.56	225°39.31 240°38.68	44.69 44.06	160° 17.10 175° 18.07	46.83 47.48	245°17.63 260°19.61	14.04 13.99	353°24.03 8°26.65	14.19 14.27	Scheat	13°44.34	28°13.42
3	24° 33.02	255° 38.04	• 43.44	190° 19.05	• 48.13	275°21.59	. 13.93	23°29.27	• • 14.34	Markab	13°29.05	15°20.72
4	39°35.49	270°37.40	42.81	205° 20.02	48.78	290°23.57	13.88	38°31.89	14.42	Aug 29 Fri	SHA	Mer.pass
5	54°37.95	285°36.77	42.18	220°20.99	49.44	305°25.55	13.82	53°34.51	14.49	Venus	233°43.45	09:56
6	69°40.42	300°36.13			S05°50.09		N22° 13.77		S02°14.56	Mars	167°1.93	14:21
7	84° 42.88	315° 35.50	40.92	250°22.93	50.74	335°29.51	13.71	83°39.75	14.64		251°13.51	08:44
8	99° 45.35	330°34.86	40.29	265°23.90	51.39	350°31.49	13.66	98°42.37	14.71	Saturn	358°48.46	01:35
9 10	114° 47.81 129° 50.27	345°34.23 0°33.60	· · 39.66 39.02	280°24.87 295°25.84	• • 52.04 52.69	5°33.47 20°35.45	· · 13.60 13.55	113°44.99 128°47.61	· · 14.79 14.86	Aug 30 Sat	SHA	Mer.pass
11	129 50.27 144° 52.74	15°32.96	39.02	295 25.84 310° 26.81	52.09 53.34	20 35.45 35°37.43	13.55	128 47.01 143°50.23	14.80		232°28.81	09:57
12	159° 55.20		N18°37.76	325° 27.78	S05°53.99	50°39.41	N22°13.44	158°52.85	\$02°15.01		166° 26.26	14:20
13	174° 57.67	45°31.70	37.12	340°28.76	54.64	65°41.39	13.38	173°55.47	15.08	Jupiter	251°1.72	08:41
14	190°0.13	60°31.06	36.48	$355^{\circ}29.73$	55.30	80°43.37	13.33	188°58.09	15.16	Saturn	358°52.10	01:30
15	205°2.59	75°30.43	• • 35.85	10°30.70	• • 55.95	95°45.35	• • 13.27	204°0.71	• • 15.23	Aug 31 Sun	SHA	Mer.pass
16	220°5.06	90°29.80	35.21	25°31.66	56.60	110°47.34	13.22	219°3.33	15.30		231°14.32	09:58
17	235°7.52 250°9.99	105°29.17	34.57 N18°33.93	40°32.63	57.25 \$05°57.90	125°49.32	13.16 N22° 13.11	234°5.95	15.38 \$02°15.45		165°50.50	14:18
18 19	250°9.99 265°12.45	120°28.53 N 135°27.90	33.29	55°33.60 70°34.57	58.55	140°51.30 155°53.28	N22 13.11 13.05	249°8.57 264°11.19	15.53		250°50.02	08:38
20	280° 14.91	150° 27.27	32.64	85° 35.54	59.20	170°55.26	13.00	279°13.81	15.60	Saturn	358°55.78	01:26
21	295° 17.38	165° 26.64	• • 32.00	100° 36.51	05°59.85	185°57.25	• • 12.94	294°16.43	• • 15.67	Horizoi	ntal parallax	
22	$310^{\circ}19.84$	$180^{\circ}26.01$	31.36	115° 37.48	$06^{\circ}0.50$	200°59.23	12.89	$309^{\circ}19.05$	15.75		Venus:	0.1
23	325°22.31	195°25.38	30.71	130° 38.45	1.15	216° 1.21	12.83	324°21.67	15.82		Mars:	0.1
Mer.	pass. 01:22	ν-0.6' d-0.6	5′ m-3.95	$\nu$ 1.0' d0.	.7′ m1.62	$\nu^{2.0'} d-0$	.1′ m-1.99	$\nu$ 2.6' d0	.1′ m0.66			
	<u> </u>											

h	Su			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.54	N09°20.19	120°5.15	14.3'	<b>S</b> 19°10.63	10.9'	54.2'
1	194° 44.73	19.30	134°38.43	14.2'	19°21.53	10.8'	54.2'
2	209°44.92 224°45.11	18.41 •• 17.52	149°11.64 163°44.80	14.2' 14.1'	19°32.35 19°43.09	10.7' 10.7'	54.2' 54.2'
4	239° 45.30	16.63	178°17.90	14.0'	19°53.75	10.6'	54.1'
5	254°45.48	15.74	192°50.93	14.0'	$20^{\circ}4.33$	10.5'	54.1'
6	269° 45.67	N09°14.85	207°23.91	13.9'	\$20°14.82	10.4	54.1'
7 8	284° 45.86 299° 46.05	13.96 13.07	221°56.82 236°29.68	13.9' 13.8'	20°25.23 20°35.56	10.3' 10.2'	54.1' 54.1'
9	314°46.24	• • 12.18	251° 2.47	13.7'	20°45.80	10.2'	54.1'
10	329°46.43	11.29	$265^{\circ}35.19$	13.7'	$20^{\circ}55.95$	10.1'	54.1'
11	344°46.62	10.39	280°7.86	13.6'	21°6.02	10.0'	54.1'
12 13	359°46.81 14°47.00	N09° 9.50 8.61	294°40.46 309°12.99	13.5' 13.5'	\$21°16.00 21°25.89	9.9' 9.8'	54.1' 54.1'
14	29° 47.19	7.72	323°45.46	13.4'	21°35.69	9.7'	54.1'
15	44° 47.38	• • 6.82	338° 17.87	13.3'	21°45.40	9.6'	54.1'
16	59° 47.57 74° 47.76	5.93	352°50.21 7°22.48	13.3'	21°55.02 22°4.54	9.5'	54.1'
17 18	89° 47.95	5.04 N09°4.14	21°54.68	13.2' 13.1'	522°13.98	9.4' 9.3'	54.1' 54.1'
19	104°48.14	3.25	36°26.82	13.1'	22°23.32	9.2'	54.1'
20	119°48.33	2.36	50°58.90	13.0'	$22^{\circ}32.56$	9.2'	54.1'
21	134° 48.52	• • 1.46	65°30.90	12.9'	22°41.71	9.1'	54.1'
22 23	149°48.71 164°48.90	09°0.57 08°59.67	80°2.84 94°34.70	12.9' 12.8'	22°50.77 22°59.73	9.0' 8.9'	54.1' 54.1'
23			JT J4.10			3.3	J T. 1
	SD = 15.8'	d = -0.9'		5L	0 = 14.8'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179°49.09	N08°58.78	109°6.50	12.7'	\$23°8.59	8.8'	54.1'
1 2	194° 49.28 209° 49.48	57.88 56.99	123°38.23 138°9.90	12.7' 12.6'	23°17.35 23°26.01	8.7' 8.6'	54.1' 54.1'
3	209 49.46 224°49.67	56.09	150 9.90 152°41.49	12.5'	23°34.57	8.5'	54.1'
4	239° 49.86	55.20	167°13.01	12.5'	23°43.03	8.4'	54.2'
5	254°50.05	54.30	181°44.46	12.4'	23°51.39	8.3'	54.2'
6 7	269° 50.24 284° 50.44	N08°53.40 52.51	196°15.85 210°47.16	12.3' 12.2'	\$23°59.64 24°7.79	8.2' 8.0'	54.2' 54.2'
8	284 50.44 299°50.63	52.51 51.61	210 47.16 225°18.40	12.2'	24 7.79 24°15.84	8.0 7.9'	54.2'
9	314° 50.82	• • 50.71	239°49.58	12.1'	24°23.78	7.8'	54.2'
10	329°51.01	49.81	254°20.68	12.0'	24°31.62	7.7'	54.2'
11 12	344°51.21 359°51.40	48.92 N08°48.02	268°51.71 283°22.67	12.0' 11.9'	24°39.35 \$24°46.97	7.6' 7.5'	54.2' 54.2'
13	14°51.59	47.12	203 22.07 297°53.57	11.8'	24°54.48	7.5 7.4'	54.2'
14	29°51.79	46.22	312°24.39	11.8'	25°1.89	7.3'	54.2'
15	44°51.98	• • 45.32	326°55.14	11.7'	25°9.18	7.2'	54.2'
16 17	59°52.18 74°52.37	44.42 43.52	341°25.82 355°56.43	11.6' 11.5'	25°16.36 25°23.43	7.1' 7.0'	54.2' 54.2'
18	89° 52.56	N08°42.62	10°26.97	11.5'	S25°30.39	6.8'	54.2'
19	104°52.76	41.73	24°57.44	11.4'	25°37.23	6.7'	54.2'
20	119°52.95	40.83	39°27.84	11.3'	25°43.96	6.6'	54.2'
21 22	134°53.15 149°53.34	· · 39.92 39.02	53°58.17 68°28.44	11.3' 11.2'	25°50.58 25°57.08	6.5' 6.4'	54.3' 54.3'
23	164° 53.54	38.12	82°58.63	11.1'	26°3.46	6.3	54.3'
	SD = 15.8'	d = -0.9'		SE	0 = 14.8'		
	<u>JD = 13.0</u>	u = -0.9		JL	7 — 14.0		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°53.73 194°53.93	N08°37.22 36.32	97°28.75 111°58.81	11.1' 11.0'	\$26° 9.72 26° 15.86	6.1' 6.0'	54.3' 54.3'
2	194 53.93 209°54.12	35.42	111 58.81 126°28.79	10.9'	26°21.89	5.9'	54.3'
3	224°54.32	• • 34.52	140°58.71	10.9'	26°27.80	5.8'	54.3'
4	239°54.51	33.62	155°28.57	10.8'	26°33.58	5.7'	54.3'
5 6	254°54.71 269°54.90	32.72 N08°31.81	169°58.35 184°28.07	10.7' 10.7'	26°39.24 \$26°44.78	5.5' 5.4'	54.3' 54.3'
7	284°55.10	30.91	198°57.72	10.7	26°50.20	5.4	54.4'
8	299°55.29	30.01	213°27.30	10.5'	26°55.49	5.2'	54.4'
9	314°55.49	• • 29.10	227°56.82	10.5'	27° 0.66	5.0'	54.4'
10 11	329°55.69 344°55.88	28.20 27.30	242°26.28 256°55.67	10.4' 10.3'	27°5.71 27°10.62	4.9' 4.8'	54.4' 54.4'
12	359°56.08	N08°26.39	271°24.99	10.3	\$27°15.41	4.7	54.4
13	14°56.28	25.49	285°54.25	10.2'	27°20.07	4.5'	54.4'
14	29°56.47	24.59	300°23.45	10.1'	27°24.60 27°29.01	4.4'	54.4'
15 16	44° 56.67 59° 56.87	· · 23.68 22.78	314°52.59 329°21.67	10.1' 10.0'	27°29.01 27°33.28	4.3' 4.1'	54.5' 54.5'
17	59° 56.87 22.78 74° 57.06 21.87		343°50.68	10.0'	27°37.42	4.0'	54.5
18	89°57.26	N08°20.97	358°19.64	9.9'	S27°41.43	3.9'	54.5'
19	104°57.46	20.06	12°48.53	9.8'	27°45.31 27°49.05	3.7'	54.5'
20 21	119°57.66 134°57.86	19.16 •• 18.25	27°17.37 41°46.15	9.8' 9.7'	27°49.05 27°52.66	3.6' 3.5'	54.5' 54.6'
22	149°58.05	17.35	56°14.87	9.7'	27°56.14	3.3'	54.6'
23	164°58.25	16.44	70°43.54	9.6'	27°59.48	3.2'	54.6'
	SD = 15.8'	d = -0.9'		SE	0 = 14.8'		

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

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

		Sun		Moon				
Day	Eqn.of	Time	Mer.	Mer.Pass. Upper Lower		Age		
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass			6-8		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	29-48%		
29	01:02	00:53	12:01	16:30	04:07			
30	00:44	00:34	12:01	17:17	04:53			
31	00:25	00:16	12:00	18:07	05:42			

#### September 01, 02, 03 UT (Mon., Tue., Wed.)

	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1 1074-14 1 107	Mon						SHA Dec
2 1977 1978							Alpheratz 357°33.89 29°14.01
2.5   1.5							
1							
1 97 975 170							1 '
Post   1975   201   20	5	55°37.09	285°21.60 26.82	220°44.26 5.05		54°37.39 16.27	1
1							1
9   115   46.65   385   10.00   - 24.21   200   48.1   - 7.66   67.105   - 12.23   114   47.88   - 15.57   - 10.005   -							
10   10   10   10   10   10   10   10							1
11 1475 1.88							
13   1979-943							
14   15   15   15   15   15   15   15							
16 221 207 07 17 37 18 33							
16							1
19							1
1.0	17		105°14.08 18.95	40°55.86 12.86			
Adhara   25°   1.60							
22 3311158 1001105 1502 116108 1011 1503 101016 1754 1746 1750 1701 1701 1701 1701 1701 1701 1701							1
22 3307245   1971096   1562   116°0.68   15.11   201°4.86   11.51   320°2.169   17.61							
Mer.pass. 0.11-8							1
Mor. pass. 01:18	23	$326^{\circ}21.45$	195°10.34 14.96	131°1.65 16.76	216°48.85 11.51	325°24.59 17.61	
Change	Mer.n	ass. 01:18	$\nu$ -0.6' d-0.6' m-3.95	$\nu 1.0' \ d0.7' \ m1.62$	$\nu 2.0' \ d-0.1' \ m-1.99$	$\nu 2.6' \ d0.1' \ m0.65$	1
The GHA Dec GH							
0 41°230 1 30°20 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°20 1 10°30 1 30°30 1 10°30 1 30°30 1 10°30 1 30°30 1 10°30 1 30°30 1 10°30 1 30°30 1 10°	Tue	СΗΔ	GHA Dec	GHA Dec	GHA Dec	GHA Dec	1 -
1 96°26.38   22°59.99   13.62   161°3.58   18.06   246°52.82   11.40   355°29.83   17.76   17.84   17.							
2 11 '288							1
3 20°31.30 7 270°7.578 12.28 191°5.90 19.36 270°5.679 11.29 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 17.99 25°3.68 17.91 25°4.64 17							
5 6°36.23 28°6.60 10.94 221°7.43 20.65 307°0.77 11.18 55°6.23 18.06 16.19.5 5.49.41 11.19.6 170°42.94 502°18.14 Albaid 152°5.36 18.21 19.76 18.21 170°4.29.4 502°18.14 Albaid 152°5.18.2 40°2.19.5 18.19.19.19.19.19.19.19.19.19.19.19.19.19.							Gacrux 171°51.59 -57°15.50
6 T1"3870 300"s 98 N18"10.27 230"s 40 S00"21.30 322"2.76 N22"11.12 70"42.94 S02"18.14 Albeid 152"51.87 49"11.32 N30"s 40 S02"18.14 S03"18.14 S03"1							
86°41.16 315°5.56 9.99 251°9.36 21.95 337°4.75 11.07 85°4.57 113.21 Albada 148°5.56 60°2.93 5 9 116°46.09 345°4.12 8.24 281°11.28 23.25 7°8.72 11.096 115°5.08 1 18.29 Methem 147°5.72 3 69°1.02 11 110°4.85 5 0°3.00 7.56 200°12.25 23.00 221°0.71 10.00 130°53.41 18.36 14.75 18.21 14.75 18.25 18.75 18.21 14.75 18.25 18.21 14.75 18.25 18.21 14.75 18.25 18.21 14.75 18.25 18.21 14.75 18.25 18.25 18.21 14.25 18.2							
8 101-43-6.09 345-4.12 - 8.24 261-0.32 - 22.60 352-6.73							
9 116'46.09							
11 146°51.02 15°2.88 6.89 311°13.21 24.55 37°12.70 10.88 14.5°5.60 18.51 120°13.83 30°2.26 N18°6.21 320°14.17 506°25.05 52°14.69 N22°10.79 160°58.68 S02°18.59 13 176°55.95 45°1.64 5.53 341°15.14 5.85 67°16.68 10.74 176°1.31 18.66 13.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 12.65 18.61 19.65 18.60 11.6							
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Mer.pass. 01:14         ν-0.6′ d-0.7′ m-3.95         ν1.0′ d0.6′ m1.62         ν2.0′ d-0.1′ m-2.00         ν2.6′ d-0.1′ m0.65         Peacock 55°4.36 56°3.92         56°3.92 0 20°54.84         N17°58.00         Ad°25,71 506°32.99         N22°32.36 57 N22°10.13         N34°30.17 S02°19.49         S02°19.49         Eniff 33°37.95 59         Peacock 55°4.36 56°32.99         N33°37.95 59         Peacock 55°4.36 50°1.2         S06°32.99 19.57         N22°10.13         34°30.17 S02°19.49         N34°1 Na°1″ S02°19.49         Peacock 55°4.36 50°1.2         N33°37.95 59         Peacock 55°4.56         N22°10.13         N34°30.17 S02°19.49         N34°1 Na°1″ S4°3.39         N34°1 Na°1″ S4°3.39         N34°1 Na°1 Na°1 Na°1         N34°1 Na°1 Na°1 Na°1 Na°1 Na°1 Na°1 Na°1 Na							
Wed         GHA         Dec         Al Na'ir         27°31.75         46°50.12         6°60.12         6°672.99         23.94         228°24.56         10.02         11°35.42         19.64         Markab         13°3.54         29°1.15         18°2.53         50°2.35         36°2.95         35.59         292°46.54         9.91         41°40.67         19.79         50°3.57         52.51         32.60°3.31         36°3.33         30°48.53         9.85         56°43.29         19.87         Markab         13°29.04         55.15         51°3.54         21°3.51         30°3.23         30°3.23         30°48.53         9.82         14°5.52         20°2.19.94         4							
Wed         GHA         GHA         Dec         GHA         Na         Dec         Al Na'ir         27°31.75         -66°50.12           0         342°23.05         209°54.84         N17°58.00         146°25.71         506°32.99         232°38.57         N22°10.13         341°30.17         502°19.49         Al Na'ir         27°31.75         -46°50.12           2         12°27.98         239°53.61         56.62         10.02         11°35.42         19.64         Markab         13°29.04         27°31.74         442°32.91         10°676.33         34.29         227°44.55         9.97         26°38.04         19.72         44         42°32.91         10°53.37         28°55.23         206°29.55         35.59         292°46.54         9.91         41°40.67         19.79         26°38.04         19.72         28°6         20.21         29°51.51         17°53.84         236°31.47         50°6.08         322°95.52         N22°9.80         71°45.92         502°19.94         426°10.00         426°3.14         426°3.22         20.21         28°4.50	Mer.p	ass. 01:14	ν-0.6′ d-0.1′ m-3.95	$\nu 1.0' \ d0.6' \ m1.62$	ν2.0′ d-0.1′ m-2.00	$\nu 2.6' \ d0.1' \ m0.65$	
Wed         GHA         GHA         Dec         Horizontal           1         357°25.52         220°54.53         57.31         161°26.67         33.64         247°40.56         10.08         356°32.79         19.57         Scheat         134°43.33         28°313.43           2         22°30.44         254°53.00         55.52         206°29.55         35.59         292°46.54         9.91         41°40.67         19.79         40°23.73         46°25.77         54.54         221°30.51         36.23         307°48.53         9.85         56°43.29         19.87         Yenus         229°59.98         0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°959         9.0°							
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6 72°37.84 299°51.15 N17°53.84 236°31.47 S06°36.88 322°50.52 N22°9.80 71°45.92 S02°19.94   7 87°40.30 314°50.54 53.15 251°32.43 37.53 337°52.52 9.74 86°48.54 20.02   8 102°42.76 329°49.92 52.45 266°33.39 38.18 352°54.51 9.69 101°51.17 20.10   9 117°45.23 344°49.31 · 51.75 281°34.35 · 38.83 7°56.50 · 9.63 116°53.79 · 20.17   10 132°47.69 359°48.70 51.06 296°35.31 39.48 22°58.50 9.58 131°56.42 20.25   11 147°50.16 14°48.08 50.36 311°36.27 40.12 38°0.49 9.52 146°59.04 20.32   12 162°52.62 29°47.47 N17°49.66 326°37.23 S06°40.77 53°2.48 N22°9.47 162°1.67 S02°20.40   13 177°55.09 44°46.86 48.96 341°38.18 41.42 66°4.48 9.41 177°4.29 20.47   14 192°57.55 59°46.25 48.26 356°39.14 42.07 83°6.47 9.36 192°6.92 20.55   15 208°0.01 74°45.63 · 47.55 11°40.10 · 42.72 98°8.46 · 9.30 207°9.54 · 20.63   16 223°2.48 89°45.02 46.85 26°41.06 43.37 113°10.46 9.25 222°12.17 20.70   17 238°4.94 104°44.41 46.15 41°42.02 44.01 128°12.45 9.19 237°14.79 20.78   18 253°7.41 119°43.80 N17°45.44 56°42.97 S06°44.66 143°14.45 N22°9.14 252°17.42 S02°20.85   19 268°9.87 134°43.19 44.73 71°43.93 45.31 158°16.44 9.03 282°22.67 21.00   283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00   21 298°14.80 164°41.97 · 43.32 101°45.84 · 46.61 188°20.43 · 8.97 297°25.30 · 21.08   22 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16   23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23     Mars 165°14.65 14.16 Jupiter 250°38.42 08:35   Saturn 359°52 01:22    Sept 02 Tue Venus 226°38.42 08:35   Saturn 359°5.52 01:22    Sep 02 Tue Venus 226°45.80 10:00   Mars 164°38.70 114:15   Jupiter 250°26.92 0.55   Saturn 359°3.30 01:18    Sep 03 Wed SHA Mer.pass Venus 227°31.79   Saturn 359°3.30 01:18    Sep 03 Wed SHA Mer.pass Venus 24°31.79   Saturn 359°3.10 01:18    Sep 03 Wed SHA Mer.pass Venus 24°31.79   Saturn 359°3.10 01:18    Sep 03 Wed SHA Mer.pass 25°2.20 0.55   Saturn 359°3.10 01:18    Sep 03 Wed SHA Mer.pass 25°2.20 0.55   Saturn 359°3.10 01:18    Sep 03 Wed SHA Mer.pass 25°2.20 0.55   Saturn							1 -
7 87°40.30 314°50.54 53.15 251°32.43 37.53 337°52.52 9.74 86°48.54 20.02 810°42.76 329°49.92 52.45 266°33.39 38.18 352°54.51 9.69 101°51.17 20.10 117°45.23 344°49.31 · · 51.75 281°34.35 · · 38.83 7°56.50 · · 9.63 116°53.79 · · 20.17 10 132°47.69 359°48.70 51.06 296°35.31 39.48 22°58.50 9.58 131°56.42 20.25 11 147°50.16 14°48.08 50.36 311°36.27 40.12 38°0.49 9.52 146°59.04 20.32 146°59.04 20.32 12 162°52.62 29°47.47 N17°49.66 326°37.23 \$06°40.77 53°2.48 N22°9.47 162°1.67 \$02°20.40 137°55.09 44°46.86 48.96 341°38.18 41.42 68°4.48 9.41 177°4.29 20.47 14 192°57.55 59°46.25 48.26 356°39.14 42.07 83°6.47 9.36 192°6.92 20.55 15 208°0.01 74°45.63 · · 47.55 11°40.10 · · · 42.72 98°8.46 · · 9.30 207°9.54 · · 20.63 16 223°2.48 89°45.02 46.85 26°41.06 43.37 113°10.46 9.25 222°12.17 20.70 17 238°4.94 104°44.41 46.15 41°42.02 44.01 128°12.45 9.19 237°14.79 20.78 18 253°7.41 119°43.80 N17°45.44 56°42.97 \$06°44.66 143°14.45 N22°9.14 252°17.42 \$02°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 188°16.44 9.08 267°20.04 20.93 202°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 188°16.44 9.08 267°20.04 20.93 202°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 188°16.44 9.08 267°20.04 20.93 22.67 21.00 21.298°14.80 164°41.97 · · 43.32 101°45.84 · · 46.61 188°20.43 · · · 8.97 297°25.30 · · 21.08 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23   328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23   329°30.55 21.23   348°40.50 48.50 48.50 48.50 48.50 48.50 47.26 203°22.43 8.92 312°27.92 21.16 Mars: 0.1							1
8 102°42.76 329°49.92 52.45 266°33.39 38.18 352°54.51 9.69 101°51.17 20.10 9 117°45.23 344°49.31 · 51.75 281°34.35 · 38.83 7°56.50 · 9.63 116°53.79 · 20.17 10 132°47.69 359°48.70 51.06 296°35.31 39.48 22°58.50 9.58 131°56.42 20.25 11 147°50.16 14°48.08 50.36 311°36.27 40.12 38°0.49 9.52 146°59.04 20.32 12 162°52.62 29°47.47 N17°49.66 326°37.23 S06°40.77 53°2.48 N22°9.47 162°1.67 S02°20.40 13 177°55.09 44°46.86 48.96 341°38.18 41.42 68°4.48 9.41 177°4.29 20.47 14 192°57.55 59°46.25 48.26 356°39.14 42.07 83°6.47 9.36 192°6.92 20.55 15 208°0.01 74°45.63 · 47.55 11°40.10 · 42.72 98°8.46 · 9.30 207°9.54 · 20.63 16 223°2.48 89°45.02 46.85 26°41.06 43.37 113°10.46 9.25 222°12.17 20.70 17 238°4.94 104°44.41 46.15 41°42.02 44.01 128°12.45 9.19 237°14.79 20.78 18 253°7.41 119°43.80 N17°45.44 56°42.97 S06°44.66 143°14.45 N22°9.14 252°17.42 S02°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 158°16.44 9.08 267°20.04 20.93 20 283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00 21 298°14.80 164°41.97 · 43.32 101°45.84 · 46.61 188°20.43 · 8.97 297°25.30 · 21.08 22 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23							1
9 117°45.23 344°49.31 · · 51.75 281°34.35 · · 38.83 7°56.50 · · 9.63 116°53.79 · · 20.17 10 132°47.69 359°48.70 51.06 296°35.31 39.48 22°58.50 9.58 131°56.42 20.25 11 147°50.16 14°48.08 50.36 311°36.27 40.12 38°0.49 9.52 146°59.04 20.32 12 162°52.62 29°47.47 N17°49.66 326°37.23 S06°40.77 53°2.48 N22°9.47 162°1.67 S02°20.40 13 177°55.09 44°46.86 48.96 341°38.18 41.42 68°4.48 9.41 177°4.29 20.47 14 192°57.55 59°46.25 48.26 356°39.14 42.07 83°6.47 9.36 192°6.92 20.55 15 208°0.01 74°45.63 · · 47.55 11°40.10 · · 42.72 98°8.46 · · 9.30 207°9.54 · · 20.63 16 223°2.48 89°45.02 46.85 26°41.06 43.37 113°10.46 9.25 222°12.17 20.70 17 238°4.94 104°44.41 46.15 41°42.02 44.01 128°12.45 9.19 237°14.79 20.78 18 253°7.41 119°43.80 N17°45.44 56°42.97 S06°44.66 143°14.45 N22°9.14 252°17.42 S02°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 158°16.44 9.08 267°20.04 20.93 20 283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00 21 298°14.80 164°41.97 · · 43.32 101°45.84 · · 46.61 188°20.43 · · 8.97 297°25.30 · · 21.08 22 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23     Sep 02 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°26.92 08:31   Sep 03 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°26.92 08:31   Saturn 359°3.30 01:18   Sep 03 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°26.92 08:31   Saturn 359°3.10 01:18   Sep 02 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°26.92 08:31   Saturn 359°3.30 01:18   Sep 03 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°26.92 08:31   Saturn 359°3.30 01:18   Sep 03 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°1.52 08:28 10:00   Saturn 359°3.30 01:18   Sep 03 Tue SHA Mer.pass Venus 228°45.80 10:00   Mars 164°3.870 14:15   Jupiter 250°1.52 08:28 10:00   Saturn 359°3.30 01:18   Sep 03 Tue SHA Mer.pass							1 '
10 132 47.09 399 48.70 51.06 296 35.31 39.48 22 58.50 9.58 131 50.42 20.25 146 59.04 20.32 146 59.04 20.32 12 162 52.62 29 47.47 N17 49.66 326 37.23 S06 40.77 53 2.48 N22 9.47 162 1.67 S02 20.40 13 177 55.09 44 40.86 48.96 341 38.18 41.42 68 4.88 9.41 177 4.29 20.47 14 192 57.55 59 46.25 48.26 356 39.14 42.07 83 6.47 9.36 192 6.92 20.55 15 208 0.01 74 45.63 47.55 11 40.10 42.72 98 8.46 9.25 22 20 1.17 20.70 17 238 4.94 104 44.41 46.15 41 42.02 44.01 128 12.45 9.19 237 14.79 20.78 18 253 7.41 119 43.80 N17 45.44 56 42.97 S06 44.66 143 14.45 N22 9.14 252 17.42 S02 20.85 19 268 9.87 134 43.19 44.73 71 43.93 45.31 158 16.44 9.08 267 20.04 20.93 20.283 12.33 149 42.58 44.03 86 44.89 45.96 173 18.44 9.03 282 22.67 21.00 21 298 14.80 164 41.97 43.32 101 45.84 46.61 188 20.43 8.92 312 27.92 21.16 23 328 19.73 194 40.75 41.90 131 47.76 47.90 218 24.42 8.86 327 30.55 21.23   Venus 228 45.80 10:00 Mars 164 93.70 14:15 Jupiter 250 26.92 08:31 10:00 Mars 164 93.70 14:15 Jupiter 250 26.92 08:31 Saturn 359 3.30 01:18 10:00 Mars 164 93.70 14:15 Jupiter 250 26.92 08:31 Saturn 359 3.30 01:18 10:00 Mars 164 93.70 14:15 Jupiter 250 26.92 08:31 Saturn 359 3.30 01:18 10:00 Mars 164 93.70 14:15 Jupiter 250 26.92 08:31 Saturn 359 3.70 10:01 Mars 164 93.70 16:01 Mars 164 93	9	$117^{\circ}45.23$	344°49.31 · · 51.75	281°34.35 · · 38.83	7°56.50 · · 9.63	116°53.79 · · 20.17	
11 14/*50.16 14*48.08 50.36 311*36.27 40.12 38*0.49 9.52 146*59.04 20.32 12 162*52.62 29*47.47 N17*49.66 326*37.23 \$06*40.77 53*2.48 N22*9.47 162*1.67 \$02*20.40 13 177*55.09 44*46.86 48.96 341*38.18 41.42 68*4.48 9.41 177*4.29 20.47 14 192*57.55 59*46.25 48.26 356*39.14 42.07 83*6.47 9.36 192*6.92 20.55 15 208*0.01 74*45.63 · 47.55 11*40.10 · 42.72 98*8.46 · 9.30 207*9.54 · 20.63 16 223*2.48 89*45.02 46.85 26*41.06 43.37 113*10.46 9.25 222*12.17 20.70 17 238*4.94 104*44.1 46.15 41*42.02 44.01 128*12.45 9.19 237*14.79 20.78 18 253*7.41 119*43.80 N17*45.44 56*42.97 \$06*44.66 143*14.45 N22*9.14 252*17.42 \$02*20.85 19 268*9.87 134*43.19 44.73 71*43.93 45.31 158*16.44 9.08 267*20.04 20.93 20 283*12.33 149*42.58 44.03 86*44.89 45.96 173*18.44 9.03 282*22.67 21.00 21 298*14.80 164*41.97 · 43.32 101*45.84 · 46.61 188*20.43 · 8.97 297*25.30 · 21.08 22 313*17.26 179*41.36 42.61 116*46.80 47.26 203*22.43 8.92 312*27.92 21.16 23 328*19.73 194*40.75 41.90 131*47.76 47.90 218*24.42 8.86 327*30.55 21.23							
13 177°55.09							1
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15 208°0.01 74°45.63 · · 47.55 11°40.10 · · · 42.72 98°8.46 · · · 9.30 207°9.54 · · · 20.63 16 223°2.48 89°45.02 46.85 26°41.06 43.37 113°10.46 9.25 222°12.17 20.70 17 238°4.94 104°44.41 46.15 41°42.02 44.01 128°12.45 9.19 237°14.79 20.78 18 253°7.41 119°43.80 N17°45.44 56°42.97 \$06°44.66 143°14.45 N22°9.14 252°17.42 \$02°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 158°16.44 9.08 267°20.04 20.93 20.283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00 21 298°14.80 164°41.97 · · 43.32 101°45.84 · · 46.61 188°20.43 · · · 8.97 297°25.30 · · · 21.08 23 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23							Saturn 359°3.30 01:18
17 238°4.94 104°44.41 46.15 41°42.02 44.01 128°12.45 9.19 237°14.79 20.78 18 253°7.41 119°43.80 N17°45.44 56°42.97 \$06°44.66 143°14.45 N22°9.14 252°17.42 \$02°20.85 19 268°9.87 134°43.19 44.73 71°43.93 45.31 158°16.44 9.08 267°20.04 20.93 20 283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00 21 298°14.80 164°41.97 · 43.32 101°45.84 · 46.61 188°20.43 · 8.97 297°25.30 · 21.08 22 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23 Mars: 0.1	15			11°40.10 · · 42.72		207°9.54 · · 20.63	
18							Venus 227°31.79 10:01
19 268°9.87 134°43.19 44.73 71°43.93 45.31 158°16.44 9.08 267°20.04 20.93 20 283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00 21 298°14.80 164°41.97 43.32 101°45.84 46.61 188°20.43 8.97 297°25.30 21.08 22 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23 Mars: 0.1							1
20 283°12.33 149°42.58 44.03 86°44.89 45.96 173°18.44 9.03 282°22.67 21.00 21 298°14.80 164°41.97 · · 43.32 101°45.84 · · 46.61 188°20.43 · · 8.97 297°25.30 · · 21.08 22 313°17.26 179°41.36 42.61 116°46.80 47.26 203°22.43 8.92 312°27.92 21.16 23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23  Horizontal parallax Venus: 0.1 Mars: 0.1				_			1 '
21       298°14.80       164°41.97       · · 43.32       101°45.84       · · 46.61       188°20.43       · · 8.97       297°25.30       · · 21.08       Horizontal parallax         22       313°17.26       179°41.36       42.61       116°46.80       47.26       203°22.43       8.92       312°27.92       21.16       Venus:       0.1         23       328°19.73       194°40.75       41.90       131°47.76       47.90       218°24.42       8.86       327°30.55       21.23       Mars:       0.1							
23 328°19.73 194°40.75 41.90 131°47.76 47.90 218°24.42 8.86 327°30.55 21.23 Mars: 0.1	21	$298^{\circ}14.80$	164°41.97 · · 43.32	101°45.84 · · 46.61	188°20.43 · · 8.97	297°25.30 · · 21.08	-
25 320 15/16 15 16/16 14/							1
Mer.pass. 01:10 $\nu$ -0.6′ $d$ -0.7′ m-3.94 $\nu$ 1.0′ $d$ 0.6′ m1.62 $\nu$ 2.0′ $d$ -0.1′ m-2.00 $\nu$ 2.6′ $d$ 0.1′ m0.64							IVIAIS: U.1
	Mer.p	pass. 01:10	ν-0.6' d-0.7' m-3.94	ν1.0' d0.6' m1.62	ν2.0′ d-0.1′ m-2.00	ν2.6' d0.1' m0.64	

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179° 58.45	N08°15.53	85°12.15	9.6'	S28°2.68	3.1'	54.6'
1	194°58.65	14.63	99°40.71	9.5'	$28^{\circ}5.75$	2.9'	54.6'
2	209°58.85	13.72	114°9.21	9.5'	28°8.68	2.8'	54.6'
3	224°59.05 239°59.24	· · 12.81	128°37.66 143°6.06	9.4'	28°11.48	2.7'	54.7'
4 5	239°59.24 254°59.44	11.90	143° 6.06 157° 34.40	9.3' 9.3'	28°14.13 28°16.65	2.5' 2.4'	54.7' 54.7'
6	269° 59.64	N08°10.09	172°2.70	9.2'	S28°19.02	2.2'	54.7'
7	284° 59.84	9.18	186°30.95	9.2'	28°21.26	2.1'	54.7'
8	300°0.04	8.27	200°59.15	9.2'	28°23.35	2.0'	54.7'
9	315°0.24	• • 7.36	215°27.31	9.1'	28°25.30	1.8'	54.8'
10	330°0.44 345°0.64	6.46	229°55.42 244°23.48	9.1'	28°27.11 28°28.78	1.7'	54.8'
11 12	0°0.84	5.55 N08° 4.64	244 23.48 258°51.50	9.0' 9.0'	28 28.78 \$28°30.31	1.5' 1.4'	54.8' 54.8'
13	15°1.04	3.73	273°19.48	8.9'	28°31.69	1.2'	54.8'
14	30°1.24	2.82	287°47.42	8.9'	28°32.92	1.1'	54.9'
15	45°1.44	•• 1.91	$302^{\circ}15.31$	8.9'	$28^{\circ}34.01$	0.9'	54.9'
16	60°1.64	1.00	316°43.17	8.8'	28°34.96	0.8'	54.9'
17	75°1.84 90°2.04	08° 0.09 N07° 59.18	331°10.99 345°38.77	8.8'	28°35.76 \$28°36.42	0.7'	54.9'
18 19	105°2.24	58.27	0°6.52	8.7' 8.7'	28°36.92	0.5' 0.4'	54.9' 55.0'
20	105 2.24 120°2.44	57.36	14°34.24	8.7'	28°37.28	0.4	55.0'
21	135°2.64	• • 56.45	29° 1.92	8.6'	28°37.50	0.1'	55.0'
22	150°2.84	55.53	43°29.57	8.6'	28°37.56	-0.1'	55.0'
23	165°3.05	54.62	57°57.19	8.6'	28°37.48	-0.2'	55.1'
	SD = 15.8'	d = -0.9'		SI	O = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0 1	180°3.25 195°3.45	N07°53.71 52.80	72°24.78 86°52.34	8.6' 8.5'	\$28°37.24 28°36.86	-0.4' -0.5'	55.1' 55.1'
2	195 3.45 210°3.65	52.80 51.89	80 52.34 101°19.87	8.5'	28°36.33	-0.5 -0.7'	55.1'
3	225°3.85	• • 50.97	115°47.38	8.5'	28°35.65	-0.8'	55.2'
4	240°4.05	50.06	$130^{\circ}14.87$	8.5'	$28^{\circ}34.82$	-1.0'	55.2'
5	255°4.26	49.15	144°42.33	8.4'	28°33.84	-1.1'	55.2'
6	270°4.46 285°4.66	N07°48.24	159° 9.78	8.4'	\$28°32.70	-1.3'	55.2'
7 8	285°4.66 300°4.86	47.32 46.41	173°37.20 188°4.60	8.4' 8.4'	28°31.42 28°29.98	-1.4' -1.6'	55.3' 55.3'
9	315°5.07	• • 45.50	202°31.99	8.4'	28°28.40	-1.7'	55.3'
10	330°5.27	44.58	216°59.36	8.4'	28°26.66	-1.9'	55.3'
11	345°5.47	43.67	231°26.72	8.3'	28°24.77	-2.0'	55.4'
12	0°5.67	N07°42.75	245°54.06	8.3'	\$28°22.73	-2.2'	55.4'
13 14	15°5.88 30°6.08	41.84 40.92	260°21.39 274°48.71	8.3' 8.3'	28°20.53 28°18.19	-2.3' -2.5'	55.4' 55.4'
15	45°6.28	40.01	289°16.03	8.3'	28°15.69	-2.5' -2.7'	55.5'
16	60°6.49	39.09	303°43.33	8.3'	28°13.03	-2.8'	55.5'
17	75°6.69	38.18	$318^{\circ}10.63$	8.3'	$28^{\circ}10.23$	-3.0'	55.5'
18	90°6.89	N07°37.26	332°37.92	8.3'	\$28°7.27	-3.1'	55.5'
19 20	105°7.10 120°7.30	36.35 35.43	347°5.21 1°32.49	8.3' 8.3'	28°4.16 28°0.90	-3.3' -3.4'	55.6' 55.6'
21	135°7.51	34.52	1 52.49 15°59.77	o.s 8.3'	26 0.90 27°57.48	-3.4 -3.6'	55.6'
22	150°7.71	33.60	30°27.06	8.3'	27°53.91	-3.7'	55.7'
23	165°7.91	32.68	44°54.34	8.3'	$27^{\circ}50.19$	-3.9'	55.7'
	SD = 15.8'	d = -0.9'		SI	O = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°8.12	N07°31.77	59°21.63	8.3'	\$27°46.32	-4.0'	55.7'
1	195°8.32	30.85	73°48.93	8.3'	$27^{\circ}42.29$	-4.2'	55.7'
2	210°8.53	29.93	88°16.22	8.3'	27°38.11	-4.3'	55.8'
3	225°8.73 240°8.94	• • 29.01	102°43.53 117°10.84	8.3'	27°33.78	-4.5'	55.8'
4 5	240°8.94 255°9.14	28.10 27.18	117°10.84 131°38.16	8.3' 8.3'	27°29.29 27°24.66	-4.6' -4.8'	55.8' 55.9'
6	270° 9.35	N07°26.26	131 36.10 146°5.49	8.3'	\$27°19.87	-4.0 -4.9'	55.9'
7	285°9.55	25.34	160°32.83	8.4'	$27^{\circ}14.92$	-5.1'	55.9'
8	300°9.76	24.42	175°0.19	8.4'	27°9.83	-5.2'	55.9'
9	315°9.96	• • 23.50	189°27.56	8.4'	27°4.59	-5.4'	56.0'
10 11	330° 10.17 345° 10.38	22.59 21.67	203°54.94 218°22.34	8.4' 8.4'	26°59.19 26°53.64	-5.5' -5.7'	56.0' 56.0'
12	0° 10.58	21.67 N07°20.75	218 22.34 232°49.76	8.4	20 53.04 \$26°47.95	-5. <i>1</i> -5.8'	56.1
13	15° 10.79	19.83	247°17.19	8.5'	26°42.10	-6.0'	56.1
14	30° 10.99	18.91	261°44.65	8.5'	26°36.10	-6.1'	56.1'
15	45° 11.20	17.99	276°12.13	8.5'	26°29.95	-6.3'	56.2'
16 17	60° 11.41 75° 11.61	17.07 16.15	290°39.62 305°7.14	8.5' 8.5'	26°23.65 26°17.20	-6.4' -6.6'	56.2' 56.2'
18	90°11.82	N07°15.23	305 7.14 319°34.69	8.6'	20 17.20 S26°10.61	-6.7'	56.2'
19	105° 12.03	14.31	334°2.26	8.6'	26°3.86	-6.9	56.3
20	120° 12.23	13.39	348°29.85	8.6'	25°56.97	-7.0'	56.3'
21	135° 12.44	• • 12.46	2°57.47	8.6'	25°49.93	-7.2'	56.3'
22 23	150° 12.65 165° 12.85	11.54 10.62	17°25.12 31°52.80	8.7' 8.7'	25°42.75 25°35.41	-7.3' -7.5'	56.4' 56.4'
23			J1 J2.0U			-1.5	50.4
	SD = 15.8'	d = -0.9'		SI	D = 15.2'		

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

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

Day			Sun		Moon				
		Eqn.of	f Time	Mer.	Mer.	Pass.	Age		
	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	9-11		
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	57-76		
	01	00:06	00:03	12:00	19:00	06:33			
	02	00:13	00:23	12:00	19:54	07:26			
	03	00:32	00:42	11:59	20:48	08:21			

### September 04, 05, 06 UT (Thu., Fri., Sat.)

h	Aries	Veni	us	Ma	ars	Jup	iter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	343°22.19	209°40.14		146°48.72	S06°48.55	233°26.42	N22°8.81	342°33.17	S02°21.31			
1	358°24.66	224°39.53	40.48	161°49.67	49.20	248°28.41	8.75	357°35.80	21.38	Alpheratz	357°33.88	29°14.02 -42°9.76
2	$13^{\circ}27.12$	239°38.92	39.77	$176^{\circ}50.63$	49.85	263°30.41	8.70	12°38.43	21.46	Ankaa Schedar	353°6.19 349°29.94	56°40.67
3	28° 29.58	254°38.31	• • 39.06	191°51.58	• • 50.49	278°32.40	• • 8.64	27°41.05	• • 21.54	Diphda	348°46.45	-17°50.54
4	43°32.05	269°37.71	38.34	206° 52.54 221° 53.50	51.14	293°34.40 308°36.40	8.59	42°43.68	21.61	Achernar	$335^{\circ}19.31$	-57° 6.08
5 6	58° 34.51 73° 36.98	284°37.10 299°36.49	37.63 N17°36.91	221 53.50 236° 54.45	51.79 \$06°52.44	308 30.40 323°38.39	8.53 N22°8.48	57°46.30 72°48.93	21.69 \$02°21.76	Hamal	$327^{\circ}50.36$	23°35.09
7	88°39.44	314°35.88	36.20	251°55.41	53.08	338°40.39	8.42	87°51.56	21.84	Polaris	313°33.60	89°22.06
8	103°41.90	329°35.28	35.48	266° 56.36	53.73	353°42.39	8.37	102°54.18	21.92	Acamar	315°11.15	-40°11.76
9	118°44.37	344°34.67	• • 34.76	281°57.32	• • 54.38	8°44.38	• • 8.31	$117^{\circ}56.81$	• • 21.99	Menkar Mirfak	314°5.43 308°27.31	4°11.58 49°57.02
10	133°46.83	359°34.07	34.04	296° 58.27	55.03	23°46.38	8.26	132°59.44	22.07	Aldebaran	290°38.97	16°33.72
11	148°49.30	14°33.46	33.32	311°59.23	55.67	38°48.38	8.20	148°2.06	22.15	Rigel	281°3.38	-8°10.10
12	163°51.76		N17°32.60	327°0.18	\$06°56.32	53°50.38	N22°8.15	163°4.69	502°22.22	Capella	$280^{\circ}21.14$	46°1.30
13 14	178° 54.23 193° 56.69	44°32.25 59°31.64	31.88 31.16	342°1.13 357°2.09	56.97 57.62	68°52.38 83°54.37	8.09 8.04	178°7.32 193°9.94	22.30 22.37	Bellatrix	$278^{\circ}22.34$	6°22.50
15	208° 59.15	74°31.04	30.43	12°3.04	• • 58.26	98°56.37	. 7.98	208° 12.57	• • 22.45	Elnath	278°1.23	28°37.72
16	224°1.62	89°30.44	29.71	27°4.00	58.91	113°58.37	7.93	223°15.20	22.53	Alnilam	275°37.24	-1°10.96
17	239°4.08	104°29.83	28.98	42°4.95	06°59.56	$129^{\circ}0.37$	7.87	238° 17.82	22.60	Betelgeuse Canopus	270°51.58 263°52.37	7°24.83 -52°42.18
18	254°6.55		N17°28.26	57°5.90	S07°0.21	144°2.37	N22°7.82	253° 20.45	S02°22.68	Sirius	258°25.91	-16°44.84
19	269°9.01	134°28.62	27.53	72°6.86	0.85	159°4.37	7.76	268°23.08	22.76	Adhara	255°5.63	-29°0.13
20	284°11.47	149°28.02	26.80	87°7.81	1.50	174° 6.37	7.71	283°25.71	22.83	Procyon	244°50.47	5° 9.67
21 22	299° 13.94 314° 16.40	164°27.42 179°26.82	· · 26.07 25.34	102°8.76 117°9.72	· · 2.15 2.79	189°8.37 204°10.36	7.65 7.59	298°28.33 313°30.96	· · 22.91 22.98	Pollux	$243^{\circ}16.88$	27°57.86
23	329° 18.87	194°26.21	24.61	132° 10.67	3.44	219°12.36	7.54	328° 33.59	23.06	Avior	234° 15.05	-59°35.23
_										Suhail	222°46.32	-43°31.96
IVIer.	pass. 01:06	$\nu$ -0.6' d-0.7	m-3.94	$\nu 1.0' d0.$	o m1.62	$\nu$ 2.0′ <i>d</i> -0.	m-2.00	$\nu 2.6' d0$	1 mU.b4	Miaplacidus Alphard	221°39.07 217°47.52	-69°49.15 -8°46.05
										Regulus	217 47.52 207°34.17	11°50.61
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		193°40.95	61°36.81
0	344°21.33		N17°23.88	147°11.62	S07°4.09	234°14.36	N22°7.48	343°36.22	S02°23.14	Denebola	182°24.69	14°25.83
1	359°23.79 14°26.26	224°25.01 239°24.41	23.15	162° 12.57 177° 13.53	4.73	249°16.36 264°18.36	7.43	358°38.84	23.21	Gienah	$175^{\circ}43.33$	-17°41.01
2	14 26.26 29°28.72	254°23.81	22.42 •• 21.68	177 13.53 192°14.48	5.38 • • 6.03	204 18.30 279°20.37	7.37 •• 7.32	13°41.47 28°44.10	23.29 •• 23.37	Acrux	173°0.17	-63°14.57
4	44°31.19	269°23.21	20.95	207° 15.43	6.67	294°22.37	7.26	43° 46.73	23.44	1	171°51.60	-57°15.49
5	59°33.65	284°22.61	20.21	222°16.38	7.32	309°24.37	7.21	58° 49.35	23.52	Alioth	166° 12.92 158° 21.97	55°49.40 -11°17.67
6	74°36.12		N17°19.48	237° 17.33	S07°7.97	324°26.37	N22°7.15	73°51.98	S02°23.60	Spica Alkaid	150 21.97 152°51.88	49°11.30
7	89°38.58	314°21.41	18.74	252°18.28	8.61	339°28.37	7.10	88°54.61	23.67	Hadar	148°35.67	-60°29.98
8	104°41.04	329°20.81	18.00	267°19.24	9.26	354°30.37	7.04	103°57.24	23.75		147°57.23	-36°29.85
9	119°43.51	344°20.21	17.26	282°20.19	• • 9.91	9°32.37	. 6.99	118°59.87	• • 23.83	Arcturus	$145^{\circ}47.60$	19°3.08
10 11	134° 45.97 149° 48.44	359° 19.61 14° 19.01	16.52 15.78	297°21.14 312°22.09	10.55 11.20	24°34.37 39°36.38	6.93 6.88	134°2.49 149°5.12	23.90 23.98	Rigil Kent.	139°39.93	-60°56.68
12	164° 50.90		N17°15.04	327°23.04	S07°11.85	54°38.38	N22° 6.82	164°7.75	S02°24.06	Kochab	137°20.30	74°3.20
13	179°53.36	44° 17.81	14.30	342°23.99	12.49	69°40.38	6.77	179°10.38	24.13		136°55.57 126°3.37	-16°8.90
14	194°55.83	59°17.22	13.56	$357^{\circ}24.94$	13.14	84°42.38	6.71	194°13.01	24.21	Alphecca Antares	120 3.37 112° 15.19	26°37.89 -26°29.38
15	209°58.29	74° 16.62	• • 12.81	12°25.89	•• 13.78	99°44.39	• • 6.66	209° 15.64	• • 24.29	Atria	107°8.88	-69° 4.66
16	225°0.76	89° 16.02	12.07	27°26.84	14.43	114°46.39	6.60	224° 18.27	24.36	Sabik	$102^{\circ}2.11$	-15°45.39
17 18	240°3.22 255°5.68	104° 15.43 119° 14.83	11.32 N17°10.58	42°27.79 57°28.74	15.08 \$07°15.72	129°48.39 144°50.39	6.55 N22° 6.49	239°20.89 254°23.52	24.44 \$02°24.52	Shaula	96°9.54	-37°7.44
19	270°8.15	134°14.23	9.83	72°29.69	16.37	159°52.40	6.44	269° 26.15	24.59	Rasalhague	95°57.97	12°32.63
20	285° 10.61	149°13.64	9.08	87°30.63	17.01	174°54.40	6.38	284°28.78	24.67	Eltanin	90°41.77	51°29.37
21	300°13.08	164°13.04	• • 8.33	102°31.58	• • 17.66	189°56.41	• • 6.33	299°31.41	• • 24.75	Kaus Aust. Vega	83°31.62 80°32.67	-34°22.40 38°48.66
22	$315^{\circ}15.54$	179°12.45	7.58	$117^{\circ}32.53$	18.30	204°58.41	6.27	314°34.04	24.82	Nunki	75°46.88	-26°15.89
23	330° 18.01	194°11.85	6.83	132°33.48	18.95	220°0.41	6.22	329°36.67	24.90	Altair	61°59.19	8°56.31
Mer.	pass. 01:02	$\nu$ -0.6' d-0.7	7′ m-3.94	$\nu$ 1.0′ d0.	6′ m1.62	$\nu$ 2.0′ d-0.	1′ m-2.01	$\nu 2.6' \ d0$	1′ m0.64	Peacock	53°4.37	-56°39.21
										Deneb	49°25.06	45°22.49
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Enif	33°37.95	9°59.71
0	345° 20.47	209°11.26	N17°6.08	147°34.43	S07°19.60	235°2.42	N22°6.16	344°39.30	S02°24.98	Al Na'ir Fomalhaut	27°31.74 15°13.53	-46°50.13 -29°29.03
1	$0^{\circ}22.93$	224°10.66	5.33	$162^{\circ}35.38$	20.24	$250^{\circ}4.42$	6.11	359°41.93	25.05	Scheat	13°44.32	28°13.44
2	15°25.40	239°10.07	4.57	177°36.33	20.89	265°6.43	6.05	14°44.55	25.13	Markab	13°29.03	15°20.74
3	30°27.86	254°9.48	3.82	192°37.27	•• 21.53	280°8.43	• • 6.00	29°47.18	• • 25.21	San 04 Th	CHV	
4 5	45°30.33 60°32.79	269°8.88 284°8.29	3.06 2.31	207°38.22 222°39.17	22.18 22.82	295°10.44 310°12.44	5.94 5.89	44° 49.81 59° 52.44	25.28 25.36	Sep 04 Thu Venus	<b>SHA</b> 226° 17.95	Mer.pass 10:02
6	75° 35.25	284 8.29 299°7.70	2.31 N17° 1.55		22.82 \$07°23.47	310°12.44 325°14.45	5.89 N22°5.83	74° 55.07	25.36 \$02°25.44		163° 26.52	14:12
7	90°37.72	314°7.10	0.79	252°41.06	24.11	340°16.45	5.78	89°57.70	25.52	Jupiter	250°4.23	08:25
8	105°40.18	329°6.51	$17^{\circ}0.04$	267°42.01	24.76	355°18.46	5.72	105°0.33	25.59	Saturn	359°10.98	01:10
9	120° 42.65	344°5.92	$16^{\circ}59.28$	282°42.96	•• 25.41	10°20.47	• • 5.67	120°2.96	• • 25.67	Sep 05 Fri	SHA	Mer.pass
10	135° 45.11	359°5.33	58.52	297°43.90	26.05	25°22.47	5.61	135°5.59	25.75	Venus	225°4.28	10:03
11	150° 47.57	14°4.74	57.76	312° 44.85	26.70	40°24.48	5.56	150°8.22	25.82	Mars	162°50.29	14:10
12 13	165° 50.04 180° 52.50	29°4.15   44°3.56	N16°56.99 56.23	327° 45.80 342° 46.74	\$07°27.34 27.99	55°26.48 70°28.49	N22°5.50 5.45	165° 10.85 180° 13.48	\$02°25.90 25.98	Jupiter	$249^{\circ}53.03$	08:22
14	195° 54.97	59°2.97	50.23 55.47	357° 47.69	28.63	85°30.50	5.45	195° 16.11	26.06	Saturn	359°14.89	01:05
15	210° 57.43	74°2.38	• • 54.70	12°48.63	• • 29.28	100°32.51	5.34	210° 18.74	• • 26.13	Sep 06 Sat	SHA	Mer.pass
16	225°59.89	89°1.79	53.94	27°49.58	29.92	115°34.51	5.28	225°21.37	26.21		223°50.79	10:04
17	241°2.36	104°1.20	53.17	42°50.52	30.56	130°36.52	5.23	240°24.00	26.29		$162^{\circ}13.96$	14:09
18	256°4.82		N16°52.41	57°51.47	S07°31.21	145°38.53	N22°5.17	255° 26.63	S02°26.36		249°41.95	08:19
19	271°7.29	134°0.02	51.64	72°52.41	31.85	160°40.54	5.12	270°29.26	26.44	Saturn	359° 18.83	01:01
20 21	286°9.75 301°12.21	148°59.43 163°58.84	50.87 •• 50.10	87°53.36 102°54.30	32.50 · · 33.14	175°42.54 190°44.55	5.06 •• 5.01	285°31.89 300°34.52	26.52 •• 26.60	Horizor	ıtal parallax	
22	316° 14.68	178°58.26	49.33	117° 55.25	33.79	205°46.56	4.95	315° 37.15	26.67		Venus:	0.1
23	331° 17.14	193°57.67	48.56	132°56.19	34.43	220°48.57	4.90	330°39.78	26.75		Mars:	0.1
Mer	pass. 00:58	ν-0.6′ d-0.8	3′ m-3 04	ν0 α/ d0	6′ m1.62	$\nu 2.0' \ d-0.$	1′ m-2 01	$\nu 2.6' d0$	1′ m0 63			
	- 355. 55.56	. J.J u J.C	5.57	. J.J UU.		u u.		. <u>-</u> .0 u0.				

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	$180^{\circ}13.06$	$N07^{\circ}9.70$	46°20.51	8.7'	\$25°27.93	-7.6'	56.4'
1	195°13.27	8.78	60°48.24	8.8'	25°20.31	-7.8'	56.5'
2	210°13.48 225°13.68	7.86 · · 6.93	75°16.01 89°43.81	8.8' 8.8'	25°12.54 25°4.62	-7.9' -8.1'	56.5' 56.5'
4	240°13.89	6.01	104°11.64	8.9'	24°56.57	-8.2'	56.6'
5	255°14.10	5.09	118°39.51	8.9'	24°48.36	-8.3'	56.6'
6	270°14.31	N07°4.17	133°7.41	8.9'	S24°40.02	-8.5'	56.6'
7 8	285°14.51 300°14.72	3.24 2.32	147°35.35 162°3.32	9.0' 9.0'	24°31.53 24°22.90	-8.6' -8.8'	56.7' 56.7'
9	315°14.93	. 1.40	176°31.33	9.0'	24° 22.90 24° 14.14	-o.o -8.9'	56.7'
10	330°15.14	07°0.47	190°59.37	9.1'	24°5.23	-9.0'	56.8'
11	345°15.35	$06^{\circ}59.55$	205°27.45	9.1'	$23^{\circ}56.18$	-9.2'	56.8'
12	0°15.56	N06°58.62	219°55.57	9.2'	\$23°46.99	-9.3'	56.8'
13 14	15°15.76 30°15.97	57.70 56.78	234°23.73 248°51.93	9.2' 9.2'	23°37.67 23°28.20	-9.5' -9.6'	56.9' 56.9'
15	45°16.18	• • 55.85	263°20.16	9.2	23°18.60	-9.0 -9.7'	56.9'
16	60°16.39	54.93	277°48.44	9.3'	23°8.87	-9.9'	57.0'
17	75°16.60	54.00	292°16.76	9.4'	22°59.00	-10.0'	57.0'
18	90°16.81 105°17.02	N06°53.08	306°45.12 321°13.52	9.4'	\$22°48.99 22°38.86	-10.1'	57.0' 57.1'
19 20	105°17.02 120°17.23	52.15 51.22	321°13.52 335°41.96	9.4' 9.5'	22° 38.86 22° 28.59	-10.3' -10.4'	57.1'
21	135°17.44	50.30	350°10.45	9.5'	22°18.18	-10.5	57.1
22	150°17.65	49.37	4°38.97	9.6'	22°7.65	-10.7'	57.2'
23	165°17.86	48.45	19°7.54	9.6'	21°56.99	-10.8'	57.2'
	SD = 15.9'	d = -0.9'		SI	O = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.07	N06°47.52	33°36.15	ν 9.7'	\$21°46.20	-10.9'	57.2'
1	195°18.28	46.59	48°4.81	9.7'	$21^{\circ}35.27$	-11.0'	57.3'
2	210°18.49	45.67	62°33.51	9.7'	21°24.23	-11.2'	57.3'
3 4	225°18.70 240°18.91	· · 44.74 43.81	77°2.25 91°31.04	9.8' 9.8'	21°13.05 21°1.75	-11.3' -11.4'	57.3' 57.4'
4 5	240 18.91 255°19.12	43.81 42.89	91 31.04 105°59.87	9.8 9.9'	21 1.75 20°50.33	-11.4 -11.5'	57.4' 57.4'
6	270°19.33	N06°41.96	120°28.74	9.9'	S20°38.78	-11.7'	57.4'
7	285°19.54	41.03	134°57.66	10.0'	$20^{\circ}27.11$	-11.8'	57.5'
8	300°19.75	40.10	149°26.62	10.0'	20°15.32	-11.9'	57.5'
9 10	315°19.96 330°20.17	· · 39.17 38.25	163°55.62 178°24.67	10.0' 10.1'	20°3.41 19°51.37	-12.0' -12.2'	57.5' 57.6'
11	345°20.38	37.32	176 24.07 192°53.76	10.1	19°31.37	-12.2	57.6'
12	0°20.59	N06°36.39	207°22.90	10.2'	S19°26.96	-12.4'	57.6'
13	15°20.80	35.46	221°52.08	10.2'	19°14.57	-12.5'	57.7'
14	30°21.01	34.53	236°21.30	10.3'	19°2.07	-12.6'	57.7'
15 16	45°21.23 60°21.44	· · 33.60 32.67	250°50.57 265°19.88	10.3' 10.4'	18°49.46 18°36.73	-12.7' -12.8'	57.7' 57.8'
17	75°21.65	31.74	279°49.23	10.4	18°23.89	-13.0'	57.8'
18	90°21.86	N06°30.81	294°18.63	10.4'	S18°10.94	-13.1'	57.8'
19	105°22.07	29.88	308°48.07	10.5'	17°57.88	-13.2'	57.9'
20 21	120°22.28 135°22.50	28.95 •• 28.02	323°17.55 337°47.07	10.5' 10.6'	17°44.71 17°31.44	-13.3' -13.4'	57.9' 57.9'
22	150°22.71	27.09	352°16.64	10.6'	17°18.05	-13.5'	58.0'
23	165°22.92	26.16	6°46.24	10.6'	17°4.57	-13.6'	58.0'
	SD = 15.9'	d = -0.9'		SI	D = 15.6'		
C = 4	CH4	Das			Dec		HP
Sat 0	<b>GHA</b> 180°23.13	<b>Dec</b> N06°25.23	<b>GHA</b> 21°15.89	u 10.7'	S16°50.98	d -13.7'	<b>нР</b> 58.0'
1	195°23.34	24.30	35°45.58	10.7'	$16^{\circ}37.28$	-13.8'	58.1'
2	210°23.56	23.37	50°15.30	10.8'	16°23.49	-13.9'	58.1'
3	225°23.77 240°23.98	• • 22.44	64°45.07	10.8'	16°9.59	-14.0' -14.1'	58.1'
4 5	240°23.98 255°24.19	21.51 20.57	79°14.88 93°44.72	10.8' 10.9'	15°55.59 15°41.50	-14.1' -14.2'	58.2' 58.2'
6	270°24.41	N06°19.64	108°14.60	10.9	S15°27.31	-14.3'	58.2'
7	285°24.62	18.71	122°44.53	11.0'	15°13.03	-14.4'	58.3'
8	300°24.83	17.78	137°14.48	11.0'	14°58.65	-14.5'	58.3'
9 10	315°25.05 330°25.26	· · 16.85 15.91	151°44.48 166°14.51	11.0' 11.1'	14°44.17 14°29.61	-14.6' -14.7'	58.3' 58.4'
11	345°25.47	14.98	180°44.58	11.1'	14 29.01 14°14.96	-14.7'	58.4'
12	0°25.68	N06°14.05	195°14.68	11.1'	S14°0.21	-14.8'	58.4'
13	15°25.90	13.11	209°44.81	11.2'	13°45.38	-14.9'	58.4'
14 15	30°26.11 45°26.33	12.18 •• 11.25	224°14.98 238°45.18	11.2' 11.2'	13°30.47 13°15.47	-15.0' -15.1'	58.5' 58.5'
15 16	45 26.33 60°26.54	10.31	253° 15.42	11.2	13 15.47 13°0.38	-15.1 -15.2'	58.5'
17	75°26.75	9.38	267°45.68	11.3'	12°45.21	-15.2'	58.6'
18	90°26.97	N06°8.45	282°15.98	11.3'	S12°29.96	-15.3'	58.6'
19 20	105°27.18 120°27.39	7.51	296°46.30 311°16.66	11.4'	12°14.64 11°59.23	-15.4'	58.6'
20 21	120°27.39 135°27.61	6.58 • • 5.64	311°16.66 325°47.04	11.4' 11.4'	11°59.23 11°43.75	-15.5' -15.6'	58.7' 58.7'
22	150°27.82	4.71	340°17.45	11.4'	11°28.19	-15.6'	58.7'
23	165°28.04	3.77	354°47.89	11.5'	11°12.56	-15.7'	58.7'
	SD = 15.9'	d = -0.9'		SI	D = 15.8'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	12-14	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	84-96%	
04	00:52	01:02	11:59	21:41	09:14		
05	01:12	01:22	11:59	22:32	10:07		
06	01:33	01:43	11:58	23:22	10:57		

# September 07, 08, 09 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	346° 19.61	208°57.08 N16°47.79	147°57.14 \$07°35.08	235°50.58 N22°4.84	345°42.41 <b>S</b> 02°26.83	
1	1°22.07	223°56.50 47.01	162°58.08 35.72	250°52.59 4.79	0°45.04 26.90	Alpheratz 357°33.87 29°14.03 Ankaa 353°6.18 -42°9.77
2	16°24.54	238°55.91 46.24	177°59.02 36.37	265°54.60 4.73	15°47.67 26.98	Schedar 349°29.93 56°40.68
3	31°27.00	253°55.32 · · 45.47	192°59.97 · · 37.01	280°56.61 · · 4.68	30°50.30 · · 27.06	Diphda 348°46.43 -17°50.54
4	46° 29.46	268°54.74 44.69	208° 0.91 37.65	295°58.62 4.62	45°52.93 27.14	Achernar 335°19.29 -57°6.09
5 6	61°31.93 76°34.39	283°54.15 43.92 298°53.57 N16°43.14	223°1.85 38.30 238°2.80 <b>S</b> 07°38.94	311°0.63 4.57 326°2.64 N22°4.51	60°55.57 27.21 75°58.20 \$02°27.29	Hamal 327°50.34 23°35.10
7	91°36.86	313°52.98 42.36	253°3.74 39.59	341° 4.65 4.46	91°0.83 27.37	Polaris 313°32.32 89°22.08
8	106° 39.32	328°52.40 41.58	268°4.68 40.23	356° 6.66 4.40	106°3.46 27.45	Acamar 315°11.13 -40°11.77
9	121°41.78	343°51.81 · · 40.80	283°5.62 · · 40.87	11°8.67 · · 4.35	121°6.09 · · 27.52	Menkar 314°5.41 4°11.58 Mirfak 308°27.28 49°57.03
10	136° 44.25	358°51.23 40.02	298°6.57 41.52	26°10.68 4.29	136°8.72 27.60	Aldebaran 290°38.95 16°33.72
11	151°46.71	13°50.64 39.24	313°7.51 42.16	41°12.69 4.24	151°11.35 27.68	Rigel 281°3.36 -8°10.10
12 13	166° 49.18 181° 51.64	28°50.06 N16°38.46 43°49.48 37.68	328°8.45 <b>S</b> 07°42.81 343°9.39 43.45	56°14.70 N22°4.18 71°16.71 4.13	166°13.98 S02°27.76 181°16.61 27.83	Capella 280°21.11 46°1.30
14	196°54.10	58°48.90 36.89	358° 10.33 44.09	86°18.72 4.07	196°19.24 27.91	Bellatrix 278°22.32 6°22.51
15	211° 56.57	73°48.31 · · 36.11	13°11.28 · · 44.74	101°20.73 · · 4.02	211°21.88 · · 27.99	Elnath 278°1.21 28°37.73
16	226°59.03	88°47.73 35.33	28°12.22 45.38	116°22.75 3.96	226°24.51 28.07	Alnilam 275°37.22 -1°10.95 Betelgeuse 270°51.56 7°24.83
17	242°1.50	103°47.15 34.54	43°13.16 46.02	131°24.76 3.91	241°27.14 28.14	Betelgeuse 270°51.56 7°24.83 Canopus 263°52.34 -52°42.17
18	257°3.96	118°46.57 N16°33.75	58°14.10 S07°46.67	146°26.77 N22°3.85	256°29.77 S02°28.22	Sirius 258°25.89 -16°44.83
19	272°6.42	133°45.99 32.97	73°15.04 47.31	161°28.78 3.80	271°32.40 28.30	Adhara 255°5.61 -29°0.12
20 21	287°8.89 302°11.35	148° 45.41 32.18 163° 44.83 · · 31.39	88°15.98 47.95 103°16.92 · · 48.60	176°30.80 3.75 191°32.81 · · 3.69	286° 35.03 28.38 301° 37.67 · · · 28.45	Procyon 244°50.46 5°9.67
22	317° 13.82	178°44.25 30.60	118° 17.86 49.24	206°34.82 3.64	316°40.30 28.53	Pollux 243°16.86 27°57.86
23	332° 16.28	193°43.67 29.81	133°18.80 49.88	221°36.84 3.58	331°42.93 28.61	Avior 234°15.03 -59°35.21
		-				Suhail 222°46.31 -43°31.95 Miaplacidus 221°39.05 -69°49.13
ivier.	pass. 00:55	ν-0.6' d-0.8' m-3.94	$\nu 0.9' \ d0.6' \ m1.62$	ν2.0' d-0.1' m-2.01	ν2.6' d0.1' m0.63	Miaplacidus 221°39.05 -69°49.13 Alphard 217°47.51 -8°46.04
						Regulus 207°34.16 11°50.61
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.94 61°36.80
0	347° 18.74	208°43.09 N16°29.02	148°19.74 \$07°50.53	236°38.85 N22°3.53	346°45.56	Denebola 182°24.69 14°25.83
1 2	2°21.21 17°23.67	223°42.51 28.22 238°41.93 27.43	163°20.68 51.17 178°21.62 51.81	251°40.86 3.47 266°42.88 3.42	1°48.19 28.76 16°50.82 28.84	Gienah 175°43.34 -17°41.01
3	32°26.14	253°41.35 · · 26.64	193°22.56 · · 52.46	281°44.89 · · 3.36	31°53.46 · · 28.92	Acrux 173°0.19 -63°14.56
4	47° 28.60	268° 40.77 25.84	208°23.50 53.10	296°46.90 3.31	46°56.09 29.00	Gacrux 171°51.61 -57°15.48
5	62°31.06	283°40.19 25.05	223°24.44 53.74	311°48.92 3.25	61°58.72 29.08	Alioth 166°12.93 55°49.38 Spica 158°21.98 -11°17.67
6	77° 33.53	298°39.61 N16°24.25	238°25.37 <b>S</b> 07°54.38	326°50.93 N22°3.20	77°1.35 \$02°29.15	Alkaid 152°51.89 49°11.29
7	92°35.99	313°39.04 23.45	253°26.31 55.03	341°52.95 3.14	92°3.99 29.23	Hadar 148°35.70 -60°29.97
8	107°38.46	328°38.46 22.65	268° 27.25 55.67 283° 28.19 · · · 56.31	356°54.96 3.09	107°6.62 29.31	Menkent 147°57.25 -36°29.84
9 10	122° 40.92 137° 43.38	343°37.88 ·· 21.85 358°37.31 21.05	283°28.19 · · 56.31 298°29.13 56.96	11°56.98 · · 3.03 26°58.99 2.98	122°9.25 · · 29.39 137°11.88 29.46	Arcturus 145°47.61 19°3.07
11	152°45.85	13°36.73 20.25	313°30.07 57.60	42°1.01 2.92	152°14.52 29.54	Rigil Kent. 139°39.96 -60°56.67
12	167°48.31	28°36.16 N16°19.45	328°31.00 S07°58.24	57°3.02 N22°2.87	167°17.15 S02°29.62	Kochab 137°20.35 74°3.19
13	182°50.78	43°35.58 18.65	343°31.94 58.88	72°5.04 2.81	182°19.78 29.70	Zuben'ubi 136°55.58 -16°8.90 Alphecca 126°3.39 26°37.88
14	197°53.24	58°35.00 17.85	358°32.88 07°59.53	87°7.06 2.76	197°22.41 29.78	Antares 112°15.20 -26°29.38
15	212°55.70	73°34.43 · · 17.04	13°33.81 08°0.17	102°9.07 · · 2.70	212°25.05 · · 29.85	Atria 107°8.92 -69°4.66
16 17	227°58.17 243°0.63	88°33.86 16.24 103°33.28 15.43	28°34.75 0.81 43°35.69 1.45	117°11.09 2.65 132°13.11 2.59	227°27.68 29.93 242°30.31 30.01	Sabik 102°2.13 -15°45.39
18	243 0.03 258°3.10	103°33.28 15.43 118°32.71 N16°14.63	58° 36.62 \$08° 2.09	147°15.12 N22°2.54	257°32.94 S02°30.09	Shaula 96°9.55 -37°7.44
19	273°5.56	133°32.13 13.82	73°37.56 2.74	162°17.14 2.48	272°35.58 30.17	Rasalhague 95°57.98 12°32.63
20	288°8.02	148°31.56 13.01	88°38.50 3.38	177°19.16 2.43	287°38.21 30.24	Eltanin 90°41.80 51°29.37 Kaus Aust. 83°31.63 -34°22.41
21	303°10.49	163°30.99 · · 12.20	103°39.43 · · 4.02	192°21.18 · · 2.37	302°40.84 · · 30.32	Vega 80°32.68 38°48.67
22	318° 12.95	178°30.41 11.39	118° 40.37 4.66	207°23.19 2.32	317°43.48 30.40	Nunki 75°46.90 -26°15.90
23	333° 15.42	193°29.84 10.58	133°41.30 5.30	222°25.21 2.26	332°46.11 30.48	Altair 61°59.20 8°56.31
Mer. <sub>I</sub>	pass. 00:51	$\nu$ -0.6′ d-0.8′ m-3.94	$ u 0.9' \ d0.6' \ m1.62$	$\nu 2.0' \ d$ -0.1' m-2.02	$\nu 2.6' \ d0.1' \ m0.63$	Peacock 53°4.38 -56°39.22
						Deneb 49°25.07 45°22.50
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.95 9°59.71
0	348° 17.88	208°29.27 N16°9.77	148°42.24 \$08°5.95	237°27.23 N22°2.21	347°48.74 <b>S</b> 02°30.56	Al Na'ir 27°31.74 -46°50.14 Fomalhaut 15°13.53 -29°29.04
1	3°20.34	223°28.70 8.96	163°43.18 6.59	252°29.25 2.16	2°51.38 30.63	Scheat 13°44.32 28°13.45
2	18° 22.81	238°28.13 8.15	178° 44.11 7.23	267°31.27 2.10	17°54.01 30.71	Markab 13°29.03 15°20.75
3 4	33°25.27 48°27.74	253°27.56 ·· 7.34 268°26.99 6.52	193°45.04 · · 7.87 208°45.98 8.51	282°33.28 · · 2.05 297°35.30 1.99	32°56.64 · · · 30.79 47°59.28	Sep 07 Sun SHA Mer.pass
4 5	48 27.74 63°30.20	283°26.41 5.71	208 45.98 8.51 223°46.91 9.15	312°37.32 1.94	47°59.28 30.87 63°1.91 30.95	Venus 222°37.47 10:05
6	78° 32.66	298°25.84 N16°4.89	238°47.85 \$08°9.79	327°39.34 N22°1.88	78°4.54 S02°31.02	Mars 161°37.53 14:07
7	93°35.13	313°25.27 4.07	253°48.78 10.44	342°41.36 1.83	93°7.18 31.10	Jupiter 249°30.97 08:16
8	108° 37.59	328°24.71 3.26	268° 49.72 11.08	357°43.38 1.77	108°9.81 31.18	Saturn 359°22.80 00:57
9	123° 40.06	343°24.14 · · 2.44	283°50.65 · · 11.72	12°45.40 · · 1.72	123°12.44 · · · 31.26	Sep 08 Mon SHA Mer.pass
10 11	138° 42.52 153° 44.98	358°23.57 1.62 13°23.00 0.80	298°51.58 12.36 313°52.52 13.00	27°47.42 1.66 42°49.44 1.61	138° 15.08 31.34 153° 17.71 31.41	Venus 221°24.34 10:06
12	153 44.98 168° 47.45	28°22.43 N15°59.98	313 52.52 13.00 328°53.45 \$08°13.64	42°49.44 1.61 57°51.46 N22°1.55	153°17.71 31.41 168°20.34 \$02°31.49	Mars 161°1.00 14:06
13	183°49.91	43°21.86 15°59.16	343°54.38 14.28	72°53.48 1.50	183°22.98 31.57	Jupiter 249°20.10 08:12
14	198°52.38	58°21.29 58.33	358°55.32 14.92	87°55.50 1.44	198°25.61 31.65	Saturn 359°26.82 00:53
15	213°54.84	73°20.73 · · 57.51	13°56.25 · · 15.56	102°57.52 · · 1.39	213°28.25 · · 31.73	Sep 09 Tue SHA Mer.pass
16	228° 57.30	88°20.16 56.69	28° 57.18 16.21	117°59.54 1.33	228°30.88 31.80	Venus 220°11.39 10:06
17	243°59.77	103°19.59 55.86	43°58.11 16.85 58°59.05 <b>S</b> 08°17.49	133° 1.57 1.28 148° 3.59 N22° 1.22	243°33.51 31.88	Mars 160°24.36 14:04
18 19	259°2.23 274°4.70	118°19.03 N15°55.04 133°18.46 54.21	58°59.05 S08°17.49 73°59.98 18.13	148°3.59 N22°1.22 163°5.61 1.17	258°36.15 \$02°31.96 273°38.78 32.04	Jupiter 249°9.35 08:09 Saturn 359°30.86 00:49
20	289°7.16	148°17.90 53.38	89°0.91 18.77	178° 7.63 1.12	288°41.42 32.12	Jatum 339 30.80 00:49
21	304°9.63	163°17.33 · · 52.56	104°1.84 · · 19.41	193° 9.65 · · 1.06	303°44.05 · · 32.20	Horizontal parallax
22	319° 12.09	178°16.77 51.73	119°2.77 20.05	208°11.68 1.01	318° 46.68 32.27	Venus: 0.1
23	334° 14.55	193°16.20 50.90	134°3.70 20.69	223°13.70 0.95	333°49.32 32.35	Mars: 0.1
Mer.	pass. 00:47	ν-0.6′ d-0.8′ m-3.94	$ u 0.9' \ d0.6' \ m1.61$	$\nu 2.0' \ d$ -0.1' m-2.02	$\nu 2.6' \ d0.1' \ m0.62$	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.25	N06°2.84	9° 18.35	11.5'	S10°56.86	-15.8'	58.8'
1	195°28.47	1.90	23°48.84	11.5'	10°41.08	-15.8'	58.8'
2	210°28.68	0.97	38° 19.35	11.5'	10°25.24	-15.9'	58.8'
3 4	225°28.89 240°29.11	06°0.03 05°59.10	52°49.89 67°20.45	11.6' 11.6'	10°9.32 09°53.34	-16.0' -16.0'	58.9' 58.9'
5	255°29.32	58.16	81°51.03	11.6'	09°37.30	-16.1	58.9'
6	270°29.54	N05°57.22	96°21.63	11.6'	S09°21.19	-16.2	58.9'
7	285°29.75	56.29	$110^{\circ}52.25$	11.6'	$09^{\circ}5.02$	-16.2'	59.0'
8	300°29.97	55.35	125°22.89	11.7'	08°48.79	-16.3'	59.0'
9	315°30.18	54.41	139°53.55	11.7'	08°32.49	-16.3	59.0'
10 11	330°30.40 345°30.61	53.48 52.54	154°24.22 168°54.91	11.7' 11.7'	08° 16.15 07° 59.74	-16.4' -16.5'	59.0' 59.1'
12	0°30.83	N05°51.60	183°25.62	11.7'	507°43.28	-16.5	59.1
13	15°31.04	50.67	197° 56.34	11.7'	07°26.77	-16.6'	59.1'
14	30°31.26	49.73	$212^{\circ}27.07$	11.7'	$07^{\circ}10.20$	-16.6'	59.1'
15	45°31.48	• • 48.79	226° 57.82	11.8'	06°53.59	-16.7'	59.2'
16 17	60°31.69 75°31.91	47.85 46.92	241°28.57 255°59.34	11.8' 11.8'	06°36.92 06°20.21	-16.7' -16.8'	59.2' 59.2'
18	90°32.12	N05°45.98	270°30.11	11.8'	S06°3.45	-16.8	59.2'
19	105°32.34	45.04	285°0.89	11.8'	05° 46.65	-16.8'	59.3'
20	120°32.55	44.10	299°31.68	11.8'	05°29.81	-16.9'	59.3'
21	135°32.77	• • 43.16	$314^{\circ}2.47$	11.8'	$05^{\circ}12.92$	-16.9'	59.3'
22	150°32.99	42.22	328° 33.27	11.8'	04°56.00	-17.0'	59.3'
23	165°33.20	41.28	343°4.07	11.8'	04°39.04	-17.0'	59.4'
	SD = 15.9'	d = -0.9'		SI	O = 16.0'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0 0	180°33.42	N05° 40.35	357°34.87	u 11.8'	504° 22.04	a -17.0'	пР 59.4'
1	195°33.64	39.41	12°5.68	11.8'	04°5.01	-17.1'	59.4'
2	210°33.85	38.47	26°36.48	11.8'	03°47.95	-17.1'	59.4'
3	225°34.07	• • 37.53	41°7.28	11.8'	03°30.85	-17.1'	59.4'
4	240°34.28 255°34.50	36.59	55°38.08 70°8.88	11.8' 11.8'	03°13.73 02°56.57	-17.2'	59.5'
5 6	255 34.50 270°34.72	35.65 N05°34.71	70 8.88 84°39.67	11.8'	502°39.39	-17.2' -17.2'	59.5' 59.5'
7	285°34.93	33.77	99° 10.46	11.8'	02°22.19	-17.2	59.5'
8	300°35.15	32.83	113°41.24	11.8'	02°4.96	-17.2'	59.5'
9	315°35.37	• • 31.89	$128^{\circ}12.01$	11.8'	$01^{\circ}47.72$	-17.3'	59.6'
10	330°35.59	30.95	142°42.78	11.8'	01°30.45	-17.3'	59.6'
11	345°35.80 0°36.02	30.00 N05°29.06	157°13.53 171°44.27	11.7'	01°13.16 \$00°55.86	-17.3'	59.6'
12 13	15°36.02	28.12	171° 44.27 186° 15.00	11.7' 11.7'	00° 38.54	-17.3' -17.3'	59.6' 59.6'
14	30°36.45	27.18	200°45.71	11.7'	00° 30.34	-17.3'	59.6'
15	45°36.67	• • 26.24	215° 16.41	11.7'	\$00°3.87	-17.4'	59.7'
16	60°36.89	25.30	229°47.09	11.7'	N00° 13.48	17.4'	59.7'
17	75°37.11	24.36	244° 17.75	11.6'	00°30.84	17.4	59.7'
18 19	90°37.32 105°37.54	N05°23.41 22.47	258° 48.40 273° 19.03	11.6' 11.6'	N00°48.20 01°5.57	17.4' 17.4'	59.7' 59.7'
20	120°37.76	21.53	287°49.63		01°22.94		59.7'
21	135°37.98	20.59	302°20.21	11.6'	01°40.31	17.4	59.8'
22	150°38.19	19.64	$316^{\circ}50.77$	11.5'	$01^{\circ}57.68$	17.4'	59.8'
23	165°38.41	18.70	331°21.30	11.5'	02°15.05	17.4'	59.8'
	SD = 15.9'	d = -0.9'		SI	O = 16.2'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	180°38.63	N05° 17.76	345°51.81	11.5'	N02°32.42	17.4'	59.8'
1	195°38.85	16.82	0°22.29	11.5'	$02^{\circ}49.78$	17.4'	59.8'
2	210°39.07	15.87	14°52.74	11.4'	03°7.13	17.3'	59.8'
3 4	225°39.28 240°39.50	· · 14.93 13.99	29°23.16 43°53.55	11.4' 11.4'	03°24.47 03°41.80	17.3' 17.3'	59.8' 59.8'
4 5	240°39.50 255°39.72	13.99 13.04	43°53.55 58°23.91	11.4	03°41.80 03°59.11	17.3'	59.8° 59.9'
6	270°39.94	N05° 12.10	72° 54.23	11.3'	N04° 16.42	17.3	59.9'
7	285°40.16	11.15	87°24.52	11.3'	04°33.70	17.3	59.9'
8	300°40.38	10.21	101°54.78	11.2'	04°50.97	17.2'	59.9'
9	315°40.59	• • 9.26	116°25.00	11.2'	05°8.21	17.2'	59.9'
10 11	330°40.81 345°41.03	8.32 7.38	130°55.17 145°25.31	11.1' 11.1'	05°25.44 05°42.64	17.2' 17.2'	59.9' 59.9'
11	345 41.03 0°41.25	7.38 N05°6.43	145° 25.31 159° 55.41	11.1'	N05° 59.81	17.2	59.9'
13	15°41.47	5.49	174° 25.47	11.0'	06° 16.96	17.1	59.9'
14	30°41.69	4.54	188°55.48	11.0'	06°34.08	17.1'	59.9'
15	45°41.91	• • 3.60	203°25.45	10.9'	06°51.16	17.1'	60.0'
16	60°42.13	2.65	217°55.37 232°25.25	10.9'	07°8.22 07°25.24	17.0'	60.0'
17 18	75°42.34 90°42.56	1.70 N05°0.76	232°25.25 246°55.08	10.8' 10.8'	07°25.24 N07°42.22	17.0' 16.9'	60.0' 60.0'
19	105°42.78	04°59.81	261°24.86	10.8	07°59.16	16.9	60.0
20	120°43.00	58.87	275°54.59	10.7'	08° 16.07	16.9	60.0'
21	135°43.22	•• 57.92	290°24.27	10.6'	08° 32.93	16.8'	60.0'
22	150°43.44	56.97	304°53.90	10.6'	08°49.74	16.8'	60.0'
23	165°43.66	56.03	319°23.47	10.5'	09°6.52	16.7'	60.0'
	SD = 15.9'	d = -0.9'		SI	D = 16.3'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	15-17	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%	
07	01:53	02:03	11:58	-:-	11:46		
80	02:14	02:24	11:58	00:10	12:34		
09	02:35	02:45	11:57	00:58	13:23		

### September 10, 11, 12 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$349^{\circ}17.02$	208°15.64 N15°50.07	149°4.63 \$08°21.33	238°15.72 N22°0.90	348°51.95 \$02°32.43	Alpheratz 357°33.86 29°14.04
1	4°19.48	223°15.07 49.24	164°5.56 21.97	253°17.74 0.84	3°54.59 32.51	Ankaa 353°6.17 -42°9.78
2	19°21.95 34°24.41	238°14.51 48.41 253°13.94 · · 47.57	179°6.49 22.61	268°19.77 0.79 283°21.79 · · 0.73	18°57.22 32.59	Schedar 349°29.92 56°40.70
3 4	34 24.41 49°26.87	253°13.94 · · 47.57 268°13.38 46.74	194°7.42 · · · 23.25 209°8.35         23.89	283°21.79 · · 0.73 298°23.81 0.68	33°59.86 · · 32.67 49°2.49 32.74	Diphda 348°46.43 -17°50.54
5	64°29.34	283°12.82 45.91	224°9.28 24.53	313°25.84 0.62	64°5.13 32.82	Achernar 335°19.27 -57°6.10
6	79°31.80	298°12.26 N15°45.07	239°10.21 <b>S</b> 08°25.17	328°27.86 N22°0.57	79°7.76 <b>S</b> 02°32.90	Hamal 327°50.33 23°35.10 Polaris 313°30.93 89°22.08
7	94°34.27	313°11.69 44.23	254°11.14 25.81	343°29.89 0.51	94°10.39 32.98	Acamar 315°11.11 -40°11.77
8 9	109°36.73 124°39.19	328°11.13 43.40 343°10.57 • 42.56	269°12.07 26.45 284°13.00 •• 27.09	358°31.91 0.46 13°33.93 · · 0.41	109°13.03 33.06 124°15.66 · · 33.14	Menkar 314°5.40 4°11.58
10	139° 41.66	358°10.01 41.72	299°13.93 27.73	28°35.96 0.35	139°18.30 33.21	Mirfak 308°27.25 49°57.03
11	154° 44.12	13°9.45 40.88	314°14.86 28.37	43°37.98 0.30	154°20.93 33.29	Aldebaran 290°38.93 16°33.72 Rigel 281°3.34 -8°10.10
12	169°46.59	28°8.89 N15°40.04	329°15.79 \$08°29.01	58°40.01 N22°0.24	169°23.57 \$02°33.37	Capella 280°21.08 46°1.30
13 14	184° 49.05 199° 51.51	43°8.33 39.20 58°7.77 38.36	344°16.72 29.65 359°17.65 30.29	73°42.03 0.19 88°44.06 0.13	184°26.20 33.45 199°28.84 33.53	Bellatrix 278°22.30 6°22.51
15	214° 53.98	73°7.21 · · 37.52	359° 17.65 30.29 14° 18.57 · · 30.93	88°44.06 0.13 103°46.09 · · 0.08	214°31.47 · · 33.61	Elnath 278°1.19 28°37.73
16	229° 56.44	88°6.65 36.68	29° 19.50 31.57	118°48.11 0.02	229°34.11 33.68	Alnilam 275°37.20 -1°10.95   Betelgeuse 270°51.55 7°24.83
17	244°58.91	103°6.09 35.84	44°20.43 32.21	133°50.14 21°59.97	244°36.74 33.76	Betelgeuse 270°51.55 7°24.83 Canopus 263°52.31 -52°42.16
18	260°1.37	118°5.53 N15°34.99	59°21.36	148°52.16 N21°59.91	259°39.38 \$02°33.84	Sirius 258°25.88 -16°44.83
19 20	275°3.83 290°6.30	133° 4.97 34.15 148° 4.41 33.30	74°22.28 33.48 89°23.21 34.12	163°54.19 59.86 178°56.22 59.81	274°42.01 33.92 289°44.65 34.00	Adhara 255°5.60 -29°0.12
21	305°8.76	163°3.86 · · 32.45	104°24.14 · · 34.76	193°58.24 · · 59.75	304°47.28 · · 34.08	Procyon 244°50.44 5°9.67
22	$320^{\circ}11.23$	178°3.30 31.61	119°25.07 35.40	209° 0.27 59.70	319°49.92 34.15	Pollux 243°16.85 27°57.85 Avior 234°15.01 -59°35.20
23	335°13.69	193°2.74 30.76	134°25.99 36.04	224°2.30 59.64	334°52.56 34.23	Suhail 222°46.30 -43°31.94
Mer.p	pass. 00:43	$\nu$ -0.6′ $d$ -0.8′ m-3.94	$ u 0.9' \ d0.6' \ m1.61$	$\nu 2.0' \ d\text{-}0.1' \ \text{m-}2.02$	$\nu 2.6' \ d0.1' \ m0.62$	Miaplacidus 221°39.02 -69°49.12
						Alphard 217°47.50 -8°46.04
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.16 11°50.60 Dubhe 193°40.94 61°36.78
0	350° 16.15	208°2.18 N15°29.91	149°26.92 <b>S</b> 08°36.68	239°4.33 N21°59.59	349°55.19 <b>S</b> 02°34.31	Denebola 182°24.70 14°25.83
1	5° 18.62	223°1.63 29.06	164°27.84 37.32	254°6.35 59.53	4°57.83 34.39	Gienah 175°43.34 -17°41.00
2	20°21.08 35°23.55	238°1.07 28.21 253°0.52 · · 27.36	179°28.77 37.96 194°29.70 · · 38.59	269° 8.38 59.48 284° 10.41 • 59.42	20°0.46 34.47 35°3.10 · · 34.55	Acrux 173°0.20 -63°14.54
4	50°26.01	267°59.96 26.51	209°30.62 39.23	299°12.44 59.37	50°5.73 34.63	Gacrux 171°51.62 -57°15.47
5	65°28.48	282°59.40 25.65	224°31.55 39.87	314°14.47 59.31	65°8.37 34.70	Alioth 166°12.95 55°49.37 Spica 158°21.99 -11°17.66
6	80°30.94	297°58.85 N15°24.80	239°32.47 \$08°40.51	329°16.49 N21°59.26	80°11.00 <b>S</b> 02°34.78	Alkaid 152°51.91 49°11.28
7 8	95°33.40 110°35.87	312°58.30 23.95 327°57.74 23.09	254°33.40 41.15 269°34.32 41.79	344°18.52 59.21 359°20.55 59.15	95°13.64 34.86 110°16.28 34.94	Hadar 148°35.72 -60°29.96
9	110 35.67 125°38.33	342°57.19 · · 22.23	284°35.25 · · 42.43	359°20.55 59.15 14°22.58 • 59.10	110°16.28 34.94 125°18.91 · · 35.02	Menkent 147°57.26 -36°29.83
10	140°40.80	357°56.63 21.38	299° 36.17 43.06	29°24.61 59.04	140°21.55 35.10	Arcturus 145°47.63 19°3.07 Rigil Kent. 139°39.98 -60°56.66
11	155° 43.26	12°56.08 20.52	314°37.09 43.70	44°26.64 58.99	155°24.18 35.18	Kochab 137°20.40 74°3.18
12	170° 45.72	27°55.53 N15°19.66	329°38.02	59°28.67 N21°58.93	170°26.82 \$02°35.25	Zuben'ubi 136°55.59 -16°8.89
13 14	185° 48.19 200° 50.65	42°54.97 18.80 57°54.42 17.94	344°38.94 44.98 359°39.87 45.62	74°30.70 58.88 89°32.73 58.82	185°29.46 35.33 200°32.09 35.41	Alphecca 126°3.41 26°37.88
15	215°53.12	72°53.87 · · 17.08	14°40.79 · · 46.25	104°34.76 · · 58.77	215°34.73 · · 35.49	Antares 112°15.22 -26°29.38
16	230°55.58	87°53.32 16.22	29°41.71 46.89	119°36.79 58.72	230°37.36 35.57	Atria 107°8.97 -69°4.66 Sabik 102°2.15 -15°45.39
17	245°58.04	102°52.77 15.36	44°42.64 47.53	134°38.82 58.66	245°40.00 35.65	Shaula 96°9.57 -37°7.44
18 19	261°0.51 276°2.97	117°52.22 N15°14.50 132°51.66 13.63	59°43.56	149°40.85 N21°58.61 164°42.89 58.55	260°42.64 S02°35.73 275°45.27 35.80	Rasalhague 95°58.00 12°32.63
20	291°5.44	147°51.11 12.77	89°45.40 49.44	179°44.92 58.50	290°47.91 35.88	Eltanin 90°41.82 51°29.37 Kaus Aust. 83°31.65 -34°22.41
21	306°7.90	162°50.56 · · 11.90	104°46.33 · · 50.08	194°46.95 · · 58.44	305°50.55 · · 35.96	Kaus Aust. 83°31.65 -34°22.41 Vega 80°32.70 38°48.67
22	321°10.36	177°50.01 11.04	119° 47.25 50.72	209°48.98 58.39	320°53.18 36.04	Nunki 75°46.91 -26°15.90
23	336°12.83	192°49.46 10.17	134°48.17 51.35	224°51.01 58.34	335°55.82 36.12	Altair 61°59.22 8°56.31
Mer.p	pass. 00:39	ν-0.6' d-0.8' m-3.94	$ u 0.9' \ d0.6' \ m1.61 $	ν2.0' d-0.1' m-2.03	$\nu 2.6' \ d0.1' \ m0.61$	Peacock 53°4.40 -56°39.23
						Deneb 49°25.09 45°22.52 Enif 33°37.96 9°59.72
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.75 -46°50.15
0 1	351°15.29 6°17.76	207°48.91 N15°9.31 222°48.37 8.44	149°49.09	239°53.05 N21°58.28 254°55.08 58.23	350°58.46 S02°36.20 6°1.09 36.28	Fomalhaut 15°13.53 -29°29.05
2	21°20.22	237° 47.82 7.57	179° 50.93 53.27	269°57.11 58.17	21°3.73 36.36	Scheat 13°44.32 28°13.46
3	36°22.69	252°47.27 · · 6.70	194°51.86 · · 53.90	284°59.14 · · 58.12	36°6.37 · · 36.43	Markab 13°29.03 15°20.75
4	51°25.15	267°46.72 5.83	209°52.78 54.54	300°1.18 58.06	51°9.00 36.51	Sep 10 Wed SHA Mer.pass
5 6	66°27.61 81°30.08	282°46.17 4.96 297°45.63 N15°4.09	224°53.70 55.18 239°54.62 \$08°55.81	315°3.21 58.01 330°5.24 N21°57.96	66°11.64 36.59 81°14.28 \$02°36.67	Venus 218°58.62 10:07   Mars 159°47.62 14:03
7	96°32.54	312°45.08 3.21	254°55.54 56.45	345° 7.28 57.90	96°16.91 36.75	Jupiter 248°58.70 08:06
8	111°35.01	327°44.53 2.34	269° 56.46 57.09	0°9.31 57.85	111°19.55 36.83	Saturn 359°34.94 00:44
9	126° 37.47	342°43.99 · · 1.47	284°57.38 · · 57.72	15°11.35 · · 57.79	126°22.19 · · 36.91	Sep 11 Thu SHA Mer.pass
10	141°39.93	357°43.44 15°0.59	299°58.30 58.36	30°13.38 57.74	141°24.82 36.99	Venus 217°46.03 10:08
11 12	156° 42.40 171° 44.86	12°42.89 14°59.72 27°42.35 N14°58.84	314°59.22 59.00 330°0.14 \$08°59.63	45°15.41 57.68 60°17.45 N21°57.63	156°27.46 37.06 171°30.10 \$02°37.14	Mars 159°10.76 14:01
13	186° 47.33	42°41.80 57.96	345°1.06 09°0.27	75°19.48 57.58	186°32.73 37.22	Jupiter 248°48.17 08:03
14	201°49.79	57°41.26 57.09	0°1.97 0.91	90°21.52 57.52	201°35.37 37.30	Saturn 359°39.04 00:40
15	216° 52.26	72°40.71 · · 56.21	15°2.89 · · 1.54	105°23.56 · · 57.47	216°38.01 · · 37.38	Sep 12 Fri SHA Mer.pass
16 17	231°54.72 246°57.18	87°40.17 55.33 102°39.63 54.45	30°3.81 2.18 45°4.73 2.81	120°25.59 57.41 135°27.63 57.36	231°40.64 37.46 246°43.28 37.54	Venus 216°33.62 10:09
18	261°59.65	117°39.08 N14°53.57	60°5.65 S09°3.45	150°29.66 N21°57.31	261°45.92 S02°37.62	Mars 158°33.80 14:00   Jupiter 248°37.75 07:59
19	$277^{\circ}2.11$	132°38.54 52.69	75°6.57 4.09	165°31.70 57.25	276°48.56 37.69	Saturn 359°43.16 00:36
20	292°4.58	147°38.00 51.80	90°7.48 4.72	180°33.74 57.20	291°51.19 37.77	Horizontal parallax
21 22	307°7.04 322°9.50	162°37.45 · · 50.92 177°36.91 50.04	105°8.40 · · 5.36 120°9.32 5.99	195°35.77 · · · 57.14 210°37.81 57.09	306°53.83 · · 37.85 321°56.47 37.93	Venus: 0.1
23	337° 11.97	192°36.37 49.15	135°10.24 6.63	225°39.85 57.03	336°59.11 38.01	Mars: 0.1
	pass. 00:35	ν-0.5' d-0.9' m-3.94	ν0.9' d0.6' m1.61	ν2.0' d-0.1' m-2.03	ν2.6' d0.1' m0.61	
14161.		∠ 0.5 a-0.5 III-5.54			ν Δ.Ο αΟ.Ι IIIΟ.ΟΙ	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.88	N04°55.08	333°52.99	10.5'	N09°23.24	16.7'	60.0'
1	195° 44.10	54.13	348°22.45	10.4'	09°39.92	16.6'	60.0'
2	210°44.32 225°44.54	53.19	2°51.86	10.3'	09°56.54 10°13.11	16.6'	60.0'
3 4	225°44.54 240°44.76	· · 52.24 51.29	17°21.21 31°50.49	10.3' 10.2'	10°13.11 10°29.62	16.5' 16.5'	60.0' 60.0'
5	255° 44.98	50.35	46° 19.72	10.2	10°25.02	16.4	60.0'
6	270° 45.20	N04°49.40	60°48.89	10.1'	N11°2.48	16.3'	60.0'
7	285°45.42	48.45	75°18.00	10.0'	$11^{\circ}18.82$	16.3'	60.0'
8	300°45.63	47.50	89°47.04	10.0'	11°35.10	16.2'	60.0'
9 10	315° 45.85 330° 46.07	· · 46.56 45.61	104°16.02 118°44.93	9.9' 9.8'	11°51.31 12°7.46	16.1' 16.1'	60.0' 60.0'
11	345° 46.29	44.66	133° 13.77	9.8'	12°23.53	16.0'	60.0'
12	0°46.51	N04°43.71	147°42.55	9.7'	N12°39.54	15.9'	60.0'
13	15°46.73	42.76	$162^{\circ}11.26$	9.6'	12°55.48	15.9'	60.0'
14	30° 46.95	41.81	176°39.91	9.6'	13°11.34	15.8'	60.0'
15 16	45° 47.17 60° 47.39	· · 40.86 39.92	191°8.48 205°36.98	9.5' 9.4'	13°27.13 13°42.84	15.7' 15.6'	60.0' 60.0'
17	75° 47.61	38.97	220° 5.41	9.4	13°58.47	15.5'	60.0'
18	90°47.84	N04°38.02	234°33.77	9.3'	N14°14.02	15.5'	60.0'
19	105° 48.06	37.07	249°2.05	9.2'	14°29.49	15.4'	60.0'
20	120° 48.28	36.12	263°30.26	9.1'	14°44.87	15.3'	60.0'
21 22	135°48.50 150°48.72	· · 35.17 34.22	277°58.39 292°26.45	9.1' 9.0'	15°0.16 15°15.37	15.2' 15.1'	60.0' 60.0'
23	165° 48.94	33.27	306°54.43	9.0 8.9'	15°30.48	15.0'	60.0'
	SD = 15.9'	d = -0.9'			0 = 16.4'		
		u — -0.9		JL	- 10.4		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°49.16	N04°32.32	321°22.34 335°50.16	8.8'	N15°45.51	14.9'	60.0'
1 2	195°49.38 210°49.60	31.37 30.42	335°50.16 350°17.91	8.7' 8.7'	16°0.44 16°15.27	14.8' 14.7'	60.0' 60.0'
3	210 49.00 225°49.82	• • 29.47	4°45.58	8.6'	16°30.01	14.6	60.0'
4	240° 50.04	28.52	19°13.17	8.5'	16°44.64	14.5'	60.0'
5	255° 50.26	27.57	33°40.68	8.4'	16°59.18	14.4'	60.0'
6	270°50.48	N04°26.62	48°8.10	8.3'	N17°13.61	14.3'	60.0'
7 8	285°50.70 300°50.92	25.66 24.71	62°35.45 77°2.71	8.3' 8.2'	17°27.94 17°42.16	14.2' 14.1'	60.0' 60.0'
9	315°51.14	. 23.76	91°29.89	8.1	17°56.27	14.1	60.0
10	330°51.37	22.81	105°56.99	8.0'	18°10.27	13.9'	60.0'
11	345°51.59	21.86	$120^{\circ}24.01$	7.9'	18°24.16	13.8'	60.0'
12	0°51.81	N04°20.91	134°50.94	7.8'	N18°37.93	13.7'	59.9'
13 14	15°52.03 30°52.25	19.96 19.00	149°17.78 163°44.55	7.8' 7.7'	18°51.59 19°5.13	13.5' 13.4'	59.9' 59.9'
15	45° 52.47	• • 18.05	178° 11.23	7.6'	19° 18.55	13.3'	59.9'
16	60°52.69	17.10	192°37.82	7.5'	19°31.85	13.2'	59.9'
17	75° 52.91	16.15	207°4.33	7.4'	19°45.02	13.1'	59.9'
18	90°53.13	N04°15.19	221°30.75	7.3'	N19°58.08 20°11.00	12.9'	59.9'
19 20	105°53.36 120°53.58	14.24 13.29	235°57.09 250°23.34	7.3' 7.2'	20°11.00 20°23.80	12.8' 12.7'	59.9' 59.9'
21	135° 53.80	• • 12.34	264°49.51	7.1'	20° 36.46	12.5'	59.9'
22	150°54.02	11.38	279°15.59	7.0'	20°49.00	12.4'	59.9'
23	165°54.24	10.43	293°41.59	6.9'	21°1.40	12.3'	59.8'
	$SD = 15.9^{\prime}$	d = -1.0'		SE	0 = 16.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180° 54.46	N04° 9.48	308° 7.50	ν 6.8'	N21°13.66	12.1'	59.8'
1	195°54.68	8.52	322°33.33	6.7'	21°25.79	12.0'	59.8'
2	210°54.91	7.57	336°59.07	6.7'	21°37.78	11.9'	59.8'
3 4	225°55.13 240°55.35	· · 6.61 5.66	351°24.73 5°50.31	6.6' 6.5'	21°49.64 22°1.34	11.7' 11.6'	59.8' 59.8'
4 5	240 55.35 255°55.57	5.00 4.71	5 50.31 20°15.80	6.4'	22 1.34 22°12.91	11.6	59.8'
6	270°55.79	N04°3.75	34°41.20	6.3'	N22°24.33	11.3'	59.8'
7	285° 56.01	2.80	49°6.53	6.2'	22°35.61	11.1'	59.7'
8	300° 56.24 315° 56.46	1.84 04°0.89	63°31.77 77°56.93	6.2'	22°46.73 22°57.71	11.0'	59.7'
9 10	315°56.46 330°56.68	04°0.89 03°59.94	77°56.93 92°22.00	6.1' 6.0'	22°57.71 23°8.53	10.8' 10.7'	59.7' 59.7'
11	345° 56.90	58.98	106°47.00	5.9'	23°19.21	10.7	59.7'
12	0°57.12	N03°58.03	121°11.92	5.8'	N23°29.72	10.4'	59.7'
13	15° 57.34	57.07	135°36.75	5.8'	23°40.09	10.2'	59.7'
14 15	30° 57.57 45° 57.79	56.12 •• 55.16	150°1.51 164°26.19	5.7' 5.6'	23°50.29 24°0.34	10.0' 9.9'	59.7'
15 16	45°57.79 60°58.01	54.20	164°26.19 178°50.79	5.6° 5.5'	24°0.34 24°10.22	9.9'	59.6' 59.6'
17	75°58.23	53.25	178 50.79 193°15.32	5.5'	24°10.22 24°19.95	9.6'	59.6'
18	90°58.45	N03°52.29	207°39.77	5.4'	N24°29.51	9.4'	59.6'
19	105° 58.68	51.34	222° 4.15	5.3'	24°38.91	9.2'	59.6'
20 21	120°58.90 135°59.12	50.38 •• 49.43	236°28.45 250°52.68	5.2' 5.2'	24°48.14 24°57.21	9.1' 8.9'	59.6' 59.5'
21	135°59.12 150°59.34	49.43 48.47	250°52.68 265°16.84	5.2	24°57.21 25°6.10	8.9° 8.7'	59.5' 59.5'
23	165° 59.57	47.51	279°40.93	5.0'	25°14.83	8.6'	59.5'
	SD = 15.9'	d = -1.0'		SF	0 = 16.3'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	18-20	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	93-77%	
10	02:56	03:06	11:57	01:48	14:14		
11	03:17	03:27	11:57	02:40	15:08		
12	03:38	03:48	11:56	03:36	16:05		

### September 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	352° 14.43	207°35.83 N14°48.27	150°11.15 S09°7.26	240°41.88 N21°56.98	352°1.74 S02°38.09	
1	$7^{\circ}16.90$	222°35.29 47.38	165°12.07 7.90	255°43.92 56.93	7°4.38 38.17	Alpheratz 357°33.85 29°14.05 Ankaa 353°6.16 -42°9.79
2	22° 19.36	237° 34.75 46.49	180°12.99 8.54	270°45.96 56.87	22°7.02 38.25	Schedar 349°29.89 56°40.71
3	37°21.82	252°34.20 · · 45.61	195°13.90 · · 9.17	285°48.00 · · 56.82	37°9.66 · · 38.33	Diphda 348°46.41 -17°50.54
4	52°24.29	267°33.66 44.72	210°14.82 9.81	300°50.03 56.76	52°12.29 38.40	Achernar 335°19.25 -57°6.11
5 6	67° 26.75 82° 29.22	282°33.12 43.83 297°32.58 N14°42.94	225°15.74 10.44 240°16.65 \$09°11.08	315°52.07 56.71 330°54.11 N21°56.66	67°14.93 38.48 82°17.57 S02°38.56	Hamal 327°50.31 23°35.11
7	97°31.68	312°32.04 42.05	255°17.57 11.71	345°56.15 56.60	97°20.21 38.64	Polaris 313°29.24 89°22.09
8	112°34.15	327°31.51 41.16	270°18.48 12.35	0°58.19 56.55	112°22.84 38.72	Acamar 315°11.08 -40°11.78
9	127°36.61	342°30.97 · · 40.27	285°19.40 · · 12.98	16°0.23 · · 56.49	127°25.48 · · 38.80	Menkar 314°5.38 4°11.59
10	$142^{\circ}39.07$	357°30.43 39.38	300°20.31 13.62	31°2.27 56.44	142°28.12 38.88	Mirfak 308°27.22 49°57.04 Aldebaran 290°38.91 16°33.73
11	157°41.54	12°29.89 38.48	315°21.23 14.25	46° 4.31 56.39	157°30.76 38.96	Rigel 281°3.31 -8°10.10
12	172°44.00	27°29.35 N14°37.59	330°22.14 S09°14.89	61°6.35 N21°56.33	172°33.40 <b>S</b> 02°39.04	Capella 280°21.05 46°1.30
13	187°46.47	42°28.81 36.69	345°23.06 15.52	76°8.39 56.28	187°36.03 39.11	Bellatrix 278°22.28 6°22.51
14 15	202°48.93 217°51.40	57°28.28 35.80 72°27.74 · · 34.90	$0^{\circ}23.97$ 16.16 15°24.88 · · 16.79	91°10.43 56.22 106°12.47 · · 56.17	202°38.67 39.19 217°41.31 · · 39.27	Elnath 278°1.16 28°37.73
16	232°53.86	87° 27.20 34.00	30°25.80 17.42	100 12.47 · · 50.17 121°14.51 56.12	232°43.95 39.35	Alnilam 275°37.18 -1°10.95
17	247°56.32	102°26.67 33.11	45°26.71 18.06	136°16.55 56.06	247°46.59 39.43	Betelgeuse 270°51.52 7°24.83
18	262°58.79	117°26.13 N14°32.21	60°27.62 <b>S</b> 09°18.69	151°18.59 N21°56.01	262°49.22 S02°39.51	Canopus 263°52.28 -52°42.16
19	278°1.25	132°25.60 31.31	75°28.54 19.33	166°20.63 55.95	277°51.86 39.59	Sirius 258°25.85 -16°44.83 Adhara 255°5.57 -29°0.11
20	293°3.72	147°25.06 30.41	90°29.45 19.96	181°22.67 55.90	292°54.50 39.67	Procyon 244°50.42 5°9.67
21	308°6.18	162°24.53 · · 29.51	105°30.36 · · 20.60	196°24.71 · · 55.85	307°57.14 · · 39.75	Pollux 243°16.82 27°57.85
22	323°8.64	177°23.99 28.61	120°31.28 21.23	211°26.75 55.79	322°59.78 39.82	Avior 234°14.98 -59°35.20
23	338° 11.11	192°23.46 27.71	135°32.19 21.86	226°28.80 55.74	338°2.41 39.90	Suhail 222°46.28 -43°31.93
Mer.	pass. 00:31	$\nu$ -0.5 $'$ d-0.9 $'$ m-3.94	$\nu 0.9'~d0.6'~\text{m}1.61$	$\nu 2.0' \ d\text{-}0.1' \ \text{m-}2.04$	$\nu 2.6' \ d0.1' \ \text{m}0.61$	Miaplacidus 221°38.99 -69°49.11
						Alphard 217°47.49 -8°46.04
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.14 11°50.60
0	353° 13.57	207°22.92 N14°26.80	150°33.10 \$09°22.50	241°30.84 N21°55.69	353°5.05 S02°39.98	Dubhe 193°40.94 61°36.76
1	8° 16.04	222°22.39 25.90	165°34.01 23.13	256°32.88 55.63	8°7.69 40.06	Denebola 182°24.69 14°25.82 Gienah 175°43.34 -17°41.00
2	$23^{\circ}18.50$	237°21.86 25.00	180°34.92 23.76	271°34.92 55.58	23°10.33 40.14	Acrux 173°0.20 -63°14.53
3	$38^{\circ}20.97$	252°21.32 · · 24.09	195°35.84 · · 24.40	286°36.97 · · 55.52	38°12.97 · · 40.22	Gacrux 171°51.61 -57°15.46
4	53°23.43	267°20.79 23.19	210°36.75 25.03	301°39.01 55.47	53°15.61 40.30	Alioth 166°12.95 55°49.36
5	68°25.89	282°20.26 22.28	225° 37.66 25.67	316°41.05 55.42	68°18.24 40.38	Spica 158°21.99 -11°17.66
6	83°28.36	297°19.72 N14°21.37	240°38.57 \$09°26.30	331°43.10 N21°55.36 346°45.14 55.31	83°20.88	Alkaid 152°51.92 49°11.27
7 8	98° 30.82 113° 33.29	312°19.19 20.46 327°18.66 19.56	255°39.48 26.93 270°40.39 27.57	346°45.14 55.31 1°47.18 55.26	98°23.52 40.54 113°26.16 40.61	Hadar 148°35.73 -60°29.95
9	128° 35.75	342°18.13 · · 18.65	285°41.30 · · 28.20	16°49.23 · · 55.20	128°28.80 · · 40.69	Menkent 147°57.26 -36°29.83
10	143°38.21	357°17.60 17.74	300°42.21 28.83	31°51.27 55.15	143°31.44 40.77	Arcturus 145°47.63 19°3.06
11	158° 40.68	12°17.07 16.83	315°43.12 29.46	46°53.32 55.09	158°34.08 40.85	Rigil Kent. 139°39.99 -60°56.65 Kochab 137°20.46 74°3.17
12	173°43.14	27°16.54 N14°15.92	330°44.03 <b>S</b> 09°30.10	61°55.36 N21°55.04	173°36.71 <b>S</b> 02°40.93	Zuben'ubi 136°55.60 -16°8.89
13	$188^{\circ}45.61$	42°16.01 15.00	345°44.94 30.73	76°57.41 54.99	188°39.35 41.01	Alphecca 126°3.42 26°37.88
14	203°48.07	57°15.48 14.09	0°45.85 31.36	91°59.45 54.93	203°41.99 41.09	Antares 112°15.23 -26°29.38
15	218° 50.54	72°14.95 · · 13.18	15°46.76 · · 32.00	107°1.50 · · 54.88	218°44.63 · · 41.17	Atria 107°9.00 -69°4.65
16	233°53.00	87°14.42 12.26	30°47.67 32.63	122°3.54 54.83	233°47.27 41.25	Sabik 102°2.15 -15°45.38
17 18	248° 55.46 263° 57.93	102°13.89 11.35 117°13.36 N14°10.43	45°48.58 33.26 60°49.48 \$09°33.89	137° 5.59 54.77 152° 7.63 N21° 54.72	248°49.91 41.33 263°52.55 \$02°41.41	Shaula 96°9.58 -37°7.43
19	279°0.39	132°12.83 9.52	75°50.39 34.53	167° 9.68 54.67	278°55.19 41.48	Rasalhague 95°58.01 12°32.63
20	294°2.86	147°12.31 8.60	90°51.30 35.16	182°11.73 54.61	293°57.83 41.56	Eltanin 90°41.85 51°29.38
21	309°5.32	162°11.78 · · 7.68	105°52.21 · · 35.79	197°13.77 · · 54.56	309°0.46 · · 41.64	Kaus Aust. 83°31.66 -34°22.41 Vega 80°32.72 38°48.68
22	324°7.78	177°11.25 6.76	120°53.12 36.42	212°15.82 54.50	324°3.10 41.72	Nunki 75°46.92 -26°15.90
23	$339^{\circ}10.25$	192°10.73 5.85	135°54.02 37.06	227°17.87 54.45	339°5.74 41.80	Altair 61°59.22 8°56.32
Mer.ı	pass. 00:27	$\nu$ -0.5' d-0.9' m-3.94	$\nu$ 0.9' d0.6' m1.61	$\nu$ 2.0' d-0.1' m-2.04	ν2.6' d0.1' m0.60	Peacock 53°4.41 -56°39.24
						Deneb 49°25.10 45°22.53
B.4:	CIIA	CHV D	CHA	CHA D	CHA D	Enif 33°37.96 9°59.72
Mon 0	<b>GHA</b> 354° 12.71	<b>GHA Dec</b> 207°10.20 N14°4.93	<b>GHA Dec</b> 150°54.93 <b>S</b> 09°37.69	<b>GHA Dec</b> 242°19.92 N21°54.40	<b>GHA Dec</b> 354°8.38 <b>S</b> 02°41.88	Al Na'ir 27°31.75 -46°50.16
1	9° 15.18	222°9.67 4.01	165°55.84 38.32	257°21.96 54.34	9°11.02 41.96	Fomalhaut 15°13.52 -29°29.05 Scheat 13°44.32 28°13.48
2	24° 17.64	237°9.15 3.08	180° 56.74 38.95	272°24.01 54.29	24°13.66 42.04	Scheat 13°44.32 28°13.48 Markab 13°29.02 15°20.76
3	39°20.11	252°8.62 · · 2.16	195°57.65 · · 39.58	287°26.06 · · 54.24	39°16.30 · · 42.12	
4	54°22.57	267°8.10 1.24	210°58.56 40.21	302°28.11 54.18	54°18.94 42.20	Sep 13 Sat SHA Mer.pass
5	69°25.03	282°7.57 14°0.32	225°59.46 40.85	317°30.16 54.13	69°21.58 42.27	Venus 215°21.40 10:10
6	84° 27.50	297°7.05 N13°59.39	241°0.37 \$09°41.48	332°32.20 N21°54.08	84°24.22	Mars 157° 56.72 13:58
7	99°29.96	312°6.52 58.47	256°1.27 42.11	347°34.25 54.02	99°26.86 42.43	Jupiter 248°27.45 07:56 Saturn 359°47.31 00:32
8 9	114° 32.43 129° 34.89	327°6.00 57.54 342°5.47 • 56.62	271°2.18 42.74 286°3.09 · · 43.37	2°36.30 53.97 17°38.35 · 53.92	114°29.50 42.51 129°32.13 • 42.59	
10	144°37.36	357°4.95 55.69	301°3.99 44.00	32°40.40 53.86	144°34.77 42.67	Sep 14 Sun SHA Mer.pass
11	159°39.82	12°4.43 54.76	316°4.90 44.63	47°42.45 53.81	159°37.41 42.75	Venus 214°9.35 10:11
12	174°42.28	27°3.91 N13°53.83	331°5.80 S09°45.27	62°44.50 N21°53.76	174°40.05	Mars 157°19.53 13:57
13	189°44.75	42°3.38 52.91	346°6.71 45.90	77°46.55 53.70	189°42.69 42.91	Jupiter 248°17.27 07:53 Saturn 359°51.48 00:28
14	204°47.21	57°2.86 51.98	1°7.61 46.53	92°48.60 53.65	204°45.33 42.99	Saturn 359 51:46 00:28
15	219°49.68	72°2.34 · · 51.05	16°8.51 · · 47.16	107°50.65 · · 53.60	219°47.97 · · 43.07	Sep 15 Mon SHA Mer.pass
16	234°52.14	87°1.82 50.11	31°9.42 47.79	122°52.70 53.54	234°50.61 43.14	Venus 212°57.49 10:12
17 18	249°54.60 264°57.07	102°1.30 49.18 117°0.78 N13°48.25	46°10.32 48.42 61°11.23 \$09°49.05	137°54.75 53.49 152°56.80 N21°53.44	249°53.25 43.22 264°55.89 \$02°43.30	Mars 156°42.22 13:55
18	279° 59.53	132°0.25 47.32	76°12.13 49.68	167°58.85 53.38	279°58.53 43.38	Jupiter 248°7.20 07:50 Saturn 359°55.67 00:23
20	295°2.00	146°59.73 46.38	91°13.03 50.31	183° 0.91 53.33	295°1.17 43.46	3aturii 339 33.07 00:23
21	310°4.46	161°59.21 · · 45.45	106° 13.93 · · 50.94	198° 2.96 · · 53.28	310°3.81 · · 43.54	Horizontal parallax
22	$325^{\circ}6.93$	176°58.69 44.52	121°14.84 51.57	213°5.01 53.22	325°6.45 43.62	Venus: 0.1
23	340°9.39	191°58.18 43.58	136°15.74 52.20	228° 7.06 53.17	340°9.09 43.70	Mars: 0.1
Mer	pass. 00:23	ν-0.5' d-0.9' m-3.93	ν0.9' d0.6' m1.61	ν2.0' d-0.1' m-2.05	ν2.6' d0.1' m0.60	

	-	T0.0001 3ec		011		, 555	
h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°59.79	N03°46.56	294°4.95	5.0'	N25°23.39	8.4'	59.5'
1	196° 0.01 211° 0.23	45.60	308°28.91 322°52.80	4.9'	25°31.78	8.2'	59.5'
2	211°0.23 226°0.45	44.64 •• 43.69	322°52.80 337°16.62	4.8' 4.8'	25°39.99 25°48.03	8.0' 7.9'	59.5' 59.4'
4	241°0.68	42.73	351°40.39	4.7'	25°55.89	7.7'	59.4'
5	256° 0.90	41.77	6°4.09	4.6'	26°3.58	7.5'	59.4'
6	271°1.12	N03°40.82	20°27.73	4.6'	$N26^{\circ}11.09$	7.3'	59.4'
7	286°1.34	39.86	34°51.31	4.5'	26° 18.42	7.2'	59.4
8 9	301°1.57 316°1.79	38.90 •• 37.94	49°14.83 63°38.30	4.5' 4.4'	26°25.57 26°32.54	7.0' 6.8'	59.4' 59.3'
10	331° 2.01	36.99	78° 1.72	4.4'	26°39.33	6.6	59.3'
11	346° 2.23	36.03	92°25.08	4.3'	26°45.94	6.4'	59.3'
12	1°2.46	N03°35.07	106°48.40	4.3'	N26° 52.36	6.2'	59.3'
13	16°2.68	34.11	121°11.67	4.2'	26°58.60	6.1'	59.3'
14 15	31°2.90 46°3.12	33.16 · · 32.20	135°34.89 149°58.07	4.2' 4.1'	27°4.65 27°10.52	5.9' 5.7'	59.3' 59.2'
16	61° 3.35	31.24	164°21.20	4.1'	27° 16.32	5.5'	59.2'
17	76° 3.57	30.28	178°44.30	4.1'	27°21.70	5.3'	59.2'
18	91°3.79	N03°29.32	193°7.35	4.0'	N27°27.01	5.1'	59.2'
19	106° 4.01	28.36	207°30.38	4.0'	27°32.13	4.9'	59.2'
20 21	121° 4.24 136° 4.46	27.40 •• 26.45	221°53.36 236°16.32	4.0' 3.9'	27°37.06 27°41.80	4.7' 4.6'	59.1' 59.1'
22	150 4.46 151° 4.68	25.49	250° 39.25	3.9'	27 41.80 27°46.35	4.0 4.4'	59.1'
23	166° 4.90	24.53	265°2.14	3.9'	27°50.71	4.2'	59.1'
	SD = 15.9'	d = -1.0'			D = 16.2'		
	JD — 13.9	u = -1.0		اد	J = 10.2°		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°5.13	N03°23.57	279°25.02	3.9'	N27°54.88	4.0'	59.1'
1	196° 5.35	22.61	293°47.87	3.8'	27°58.86	3.8'	59.0'
2	211° 5.57 226° 5.80	21.65 •• 20.69	308°10.70 322°33.51	3.8' 3.8'	28°2.64 28°6.24	3.6' 3.4'	59.0' 59.0'
3 4	220 5.80 241°6.02	19.73	322 33.51 336°56.31	3.8'	28 0.24 28°9.64	3.4	59.0'
5	256° 6.24	18.77	351°19.09	3.8'	28° 12.85	3.0'	59.0'
6	271°6.46	N03°17.81	5°41.86	3.8'	N28° 15.86	2.8'	58.9'
7	286° 6.69	16.85	20°4.63	3.8'	28° 18.69	2.6'	58.9'
8	301° 6.91 316° 7.13	15.89 •• 14.93	34°27.38 48°50.14	3.8' 3.8'	28°21.31 28°23.75	2.4' 2.2'	58.9'
9 10	310 7.13 331°7.36	· · 14.93 13.97	48 50.14 63°12.89	3.8'	28° 25.75	2.2	58.9' 58.9'
11	346° 7.58	13.01	77°35.64	3.8'	28° 28.04	1.9'	58.8'
12	1°7.80	N03°12.05	91°58.39	3.8'	N28°29.89	1.7'	58.8'
13	16°8.02	11.09	106°21.16	3.8'	28°31.55	1.5'	58.8'
14	31°8.25	10.13	120°43.92	3.8'	28°33.02	1.3'	58.8'
15 16	46°8.47 61°8.69	· · 9.17 8.21	135°6.70 149°29.50	3.8' 3.8'	28°34.30 28°35.38	1.1' 0.9'	58.8' 58.7'
17	76° 8.92	7.25	163°52.31	3.8'	28° 36.27	0.7	58.7'
18	91°9.14	N03°6.28	178°15.13	3.8'	N28° 36.96	0.5'	58.7'
19	106° 9.36	5.32	192°37.98	3.9'	28°37.46	0.3'	58.7'
20	121° 9.59	4.36	207°0.85	3.9'	28° 37.77	0.1'	58.7'
21 22	136° 9.81 151° 10.03	· · 3.40 2.44	221°23.75 235°46.67	3.9' 4.0'	28° 37.89 28° 37.82	-0.1' -0.3'	58.6' 58.6'
23	166°10.25	1.48	250° 9.63	4.0'	28° 37.56	-0.5'	58.6'
	SD = 15.9'	d = -1.0'			D = 16.1'		
	3D = 15.9	<i>u</i> = -1.0		- 31	D = 10.1		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°10.48	N03°0.52	264°32.61	4.0'	N28° 37.10	-0.6'	58.6'
1 2	196°10.70 211°10.92	02°59.55 58.59	278°55.63 293°18.69	4.1' 4.1'	28° 36.46 28° 35.63	-0.8' -1.0'	58.5' 58.5'
3	211 · 10.92 226 ° 11.15	58.59	293°18.69 307°41.79	4.1'	28° 35.63 28° 34.60	-1.0 -1.2'	58.5'
4	241°11.37	56.67	322°4.93	4.2'	28° 33.39	-1.4	58.5'
5	256°11.59	55.70	$336^{\circ}28.11$	4.2'	28°31.99	-1.6'	58.5'
6	271°11.82	N02°54.74	350°51.35	4.3'	N28° 30.41	-1.8'	58.4'
7 8	286°12.04 301°12.26	53.78 52.82	5°14.63 19°37.96	4.3' 4.4'	28° 28.64 28° 26.68	-2.0' -2.1'	58.4' 58.4'
9	301°12.26 316°12.48	52.82 •• 51.85	19°37.96 34°1.34	4.4' 4.4'	28° 26.68 28° 24.53	-2.1' -2.3'	58.4° 58.4'
10	331°12.71	50.89	48°24.78	4.5'	28°22.21	-2.5'	58.4
11	346°12.93	49.93	62°48.28	4.6'	28° 19.70	-2.7'	58.3'
12	1°13.15	N02°48.97	77°11.83	4.6'	N28° 17.01	-2.9'	58.3'
13	16°13.38 31°13.60	48.00	91°35.45 105°59.13	4.7' 4.7'	28°14.13 28°11.08	-3.1'	58.3'
14 15	46°13.82	47.04 •• 46.08	105°59.13 120°22.88	4.7'	28°11.08 28°7.85	-3.2' -3.4'	58.3' 58.2'
16	61°14.05	45.11	134°46.70	4.9'	28°4.43	-3.6'	58.2
17	76°14.27	44.15	149°10.58	5.0'	28°0.84	-3.8'	58.2'
18	91°14.49	N02°43.19	163°34.54	5.0'	N27°57.08	-3.9'	58.2'
19	106°14.72	42.22	177°58.56	5.1'	27°53.13	-4.1'	58.2'
20 21	121°14.94 136°15.16	41.26 •• 40.30	192°22.67 206°46.85	5.2' 5.3'	27° 49.02 27° 44.73	-4.3' -4.5'	58.1' 58.1'
22	150 15.10 151°15.39	39.33	200 40.85 221°11.11	5.3'	27 44.73 27°40.27	-4.5 -4.6'	58.1'
23	166° 15.61	38.37	235°35.45	5.4'	27° 35.63	-4.8'	58.1'
	SD = 15.9'	d = -1.0'		SI	D = 16.0'		
	JD — 13.9	J — -1.0		اد	_ 10.0		

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

Lat.		Moonris	e		Moonset	į.
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
N 70°						
68°						
66°						
64°						
62°	18:03		19:47	16:00		18:36
60°	18:55	19:31	20:53	15:09	16:43	17:29
N 58°	19:27	20:11	21:27	14:37	16:02	16:54
56°	19:51	20:39	21:52	14:14	15:35	16:29
54°	20:10	21:01	22:13	13:55	15:13	16:09
52°	20:27	21:19	22:29	13:39	14:55	15:51
50°	20:41	21:35	22:44	13:25	14:39	15:37
45°	21:10	22:06	23:13	12:56	14:08	15:07
N 40°	21:32	22:30	23:36	12:34	13:44	14:44
35°	21:51	22:50	23:55	12:16	13:24	14:24
30°	22:08	23:07		12:00	13:07	14:08
20°	22:35	23:36		11:33	12:39	13:40
N 10°	22:59		00:00	11:10	12:14	13:15
0°	23:21		00:23	10:49	11:51	12:53
S 10°	23:44		00:46	10:28	11:28	12:30
20°		80:00	01:11	10:05	11:04	12:06
30°		00:36	01:40	09:39	10:35	11:37
35°		00:53	01:57	09:23	10:18	11:20
40°		01:12	02:17	09:06	09:58	11:00
45°	00:19	01:36	02:42	08:44	09:34	10:36
<b>S</b> 50°	00:45	02:07	03:13	08:17	09:03	10:05
52°	00:58	02:22	03:29	08:04	08:48	09:50
54°	01:13	02:40	03:47	07:49	08:30	09:31
56°	01:30	03:01	04:09	07:31	80:80	09:09
58°	01:51	03:29	04:38	07:09	07:40	08:41
<b>S</b> 60°	02:18	04:08	05:20	06:42	07:00	07:59

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-44%
13	03:59	04:10	11:56	04:35	17:05	
14	04:21	04:31	11:55	05:36	18:07	
15	04:42	04:53	11:55	06:38	19:08	

#### September 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	355° 11.85	206°57.66 N13°42.64	151°16.64 \$09°52.83	243°9.11 N21°53.12	355°11.73 <b>S</b> 02°43.78	
1	$10^{\circ}14.32$	221°57.14 41.71	166° 17.54 53.46	258°11.17 53.06	10°14.37 43.86	Alpheratz 357°33.84 29°14.07 Ankaa 353°6.14 -42°9.79
2	25° 16.78	236°56.62 40.77	181°18.45 54.09	273°13.22 53.01	25°17.01 43.94	Schedar 349°29.87 56°40.73
3	40° 19.25	251°56.10 · · 39.83	196°19.35 · · 54.72	288°15.27 · · 52.96	40°19.65 · · 44.01	Diphda 348°46.40 -17°50.54
4 5	55°21.71 70°24.17	266°55.58 38.89 281°55.07 37.95	211°20.25 55.35 226°21.15 55.98	303°17.33 52.90 318°19.38 52.85	55°22.29 44.09 70°24.93 44.17	Achernar 335°19.22 -57°6.12
6	85° 26.64	281°55.07 37.95 296°54.55 N13°37.01	226°21.15 55.98 241°22.05 \$09°56.61	318°19.38 52.85 333°21.43 N21°52.80	70°24.93 44.17 85°27.57 \$02°44.25	Hamal 327°50.29 23°35.12
7	100°29.10	311°54.03 36.07	256°22.95 57.24	348°23.49 52.74	100°30.21 44.33	Polaris 313°27.71 89°22.11
8	115°31.57	326°53.52 35.13	271°23.85 57.87	3°25.54 52.69	115°32.85 44.41	Acamar 315°11.06 -40°11.78
9	130°34.03	341°53.00 · · 34.19	286°24.75 · · 58.50	18°27.60 · · 52.64	130°35.49 · · 44.49	Menkar 314°5.35 4°11.59 Mirfak 308°27.18 49°57.05
10	145°36.50	356°52.48 33.24	301°25.65 59.13	33°29.65 52.59	145°38.13 44.57	Aldebaran 290°38.88 16°33.73
11	160°38.96	11°51.97 32.30	316°26.55 09°59.76	48°31.71 52.53	160°40.77 44.65	Rigel 281°3.29 -8°10.09
12 13	175° 41.42 190° 43.89	26°51.45 N13°31.35 41°50.94 30.41	331°27.45 \$10°0.39 346°28.35 1.02	63°33.76 N21°52.48 78°35.82 52.43	175°43.41 \$02°44.73 190°46.05 44.81	Capella 280°21.01 46°1.30
14	205°46.35	56°50.42 29.46	1°29.25 1.65	93°37.87 52.37	205°48.69 44.89	Bellatrix 278°22.25 6°22.51
15	220° 48.82	71°49.91 · · 28.52	16°30.15 · · 2.28	108°39.93 · · 52.32	220°51.33 · · 44.96	Elnath 278°1.13 28°37.73
16	235°51.28	86°49.39 27.57	31°31.05 2.90	123°41.98 52.27	235°53.97 45.04	Alnilam 275°37.15 -1°10.95 Betelgeuse 270°51.49 7°24.83
17	250°53.74	101°48.88 26.62	46°31.95 3.53	138°44.04 52.21	250°56.61 45.12	Betelgeuse 270°51.49 7°24.83 Canopus 263°52.25 -52°42.16
18	265°56.21	116°48.37 N13°25.67	61°32.85 \$10°4.16	153°46.10 N21°52.16	265°59.25 S02°45.20	Sirius 258°25.83 -16°44.83
19	280°58.67	131°47.85 24.72	76°33.75 4.79	168°48.15 52.11	281°1.89 45.28	Adhara 255° 5.55 -29° 0.11
20 21	296°1.14 311°3.60	146°47.34 23.77 161°46.83 •• 22.82	91°34.64 5.42 106°35.54 • 6.05	183°50.21 52.06 198°52.27 • 52.00	296°4.53 45.36 311°7.17 • 45.44	Procyon 244°50.39 5°9.67
22	326°6.07	176° 46.32 21.87	121°36.44 6.67	213°54.32 51.95	326°9.81 45.52	Pollux 243°16.79 27°57.84
23	341°8.53	191°45.80 20.92	136°37.34 7.30	228°56.38 51.90	341°12.45 45.60	Avior 234°14.95 -59°35.19
	pass. 00:19	$\nu$ -0.5' d-0.9' m-3.93	$\nu$ 0.9' d0.6' m1.60	$\nu 2.1' \ d$ -0.1' m-2.05	$\nu 2.6' \ d0.1' \ m0.60$	Suhail 222°46.26 -43°31.93 Miaplacidus 221°38.96 -69°49.10
ivier.	pass. 00:19	ν-0.5° α-0.9° m-3.93	νο.9 αυ.6 m1.60	ν2.1 α-0.1 m-2.05	ν2.6 <i>a</i> 0.1 m0.60	Miaplacidus 221°38.96 -69°49.10   Alphard 217°47.47 -8°46.04
						Regulus 207°34.13 11°50.59
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.92 61°36.75
0	356° 10.99	206°45.29 N13°19.97	151°38.23 \$10°7.93	243°58.44 N21°51.84	356°15.09	Denebola 182°24.68 14°25.81
1 2	11° 13.46 26° 15.92	221°44.78 19.01 236°44.27 18.06	166°39.13 8.56 181°40.03 9.19	259°0.50 51.79 274°2.56 51.74	11°17.73 45.76 26°20.37 45.84	Gienah 175°43.33 -17°41.00
3	41° 18.39	251°43.76 · · 17.11	196°40.92 · · 9.82	289° 4.61 · · 51.69	41°23.01 · · 45.91	Acrux 173°0.19 -63°14.52
4	56° 20.85	266°43.25 16.15	211° 41.82 10.44	304° 6.67 51.63	56°25.65 45.99	Gacrux 171°51.61 -57°15.45
5	71°23.31	281°42.74 15.19	226°42.72 11.07	319° 8.73 51.58	71°28.29 46.07	Alioth 166°12.95 55°49.34 Spica 158°21.99 -11°17.66
6	86°25.78	296°42.23 N13°14.24	241°43.61 \$10°11.70	334°10.79 N21°51.53	86°30.93 <b>S</b> 02°46.15	Alkaid 152°51.93 49°11.26
7	101°28.24	311°41.72 13.28	256°44.51 12.33	349°12.85 51.47	101°33.57 46.23	Hadar 148°35.74 -60°29.94
8	116°30.71	326°41.21 12.32	271°45.40 12.95	4°14.91 51.42	116°36.21 46.31	Menkent 147°57.27 -36°29.82
9 10	131° 33.17 146° 35.64	341°40.70 · · 11.36 356°40.19 10.41	286°46.30 · · 13.58 301°47.19 14.21	19°16.97 · · 51.37 34°19.03 51.32	131°38.85 · · 46.39 146°41.49 46.47	Arcturus 145°47.64 19°3.06
11	161°38.10	11°39.69 9.45	316°48.09 14.83	49°21.09 51.26	161°44.13 46.55	Rigil Kent. 139°40.01 -60°56.64
12	176° 40.56	26°39.18 N13°8.48	331°48.98 \$10°15.46	64°23.15 N21°51.21	176°46.77 S02°46.63	Kochab 137°20.50 74°3.16
13	191°43.03	41°38.67 7.52	346°49.88 16.09	79°25.21 51.16	191°49.41 46.71	Zuben'ubi 136°55.60 -16°8.89 Alphecca 126°3.43 26°37.87
14	206°45.49	56°38.16 6.56	1°50.77 16.72	94°27.27 51.11	206°52.05 46.78	Antares 112°15.23 -26°29.38
15	221°47.96	71°37.66 · · 5.60	16°51.67 · · 17.34	109°29.33 · · 51.05	221°54.70 · · 46.86	Atria 107°9.02 -69°4.65
16	236° 50.42	86°37.15 4.64	31°52.56 17.97	124°31.39 51.00	236°57.34 46.94 251°59.98 47.02	Sabik 102°2.16 -15°45.38
17 18	251° 52.88 266° 55.35	101°36.64 3.67 116°36.14 N13°2.71	46°53.45 18.60 61°54.35 \$10°19.22	139°33.45 50.95 154°35.52 N21°50.89	251°59.98 47.02 267°2.62 \$02°47.10	Shaula 96°9.59 -37°7.44
19	281°57.81	131°35.63 1.74	76°55.24 19.85	169°37.58 50.84	282°5.26 47.18	Rasalhague 95°58.02 12°32.63
20	297°0.28	146°35.13 13°0.78	91°56.13 20.48	184°39.64 50.79	297°7.90 47.26	Eltanin 90°41.87 51°29.38 Kaus Aust. 83°31.67 -34°22.41
21	312°2.74	161°34.62 12°59.81	106°57.03 · · 21.10	199°41.70 · · 50.74	312°10.54 · · 47.34	Kaus Aust. 83°31.67 -34°22.41 Vega 80°32.74 38°48.68
22	327°5.20	176°34.12 58.84	121°57.92 21.73	214°43.77 50.68	327°13.18 47.42	Nunki 75°46.93 -26°15.90
23	342°7.67	191°33.61 57.88	136°58.81 22.35	229°45.83 50.63	342°15.82 47.50	Altair 61°59.23 8°56.32
Mer.	pass. 00:15	$\nu$ -0.5 $'$ d-1.0 $'$ m-3.93	$ u 0.9' \ d0.6' \ m1.60$	$\nu 2.1' \ d\text{-}0.1' \ \text{m-}2.05$	$ u 2.6' \ d0.1' \ m0.59$	Peacock 53°4.42 -56°39.24
						Deneb 49°25.11 45°22.54
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.96 9°59.73
0	357° 10.13	206°33.11 N12°56.91	151°59.70 \$10°22.98	244°47.89 N21°50.58	357°18.46	Al Na'ir 27°31.75 -46°50.17 Fomalhaut 15°13.52 -29°29.05
1	$12^{\circ}12.60$	221°32.60 55.94	167°0.60 23.61	259°49.95 50.53	12°21.10 47.65	Scheat 13°44.31 28°13.49
2	27° 15.06	236°32.10 54.97	182°1.49 24.23	274°52.02 50.47	27°23.74 47.73	Markab 13°29.01 15°20.77
3	42° 17.53	251°31.60 · · 54.00	197°2.38 · · 24.86	289°54.08 · · 50.42	42°26.38 · · 47.81	
4 5	57° 19.99 72° 22.45	266°31.09 53.03 281°30.59 52.06	212°3.27 25.48 227°4.16 26.11	304°56.15 50.37 319°58.21 50.32	57°29.03 47.89 72°31.67 47.97	Sep 16 Tue         SHA         Mer.pass           Venus         211°45.80         10:13
6	72°22.45 87°24.92	281°30.59 52.06 296°30.09 N12°51.08	242°5.05 \$10°26.73	335° 0.27 N21° 50.27	87°34.31 \$02°48.05	Mars 156°4.79 13:54
7	102°27.38	311°29.59 50.11	257°5.94 27.36	350°2.34 50.21	102°36.95 48.13	Jupiter 247°57.26 07:46
8	$117^{\circ}29.85$	326°29.09 49.14	272°6.83 27.98	5°4.40 50.16	117°39.59 48.21	Saturn 359°59.87 00:19
9	132° 32.31	341°28.58 · · 48.16	287°7.72 · · 28.61	20°6.47 · · · 50.11	132°42.23 · · 48.29	Sep 17 Wed SHA Mer.pass
10	147°34.77	356°28.08 47.19	302°8.61 29.24	35°8.53 50.06	147°44.87 48.37	Venus 210°34.30 10:13
11	162°37.24	11°27.58 46.21	317°9.50 29.86	50°10.60 50.00	162°47.51 48.45	Mars 155°27.24 13:53
12 13	177° 39.70 192° 42.17	26°27.08 N12°45.24 41°26.58 44.26	332°10.39 \$10°30.48 347°11.28 31.11	65°12.66 N21°49.95 80°14.73 49.90	177°50.15 \$02°48.52 192°52.79 48.60	Jupiter 247°47.45 07:43
14	207°44.63	56°26.08 43.28	2°12.17 31.73	95°16.80 49.85	207°55.43 48.68	Saturn 0°4.09 00:15
15	222° 47.09	71°25.58 · · 42.31	17°13.06 · · 32.36	110°18.86 · · 49.79	222°58.08 · · 48.76	Sep 18 Thu SHA Mer.pass
16	237°49.56	86°25.08 41.33	32°13.95 32.98	125°20.93 49.74	238°0.72 48.84	Venus 209°22.98 10:14
17	252° 52.02	101°24.58 40.35	47° 14.84 33.61	140°23.00 49.69	253°3.36 48.92	Mars 154°49.57 13:51
18	267° 54.49	116°24.09 N12°39.37	62°15.73 \$10°34.23	155°25.06 N21°49.64	268° 6.00 S02° 49.00	Jupiter 247°37.76 07:40
19 20	282°56.95 297°59.41	131°23.59 38.39 146°23.09 37.41	77°16.61 34.86 92°17.50 35.48	170°27.13 49.59 185°29.20 49.53	283°8.64 49.08 298°11.28 49.16	Saturn 0°8.33 00:11
21	313°1.88	161°22.59 · · 36.43	107°18.39 · · 36.10	200°31.27 · · 49.48	313°13.92 · · 49.24	Horizontal parallax
22	328°4.34	176°22.09 35.44	122°19.28 36.73	215°33.33 49.43	328°16.56 49.32	Venus: 0.1
23	343°6.81	191°21.60 34.46	137°20.16 37.35	230°35.40 49.38	343°19.20 49.39	Mars: 0.1
Mer	pass. 00:11	ν-0.5' d-1.0' m-3.93	ν0.9' d0.6' m1.60	ν2.1' d-0.1' m-2.06	$\nu 2.6' \ d0.1' \ m0.59$	

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°15.83	N02°37.40	249°59.87	5.5'	N27°30.83	-5.0'	58.0'
1	196°16.05	36.44	$264^{\circ}24.37$	5.6'	$27^{\circ}25.86$	-5.1'	58.0'
2	211°16.28	35.47	278°48.96	5.7'	27°20.72	-5.3'	58.0'
3	226°16.50	• • 34.51	293°13.63	5.8'	27°15.42	-5.5'	58.0'
4 5	241°16.72 256°16.95	33.55 32.58	307°38.40 322°3.25	5.9' 5.9'	27°9.95 27°4.31	-5.6' -5.8'	58.0' 57.9'
6	271°17.17	N02°31.62	336°28.19	6.0'	N26°58.52	-6.0'	57.9'
7	286°17.39	30.65	350°53.22	6.1'	26°52.56	-6.1'	57.9'
8	301°17.62	29.69	5°18.35	6.2'	$26^{\circ}46.44$	-6.3'	57.9'
9	316°17.84	• • 28.72	19°43.57	6.3'	26°40.17	-6.4'	57.8'
10 11	331°18.06 346°18.29	27.76 26.79	34°8.89 48°34.30	6.4' 6.5'	26°33.74 26°27.15	-6.6' -6.7'	57.8' 57.8'
12	1°18.51	N02°25.83	62°59.81	6.6'	N26°20.41	-6.9	57.8'
13	16°18.73	24.86	77°25.42	6.7'	26°13.52	-7.0'	57.8'
14	31°18.96	23.90	$91^{\circ}51.13$	6.8'	26°6.47	-7.2'	57.7'
15	46°19.18	• • 22.93	106°16.93	6.9'	25°59.27	-7.3'	57.7'
16 17	61°19.40 76°19.62	21.97 21.00	120°42.84 135°8.85	7.0' 7.1'	25°51.93 25°44.44	-7.5' -7.6'	57.7' 57.7'
18	91°19.85	N02°20.03	149°34.97	7.1	N25°36.80	-7.8'	57.7'
19	106°20.07	19.07	164°1.18	7.3'	25°29.02	-7.9'	57.6'
20	121°20.29	18.10	$178^{\circ}27.50$	7.4'	$25^{\circ}21.10$	-8.1'	57.6'
21	136°20.52	• • 17.14	192°53.93	7.5'	25°13.04	-8.2'	57.6'
22 23	151°20.74 166°20.96	16.17 15.20	207°20.46 221°47.10	7.6' 7.7'	25°4.84 24°56.49	-8.3' -8.5'	57.6'
23			221 47.10			-8.5	57.5'
	SD = 15.9'	d = -1.0'		SI	D = 15.8'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°21.19	N02°14.24	236°13.84	7.8'	N24°48.02	-8.6'	57.5'
1	196°21.41	13.27	250°40.69	8.0'	24°39.40	-8.7'	57.5'
2	211°21.63	12.31	265°7.65	8.1'	24°30.66	-8.9'	57.5'
3	226°21.86 241°22.08	11.34	279°34.71 294°1.88	8.2' 8.3'	24°21.78 24°12.77	-9.0'	57.5'
4 5	241 22.08 256°22.30	10.37 9.41	294 1.88 308°29.16	8.4'	24 12.77 24°3.64	-9.1' -9.3'	57.4' 57.4'
6	271°22.52	N02°8.44	322°56.55	8.5'	N23°54.37	-9.4'	57.4'
7	286°22.75	7.47	337°24.05	8.6'	23°44.98	-9.5'	57.4'
8	301°22.97	6.51	351°51.65	8.7'	23°35.47	-9.6'	57.3'
9	316°23.19	• • 5.54	6°19.36	8.8'	23°25.83	-9.8'	57.3'
10 11	331°23.42 346°23.64	4.57 3.60	20°47.19 35°15.12	8.9' 9.0'	23°16.07 23°6.20	-9.9' -10.0'	57.3' 57.3'
12	1°23.86	N02°2.64	49°43.16	9.0	N22°56.20	-10.0	57.3'
13	16°24.09	1.67	64°11.30	9.3'	22°46.09	-10.2	57.2'
14	31°24.31	$02^{\circ}0.70$	78°39.56	9.4'	$22^{\circ}35.86$	-10.3'	57.2'
15	46°24.53	01°59.74	93°7.92	9.5'	22°25.52	-10.5'	57.2'
16 17	61°24.75 76°24.98	58.77 57.80	107°36.40 122°4.98	9.6' 9.7'	22°15.07 22°4.51	-10.6' -10.7'	57.2' 57.1'
18	91°25.20	N01°56.83	136°33.67	9.7	N21°53.84	-10.7	57.1
19	106°25.42	55.87	151°2.46	9.9'	21°43.06	-10.9'	57.1'
20	121°25.65	54.90	$165^{\circ}31.37$	10.0'	$21^{\circ}32.18$	-11.0'	57.1'
21	136°25.87	• • 53.93	180°0.38	10.1'	21°21.19	-11.1'	57.1'
22 23	151°26.09 166°26.31	52.96 51.99	194°29.50 208°58.72	10.2' 10.3'	21°10.10 20°58.91	-11.2' -11.3'	57.0' 57.0'
23			208 58.72			-11.3	57.0
	SD = 15.9'	d = -1.0'		51	O = 15.7'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°26.54	N01°51.03	223°28.05	10.4'	N20°47.62	-11.4'	57.0'
1 2	196°26.76 211°26.98	50.06 49.09	237°57.48 252°27.02	10.5' 10.6'	20°36.23 20°24.75	-11.5' -11.6'	57.0' 57.0'
3	211 26.98 226°27.21	· · 48.12	252 27.02 266°56.66	10.6	20°24.75	-11.0 -11.7'	57.0 56.9'
4	241°27.43	47.15	281°26.41	10.9'	20°1.49	-11.8'	56.9'
5	256°27.65	46.19	295°56.26	11.0'	19°49.73	-11.9'	56.9'
6	271°27.87	N01°45.22	310°26.22	11.1'	N19°37.87	-11.9'	56.9'
7	286°28.10 301°28.32	44.25	324°56.27 339°26.43	11.2' 11.3'	19°25.93 19°13.90	-12.0'	56.8'
8 9	301°28.32 316°28.54	43.28 •• 42.31	339°26.43 353°56.68	11.3	19°13.90 19°1.78	-12.1' -12.2'	56.8' 56.8'
10	331°28.76	41.34	8°27.04	11.5'	18°49.58	-12.3'	56.8
11	346°28.99	40.37	22°57.50	11.6'	18°37.30	-12.4'	56.8'
12	1°29.21	N01°39.40	37°28.05	11.7'	N18°24.93	-12.4'	56.7'
13	16°29.43	38.44	51°58.71	11.8'	18°12.48 17°59.96	-12.5'	56.7'
14 15	31°29.65 46°29.88	37.47 •• 36.50	66°29.46 81°0.31	11.8' 11.9'	17°59.96 17°47.35	-12.6' -12.7'	56.7' 56.7'
16	61°30.10	35.53	95°31.25	12.0'	17°34.68	-12.8'	56.7'
17	76°30.32	34.56	110°2.29	12.1'	17°21.92	-12.8'	56.6'
18	91°30.54	N01°33.59	124°33.42	12.2'	N17°9.10	-12.9'	56.6'
19	106°30.77	32.62	139°4.64	12.3'	16°56.20	-13.0'	56.6'
20 21	121°30.99 136°31.21	31.65 · · 30.68	153°35.96 168°7.37	12.4' 12.5'	16°43.23 16°30.20	-13.0' -13.1'	56.6' 56.5'
22	151°31.43	29.71	182°38.87	12.6'	16° 30.20 16° 17.09	-13.1' -13.2'	56.5'
23	166°31.66	28.74	197° 10.46	12.7'	16°3.92	-13.2'	56.5'
	SD = 15.9'	d = -1.0'		SI	D = 15.5'		
			-				

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	24-26	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	33-15%	
16	05:03	05:14	11:55	07:38	20:06		
17	05:25	05:35	11:54	08:34	21:00		
18	05:46	05:57	11:54	09:25	21:49		

## September 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	358°9.27	206°21.10 N12°33.48	152°21.05 \$10°37.98	245°37.47 N21°49.33	358°21.85	
1	13° 11.73	221°20.60 32.49	167°21.94 38.60	260°39.54 49.27	13°24.49 49.55	Alpheratz 357°33.83 29°14.08
2	28° 14.20	236°20.11 31.51	182°22.82 39.22	275°41.61 49.22	28°27.13 49.63	Ankaa 353°6.13 -42°9.80
3	43°16.66	251°19.61 · · 30.52	197°23.71 · · 39.85	290°43.68 · · 49.17	43°29.77 · · 49.71	Schedar 349°29.86 56°40.75 Diphda 348°46.39 -17°50.55
4	$58^{\circ}19.13$	266° 19.12 29.54	212°24.60 40.47	305°45.75 49.12	58°32.41 49.79	Diphda 348°46.39 -17°50.55 Achernar 335°19.20 -57°6.13
5	73°21.59	281°18.62 28.55	227°25.48 41.09	320°47.82 49.06	73°35.05 49.87	Hamal 327°50.27 23°35.13
6	88°24.06	296°18.12 N12°27.56	242°26.37 \$10°41.72	335°49.89 N21°49.01	88°37.69 <b>S</b> 02°49.95	Polaris 313°26.50 89°22.12
7	103°26.52	311°17.63 26.57	257°27.25 42.34	350°51.96 48.96	103°40.33 50.03	Acamar 315°11.04 -40°11.78
8	118°28.98	326°17.14 25.59	272°28.14 42.96	5°54.03 48.91	118°42.98 50.11	Menkar 314°5.33 4°11.60
9	133°31.45	341°16.64 · · 24.60	287°29.02 · · 43.59 302°29.91 44.21	20°56.10 · · 48.86	133°45.62 · · 50.19 148°48.26 50.26	Mirfak 308°27.15 49°57.06
10 11	148° 33.91 163° 36.38	356°16.15 23.61 11°15.65 22.62	302°29.91 44.21 317°30.79 44.83	35°58.17 48.81 51°0.24 48.75	148°48.26 50.26 163°50.90 50.34	Aldebaran 290°38.85 16°33.74
12	178° 38.84	26°15.16 N12°21.62	332°31.68 \$10°45.45	66°2.31 N21°48.70	178°53.54 S02°50.42	Rigel 281°3.26 -8°10.09
13	193°41.30	41°14.67 20.63	347°32.56 46.08	81° 4.38 48.65	193°56.18 50.50	Capella 280°20.97 46°1.31
14	208°43.77	56°14.18 19.64	2°33.45 46.70	96° 6.45 48.60	208°58.82 50.58	Bellatrix 278°22.23 6°22.51
15	223°46.23	71°13.68 · · 18.65	17°34.33 ·· 47.32	111°8.53 · · 48.55	224°1.46 · · 50.66	Elnath 278°1.10 28°37.73 Alnilam 275°37.13 -1°10.95
16	238°48.70	86°13.19 17.65	32°35.21 47.94	126°10.60 48.49	239°4.11 50.74	Betelgeuse 270°51.47 7°24.84
17	253°51.16	101°12.70 16.66	47°36.10 48.57	141°12.67 48.44	254°6.75 50.82	Canopus 263°52.22 -52°42.15
18	268°53.62	116°12.21 N12°15.66	62°36.98 \$10°49.19	156°14.74 N21°48.39	269°9.39 <b>S</b> 02°50.90	Sirius 258°25.80 -16°44.82
19	283°56.09	131°11.72 14.67	77°37.86 49.81	171°16.82 48.34	284°12.03 50.97	Adhara 255°5.52 -29°0.11
20	298° 58.55	146°11.23 13.67	92°38.75 50.43	186°18.89 48.29	299°14.67 51.05	Procyon 244°50.37 5°9.67
21 22	314°1.02 329°3.48	161°10.74 · · 12.68	107°39.63 · · 51.05 122°40.51 51.68	201°20.96 · · 48.24	314°17.31 · · 51.13 329°19.95 51.21	Pollux 243°16.77 27°57.84
23	344°5.94	176°10.24 11.68 191°9.75 10.68	122° 40.51 51.68 137° 41.39 52.30	216°23.04 48.18 231°25.11 48.13	329°19.95 51.21 344°22.60 51.29	Avior 234°14.92 -59°35.18
						Suhail 222°46.24 -43°31.92
Mer.	pass. 00:07	$\nu$ -0.5 $'$ <i>d</i> -1.0 $'$ m-3.93	$ u 0.9' \ d0.6' \ m1.60$	$ u 2.1' \ d$ -0.1' m-2.06	$ u 2.6' \ d0.1' \ \text{m}0.59$	Miaplacidus 221°38.93 -69°49.08
						Alphard 217°47.45 -8°46.04
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.11 11°50.59 Dubhe 193°40.90 61°36.73
0	359°8.41	206°9.27 N12°9.68	152°42.27 \$10°52.92	246°27.18 N21°48.08	359°25.24 <b>S</b> 02°51.37	Denebola 182°24.68 14°25.81
1	14° 10.87	221°8.78 8.68	167° 43.16 53.54	261°29.26 48.03	14°27.88 51.45	Gienah 175°43.33 -17°40.99
2	29°13.34	236°8.29 7.68	182°44.04 54.16	276°31.33 47.98	29°30.52 51.53	Acrux 173°0.20 -63°14.51
3 4	44° 15.80	251°7.80 · · 6.68 266°7.31 5.68	197°44.92 · · 54.78 212°45.80 55.40	291°33.41 · · 47.93 306°35.48 47.87	44°33.16 · · 51.61 59°35.80 51.69	Gacrux 171°51.62 -57°15.43
5	59° 18.26 74° 20.73	281°6.82 4.68	212 45.60 55.40 227°46.68 56.02	306°35.48 47.87 321°37.56 47.82	59°35.80 51.69 74°38.44 51.76	Alioth 166°12.96 55°49.32
6	89°23.19	296°6.33 N12°3.68	242°47.56 \$10°56.65	336°39.63 N21°47.77	89°41.09 S02°51.84	Spica 158°21.99 -11°17.66
7	104°25.66	311°5.85 2.68	257° 48.44 57.27	351°41.71 47.72	104°43.73 51.92	Alkaid 152°51.94 49°11.24
8	119°28.12	326°5.36 1.67	272°49.32 57.89	6°43.78 47.67	119°46.37 52.00	Hadar 148°35.75 -60°29.93 Menkent 147°57.27 -36°29.82
9	$134^{\circ}30.58$	341°4.87 12°0.67	287°50.20 · · 58.51	21°45.86 · · 47.62	134°49.01 · · 52.08	Arcturus 145°47.64 19°3.05
10	149°33.05	356°4.38 11°59.67	302°51.08 59.13	36°47.94 47.56	149°51.65 52.16	Rigil Kent. 139°40.03 -60°56.63
11	164°35.51	11°3.90 58.66	317°51.96 10°59.75	51°50.01 47.51	164°54.29 52.24	Kochab 137°20.54 74°3.14
12	179° 37.98 194° 40.44	26°3.41 N11°57.65	332°52.84 \$11°0.37	66°52.09 N21°47.46	179°56.94 \$02°52.32	Zuben'ubi 136°55.61 -16°8.89
13 14	194° 40.44 209° 42.90	41°2.93 56.65 56°2.44 55.64	347°53.72 0.99 2°54.60 1.61	81°54.17 47.41 96°56.24 47.36	194°59.58 52.40 210°2.22 52.47	Alphecca 126°3.44 26°37.86
15	224°45.37	71°1.96 · · 54.63	17°55.48 · · 2.23	111°58.32 · · 47.31	225°4.86 · · 52.55	Antares 112°15.25 -26°29.38
16	239° 47.83	86°1.47 53.63	32°56.35 2.85	127° 0.40 47.26	240°7.50 52.63	Atria 107°9.07 -69°4.65
17	254°50.30	101°0.99 52.62	47°57.23 3.47	142°2.48 47.20	255°10.14 52.71	Sabik 102°2.17 -15°45.39 Shaula 96°9.61 -37°7.44
18	269° 52.76	116°0.50 N11°51.61	62°58.11 \$11°4.09	157°4.55 N21°47.15	270°12.79 S02°52.79	Rasalhague 95°58.03 12°32.63
19	284°55.23	131°0.02 50.60	77° 58.99 4.71	172° 6.63 47.10	285°15.43 52.87	Eltanin 90°41.90 51°29.38
20	299° 57.69	145°59.53 49.59	92°59.86 5.33	187° 8.71 47.05	300°18.07 52.95	Kaus Aust. 83°31.69 -34°22.41
21	315°0.15	160°59.05 · · 48.58	108°0.74 · · 5.95	202°10.79 · · 47.00	315°20.71 · · 53.03	Vega 80°32.75 38°48.68
22	330°2.62	175° 58.57 47.56	123°1.62 6.57	217°12.87 46.95	330°23.35 53.10	Nunki 75°46.94 -26°15.90
23	345°5.08	190°58.08 46.55	138°2.50 7.19	232°14.95 46.90	345°25.99 53.18	Altair 61°59.24 8°56.33
Mer.	pass. 23:59	$\nu$ -0.5′ $d$ -1.0′ m-3.93	$ u 0.9' \; d0.6' \; { m m} 1.60$	$ u 2.1' \ d$ -0.1' m-2.07	$ u 2.6' \; d0.1' \; { m m} 0.58$	Peacock 53°4.43 -56°39.25
						Deneb 49°25.12 45°22.55
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.96 9°59.73 Al Na'ir 27°31.75 -46°50.18
0	0°7.55	205°57.60 N11°45.54	153°3.37 \$11°7.80	247°17.03 N21°46.85	0°28.63 \$02°53.26	Al Na'ir 27°31.75 -46°50.18 Fomalhaut 15°13.51 -29°29.06
1	$15^{\circ}10.01$	220°57.12 44.53	168°4.25 8.42	262°19.11 46.79	15°31.28 53.34	Scheat 13°44.31 28°13.50
2	30° 12.47	235°56.64 43.51	183°5.12 9.04	277°21.19 46.74	30°33.92 53.42	Markab 13°29.01 15°20.78
3	45° 14.94	250°56.16 · · 42.50	198°6.00 · · 9.66	292°23.27 · · 46.69	45°36.56 · · 53.50	
4	60° 17.40	265°55.67 41.48	213°6.88 10.28	307°25.35 46.64	60°39.20 53.58	Sep 19 Fri SHA Mer.pass
5	75° 19.87	280°55.19 40.47	228°7.75 10.90	322°27.43 46.59	75°41.84 53.66	Venus 208°11.83 10:15
6	90°22.33	295°54.71 N11°39.45	243°8.63 \$11°11.52	337°29.51 N21°46.54	90°44.48	Mars 154°11.78 13:50
7 8	105°24.79 120°27.26	310°54.23 38.43 325°53.75 37.42	258°9.50 12.14 273°10.38 12.75	352°31.59 46.49 7°33.67 46.44	105°47.13 53.81 120°49.77 53.89	Jupiter 247°28.20 07:36 Saturn 0°12.57 00:07
9	120 27.20 135°29.72	340°53.27 · · 36.40	288°11.25 · · 13.37	22°35.75 · · 46.39	135°52.41 · · 53.97	
10	150°32.19	355°52.79 35.38	303°12.13 13.99	37°37.84 46.33	150°55.05 54.05	Sep 20 Sat SHA Mer.pass
11	165°34.65	10°52.31 34.36	318° 13.00 14.61	52°39.92 46.28	165°57.69 54.13	Venus 207°0.86 10:16
12	180° 37.11	25°51.83 N11°33.34	333°13.87 <b>S</b> 11°15.23	67°42.00 N21°46.23	181°0.33 <b>S</b> 02°54.21	Mars 153°33.87 13:48 Jupiter 247°18.78 07:33
13	195° 39.58	40°51.35 32.32	348°14.75 15.84	82°44.08 46.18	196°2.98 54.29	Saturn 0°16.83 00:02
14	210° 42.04	55°50.88 31.30	3°15.62 16.46	97°46.17 46.13	211°5.62 54.36	
15 16	225° 44.51 240° 46.97	70°50.40 · · 30.28 85°49.92 29.25	18°16.49 · · 17.08 33°17.37 17.70	112°48.25 · · 46.08 127°50.33 46.03	226°8.26 · · 54.44 241°10.90 54.52	Sep 21 Sun SHA Mer.pass
16 17	240 46.97 255° 49.43	100°49.44 28.23	48° 18.24 18.31	142°52.42 45.98	256°13.54 54.60	Venus 205°50.06 10:16 Mars 152°55.83 13:47
18	270°51.90	115°48.96 N11°27.21	63°19.11 S11°18.93	157°54.50 N21°45.93	271°16.18 S02°54.68	Jupiter 247°9.48 07:30
19	285°54.36	130°48.49 26.18	78°19.98 19.55	172°56.58 45.88	286°18.83 54.76	Saturn 0°21.09 23:54
20	300° 56.83	145°48.01 25.16	93°20.86 20.16	187°58.67 45.83	301°21.47 54.84	
21	315°59.29	160°47.53 · · 24.14	108°21.73 · · 20.78	203° 0.75 · · 45.77	316°24.11 · · 54.91	Horizontal parallax
22	331°1.75	175°47.06 23.11	123°22.60 21.40	218° 2.84 45.72	331°26.75 54.99	Venus: 0.1 Mars: 0.1
23	346°4.22	190°46.58 22.08	138°23.47 22.01	233° 4.92 45.67	346°29.39 55.07	177013. 3.1
Mer.	pass. 23:56	ν-0.5′ d-1.0′ m-3.93	$\nu 0.9' \ d0.6' \ m1.59$	ν2.1′ d-0.1′ m-2.07	ν2.6' d0.1' m0.58	

h	Su	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°31.88	N01°27.77	211°42.14	12.8'	N15°50.69	-13.3'	56.5'
1	196°32.10	26.80	226° 13.90	12.9'	15°37.39	-13.4'	56.5'
2	211°32.32 226°32.55	25.83 •• 24.86	240°45.75 255°17.69	12.9' 13.0'	15°24.03 15°10.61	-13.4' -13.5'	56.4' 56.4'
4	241°32.77	23.89	269° 49.72	13.1'	14°57.14	-13.5'	56.4
5	256°32.99	22.92	284°21.83	13.2'	14°43.60	-13.6'	56.4
6	271°33.21	N01°21.95	298° 54.02	13.3'	N14°30.00	-13.6'	56.4'
7	286°33.43	20.98	313°26.29 327°58.64	13.4'	14°16.36	-13.7'	56.3'
8 9	301°33.66 316°33.88	20.01 •• 19.04	342° 31.08	13.4' 13.5'	14°2.65 13°48.90	-13.8' -13.8'	56.3' 56.3'
10	331°34.10	18.07	357°3.59	13.6'	13° 35.09	-13.0' -13.9'	56.3
11	346°34.32	17.10	11°36.18	13.7'	$13^{\circ}21.23$	-13.9'	56.3'
12	1°34.54	N01°16.13	26°8.85	13.7'	N13°7.33	-14.0'	56.2'
13 14	16°34.77 31°34.99	15.16 14.19	40°41.60 55°14.42	13.8' 13.9'	12°53.37 12°39.37	-14.0' -14.0'	56.2' 56.2'
15	46°35.21	14.19	55 14.42 69°47.31	14.0'	12 39.37 12°25.33	-14.0 -14.1'	56.2'
16	61°35.43	12.25	84°20.28	14.0'	12°11.24	-14.1'	56.1
17	76°35.65	11.28	98°53.31	14.1'	$11^{\circ}57.11$	-14.2'	56.1'
18	91°35.88	N01°10.31	113°26.42	14.2'	N11° 42.93	-14.2'	56.1
19 20	106°36.10 121°36.32	9.34 8.37	127°59.60 142°32.85	14.2' 14.3'	11°28.72 11°14.47	-14.3' -14.3'	56.1' 56.1'
21	136°36.54	• • 7.40	157°6.17	14.4'	11 14.47 11°0.18	-14.3'	56.0'
22	151°36.76	6.43	171°39.55	14.4'	10°45.85	-14.4'	56.0'
23	166°36.99	5.46	186° 12.99	14.5'	$10^{\circ}31.49$	-14.4'	56.0'
	SD = 15.9'	d = -1.0'		SI	D = 15.4'		
						,	
Sat 0	<b>GHA</b> 181°37.21	<b>Dec</b> N01°4.49	<b>GHA</b> 200° 46.50	u 14.6'	<b>Dec</b> N10°17.09	d -14.4'	<b>HP</b> 56.0'
1	196°37.43	3.51	215°20.08	14.6'	10°2.66	-14.5	56.0'
2	211°37.65	2.54	229°53.72	14.7'	09°48.20	-14.5'	55.9'
3	226°37.87	• • 1.57	244°27.41	14.8'	09°33.71	-14.5'	55.9'
4	241°38.09 256°38.32	01°0.60 00°59.63	259°1.17 273°34.99	14.8'	09°19.19 09°4.64	-14.6'	55.9'
5 6	250 38.32 271°38.54	00 59.63 N00°58.66	273 34.99 288°8.86	14.9' 14.9'	N08° 50.06	-14.6' -14.6'	55.9' 55.9'
7	286°38.76	57.69	302°42.79	15.0'	08°35.46	-14.6'	55.8'
8	301°38.98	56.72	$317^{\circ}16.78$	15.0'	$08^{\circ}20.83$	-14.7'	55.8'
9	316°39.20	• • 55.74	331°50.82	15.1'	08°6.17	-14.7'	55.8'
10 11	331°39.42 346°39.64	54.77 53.80	346°24.91 0°59.06	15.1' 15.2'	07°51.50 07°36.80	-14.7' -14.7'	55.8' 55.8'
12	1°39.87	N00° 52.83	15° 33.25	15.2'	N07°22.08	-14.7	55.7'
13	16°40.09	51.86	30°7.50	15.3'	07°7.34	-14.8'	55.7'
14	31°40.31	50.89	44°41.80	15.3'	06°52.58	-14.8'	55.7'
15 16	46°40.53 61°40.75	· · 49.91 48.94	59° 16.14 73° 50.53	15.4' 15.4'	06°37.81 06°23.02	-14.8' -14.8'	55.7' 55.7'
17	76°40.97	46.94 47.97	88° 24.97	15.4	06°8.21	-14.8'	55.6'
18	91°41.19	N00°47.00	102°59.45	15.5'	N05°53.39	-14.8'	55.6'
19	106°41.41	46.03	117° 33.97	15.6'	05°38.56	-14.8'	55.6'
20	121°41.63	45.06	132°8.54		05°23.71		55.6'
21 22	136°41.86 151°42.08	· · 44.08 43.11	146°43.14 161°17.79	15.6' 15.7'	05°8.85 04°53.98	-14.9' -14.9'	55.6' 55.6'
23	166°42.30	42.14	175°52.48	15.7'	04°39.11	-14.9'	55.5'
	SD = 15.9'	d = -1.0'		SI	D = 15.3'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0 1	181°42.52 196°42.74	N00° 41.17 40.20	190°27.20 205°1.96	15.8' 15.8'	N04°24.22 04°9.33	-14.9' -14.9'	55.5' 55.5'
2	211°42.96	39.22	219°36.76	15.8'	03°54.43	-14.9'	55.5'
3	226°43.18	• • 38.25	234°11.59	15.9'	03°39.53	-14.9'	55.5'
4	241°43.40	37.28	248°46.45	15.9'	03°24.62	-14.9'	55.4'
5 6	256°43.62 271°43.84	36.31 N00°35.33	263°21.35 277°56.28	15.9' 16.0'	03°9.71 N02°54.79	-14.9' -14.9'	55.4' 55.4'
7	286°44.06	34.36	292°31.23	16.0'	02°39.88	-14.9'	55.4'
8	301°44.28	33.39	307°6.22	16.0'	02°24.96	-14.9'	55.4'
9	316°44.51	• • 32.42	321°41.23	16.0'	02°10.04	-14.9'	55.3'
10 11	331°44.73 346°44.95	31.45 30.47	336° 16.28 350° 51.34	16.1' 16.1'	01°55.13 01°40.22	-14.9' -14.9'	55.3' 55.3'
12	1°45.17	30.47 N00°29.50	5°26.43	16.1	N01° 25.31	-14.9' -14.9'	55.3'
13	16°45.39	28.53	20°1.55	16.1'	01°10.41	-14.9'	55.3'
14	31°45.61	27.56	34°36.69	16.2'	00°55.51	-14.9'	55.3'
15 16	46°45.83 61°46.05	• • 26.58	49°11.85 63°47.03	16.2'	00°40.62	-14.9'	55.2'
16 17	61°46.05 76°46.27	25.61 24.64	63°47.03 78°22.23	16.2' 16.2'	00°25.73 N00°10.86	-14.9' -14.9'	55.2' 55.2'
18	91°46.49	N00°23.66	92°57.44	16.2'	S00°4.01	14.9'	55.2'
19	106°46.71	22.69	107° 32.68	16.3'	$00^{\circ}18.87$	14.8'	55.2'
20	121°46.93	21.72	122°7.93	16.3'	00°33.72	14.8'	55.1'
21 22	136°47.15 151°47.37	· · 20.75 19.77	136°43.20 151°18.48	16.3' 16.3'	00°48.55 01°3.38	14.8' 14.8'	55.1' 55.1'
23	166°47.59	18.80	165° 53.77	16.3	01° 18.18	14.8	55.1'
	SD = 15.9'	d = -1.0'			D = 15.1'		

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

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

		Sun		Moon		
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	27-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	8-1%
19	06:08	06:18	11:54	10:12	22:34	
20	06:29	06:39	11:53	10:56	23:17	
21	06:50	07:01	11:53	11:38	23:58	

### September 22, 23, 24 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	1°6.68	205°46.11 N11°21.06	153°24.34 <b>S</b> 11°22.63	248°7.01 N21°45.62	1°32.04 <b>S</b> 02°55.15	
1	$16^{\circ}9.15$	220°45.63 20.03	168°25.21 23.25	263° 9.09 45.57	16°34.68 55.23	Alpheratz 357°33.83 29°14.09 Ankaa 353°6.13 -42°9.82
2	31°11.61	235°45.16 19.00	183°26.08 23.86	278°11.18 45.52	31°37.32 55.31	Schedar 349°29.86 56°40.76
3	46° 14.07	250°44.68 · · 17.97	198°26.96 · · 24.48	293°13.27 · · 45.47	46°39.96 · · 55.39	Diphda 348°46.38 -17°50.55
4	61° 16.54	265°44.21 16.94	213°27.83 25.10	308°15.35 45.42	61°42.60 55.46	Achernar 335°19.19 -57°6.14
5 6	76° 19.00 91° 21.47	280°43.73 15.91 295°43.26 N11°14.88	228°28.70 25.71 243°29.57 \$11°26.33	323°17.44 45.37 338°19.52 N21°45.32	76°45.24 55.54 91°47.89 \$02°55.62	Hamal 327°50.26 23°35.14
7	106°23.93	310°42.78 13.85	258° 30.44 26.94	353°21.61 45.27	106°50.53 55.70	Polaris 313°25.35 89°22.14
8	121°26.39	325°42.31 12.82	273°31.30 27.56	8°23.70 45.22	121°53.17 55.78	Acamar 315°11.02 -40°11.79
9	136°28.86	340°41.84 · · 11.79	288°32.17 · · 28.18	23°25.79 · · 45.17	136°55.81 · · 55.86	Menkar 314°5.32 4°11.60
10	151°31.32	355°41.36 10.76	303°33.04 28.79	38°27.87 45.12	151°58.45 55.93	Mirfak 308°27.13 49°57.07
11	166°33.79	10°40.89 9.72	318°33.91 29.41	53°29.96 45.07	167°1.09 56.01	Aldebaran 290°38.84 16°33.74 Rigel 281°3.25 -8°10.09
12	181°36.25	25°40.42 N11°8.69	333°34.78 \$11°30.02	68°32.05 N21°45.01	182°3.74 <b>S</b> 02°56.09	Capella 280°20.95 46°1.31
13	196°38.71	40°39.95 7.66	348°35.65 30.64	83°34.14 44.96	197°6.38 56.17	Bellatrix 278°22.21 6°22.51
14 15	211°41.18 226°43.64	55°39.48 6.62 70°39.00 •• 5.59	3°36.52 31.25 18°37.38 · · 31.87	98°36.23 44.91	212°9.02 56.25	Elnath 278°1.08 28°37.73
16	241°46.11	70°39.00 · · 5.59 85°38.53 4.55	18°37.38 · · 31.87 33°38.25 32.48	113°38.31 · · 44.86 128°40.40 44.81	227°11.66 · · 56.33 242°14.30 56.41	Alnilam 275°37.11 -1°10.95
17	256° 48.57	100°38.06 3.51	48° 39.12 33.10	143°42.49 44.76	257°16.94 56.48	Betelgeuse 270°51.45 7°24.84
18	271°51.03	115°37.59 N11°2.48	63°39.99 S11°33.71	158°44.58 N21°44.71	272°19.59 S02°56.56	Canopus 263°52.19 -52°42.15
19	286°53.50	130°37.12 1.44	78°40.85 34.33	173°46.67 44.66	287°22.23 56.64	Sirius 258°25.79 -16°44.82
20	$301^{\circ}55.96$	145°36.65 11°0.40	93°41.72 34.94	188°48.76 44.61	302°24.87 56.72	Adhara 255°5.50 -29°0.10 Procyon 244°50.36 5°9.67
21	$316^{\circ}58.43$	160°36.18 10°59.36	108°42.59 · · 35.55	203°50.85 · · 44.56	317°27.51 · · 56.80	Pollux 243°16.75 27°57.83
22	332°0.89	175° 35.71 58.32	123° 43.45 36.17	218°52.94 44.51	332°30.15 56.88	Avior 234°14.89 -59°35.17
23	347°3.35	190°35.24 57.28	138°44.32 36.78	233°55.03 44.46	347°32.79 56.95	Suhail 222°46.23 -43°31.91
Mer.	pass. 23:52	$\nu$ -0.5 $'$ d-1.0 $'$ m-3.93	$ u 0.9' \ d0.6' \ m1.59$	$\nu 2.1' \ d$ -0.1' m-2.08	$ u 2.6' \ d 0.1' \ { m m} 0.58$	Miaplacidus 221°38.90 -69°49.07
						Alphard 217°47.44 -8°46.03
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.11 11°50.58
0 0	2°5.82	205°34.77 N10°56.24	153°45.19 \$11°37.40	248°57.12 N21°44.41	2°35.44 \$02°57.03	Dubhe 193°40.89 61°36.71
1	17°8.28	220°34.31 55.20	168° 46.05 38.01	263°59.22 44.36	17°38.08 57.11	Denebola 182°24.68 14°25.80
2	$32^{\circ}10.75$	235°33.84 54.16	183°46.92 38.62	279° 1.31 44.31	32°40.72 57.19	Gienah 175°43.33 -17°40.99 Acrux 173°0.21 -63°14.49
3	$47^{\circ}13.21$	250°33.37 · · 53.12	198°47.78 · · 39.24	294°3.40 · · 44.26	47°43.36 · · 57.27	Gacrux 171°51.62 -57°15.42
4	62°15.67	265°32.90 52.08	213°48.65 39.85	309°5.49 44.21	62°46.00 57.34	Alioth 166°12.96 55°49.31
5	77° 18.14	280°32.43 51.04	228° 49.51 40.46	324°7.58 44.16	77°48.64 57.42	Spica 158°22.00 -11°17.66
6	92°20.60	295°31.97 N10°49.99	243°50.38 \$11°41.08	339°9.68 N21°44.11	92°51.29 \$02°57.50	Alkaid 152°51.95 49°11.23
7	107°23.07	310°31.50 48.95	258°51.24 41.69 273°52.10 42.30	354°11.77 44.06 9°13.86 44.01	107°53.93 57.58 122°56.57 57.66	Hadar 148°35.77 -60°29.92
8 9	122°25.53 137°27.99	325°31.03 47.90 340°30.57 • 46.86	273°52.10 42.30 288°52.97 •• 42.92	9°13.86 44.01 24°15.95 • 43.96	122°56.57 57.66 137°59.21 · · 57.74	Menkent 147°57.29 -36°29.81
10	157° 27.99 152° 30.46	355°30.10 45.81	303°53.83 43.53	39°18.05 43.91	153°1.85 57.81	Arcturus 145°47.65 19°3.04
11	167°32.92	10°29.63 44.77	318°54.70 44.14	54°20.14 43.86	168°4.49 57.89	Rigil Kent. 139°40.05 -60°56.62
12	182°35.39	25°29.17 N10°43.72	333°55.56 <b>S</b> 11°44.76	69°22.24 N21°43.81	183°7.14 <b>S</b> 02°57.97	Kochab 137°20.59 74°3.13 Zuben'ubi 136°55.62 -16°8.88
13	$197^{\circ}37.85$	40°28.70 42.67	348°56.42 45.37	84°24.33 43.76	198° 9.78 58.05	Alphecca 126°3.45 26°37.86
14	$212^{\circ}40.31$	55°28.24 41.62	3°57.28 45.98	99°26.42 43.71	213°12.42 58.13	Antares 112°15.27 -26°29.37
15	227° 42.78	70°27.77 · · 40.58	18°58.15 · · 46.59	114°28.52 · · 43.66	228°15.06 · · 58.20	Atria 107°9.11 -69°4.65
16	242° 45.24	85°27.31 39.53	33°59.01 47.20	129°30.61 43.61	243°17.70 58.28	Sabik 102°2.19 -15°45.38
17 18	257° 47.71 272° 50.17	100°26.85 38.48 115°26.38 N10°37.43	48°59.87 47.82 64°0.73 \$11°48.43	144°32.71 43.56 159°34.80 N21°43.51	258°20.34 58.36 273°22.99 S02°58.44	Shaula 96°9.63 -37°7.44
19	287° 52.64	130°25.92 36.38	79°1.59 49.04	174°36.90 43.46	288°25.63 58.52	Rasalhague 95°58.05 12°32.63
20	302°55.10	145°25.45 35.32	94°2.46 49.65	189°38.99 43.41	303°28.27 58.60	Eltanin 90°41.92 51°29.38
21	317°57.56	160°24.99 · · 34.27	109°3.32 · · 50.26	204°41.09 · · 43.36	318°30.91 · · 58.67	Kaus Aust. 83°31.71 -34°22.41 Vega 80°32.78 38°48.69
22	333°0.03	175°24.53 33.22	124°4.18 50.88	219°43.19 43.31	333°33.55 58.75	Nunki 75°46.96 -26°15.91
23	348°2.49	190°24.07 32.17	139°5.04 51.49	234°45.28 43.26	348°36.19 58.83	Altair 61°59.25 8°56.33
Mer	pass. 23:48	ν-0.5' d-1.0' m-3.93	$\nu$ 0.9' d0.6' m1.59	ν2.1' d-0.1' m-2.08	ν2.6' d0.1' m0.59	Peacock 53°4.46 -56°39.26
						Deneb 49°25.14 45°22.56
\A/I	CHA	CHA De-	CHA D	CHA D	CHA De-	Enif 33°37.97 9°59.74
Wed 0	<b>GHA</b> 3°4.96	<b>GHA Dec</b> 205°23.60 N10°31.12	<b>GHA Dec</b> 154°5.90 <b>S</b> 11°52.10	<b>GHA Dec</b> 249°47.38 N21°43.21	<b>GHA Dec</b> 3°38.84 <b>S</b> 02°58.91	Al Na'ir 27°31.76 -46°50.19
1	18°7.42	220°23.14 30.06	169°6.76 52.71	264°49.48 43.16	18°41.48 58.99	Fomalhaut 15°13.52 -29°29.07   Scheat 13°44.31 28°13.51
2	33°9.88	235°22.68 29.01	184°7.62 53.32	279°51.57 43.11	33°44.12 59.06	Markab 13°29.01 15°20.78
3	$48^{\circ}12.35$	250°22.22 · · 27.95	199°8.48 · · 53.93	294°53.67 · · 43.06	48°46.76 · · 59.14	
4	63°14.81	265°21.76 26.90	214°9.34 54.54	309°55.77 43.01	63°49.40 59.22	Sep 22 Mon SHA Mer.pass
5	78° 17.28	280°21.30 25.84	229°10.20 55.15	324°57.87 42.96	78°52.04 59.30	Venus 204°39.42 10:17
6	93°19.74	295°20.83 N10°24.78	244°11.06 \$11°55.76	339°59.97 N21°42.91	93°54.68 \$02°59.37	Mars 152°17.66 13:46   Jupiter 247°0.33 07:26
7 8	108°22.20 123°24.67	310°20.37 23.73 325°19.91 22.67	259°11.92 56.37 274°12.77 56.98	355°2.06 42.86 10°4.16 42.81	108°57.33 59.45 123°59.97 59.53	Jupiter 247°0.33 07:26 Saturn 0°25.35 23:50
9	123 24.67 138° 27.13	340°19.45 · · 21.61	289°13.63 · · 57.59	25°6.26 · · 42.76	139°2.61 · · 59.61	
10	153° 29.60	355°18.99 20.55	304°14.49 58.20	40°8.36 42.71	154°5.25 59.69	Sep 23 Tue SHA Mer.pass
11	168°32.06	10°18.54 19.49	319° 15.35 58.81	55°10.46 42.66	169°7.89 59.76	Venus 203°28.96 10:18
12	183°34.52	25°18.08 N10°18.44	334°16.21 \$11°59.42	70°12.56 N21°42.62	184°10.53 <b>S</b> 02°59.84	Mars 151°39.37 13:44
13	198° 36.99	40° 17.62 17.37	349°17.06 12°0.03	85°14.66 42.57	199°13.18 02°59.92	Jupiter 246°51.31 07:23 Saturn 0°29.62 23:45
14	213°39.45	55° 17.16 16.31	4°17.92 0.64	100°16.76 42.52	214°15.82 03°0.00	
15	228° 41.92	70°16.70 · · 15.25	19° 18.78 · · 1.25	115°18.86 · · 42.47	229°18.46 · · 0.07	Sep 24 Wed SHA Mer.pass
16	243° 44.38	85°16.24 14.19	34°19.64 1.86	130°20.96 42.42	244°21.10 0.15	Venus 202°18.65 10:19
17	258° 46.84 273° 49.31	100°15.78 13.13 115°15.33 N10°12.07	49°20.49 2.47 64°21.35 \$12°3.08	145°23.06 42.37 160°25.16 N21°42.32	259°23.74 0.23 274°26.38 \$03°0.31	Mars 151°0.94 13:43
18 19	273°49.31 288°51.77	115°15.33 N10°12.07 130°14.87 11.00	64°21.35 \$12°3.08 79°22.20 3.69	175°27.27 42.27	274°26.38	Jupiter 246°42.43 07:20
20	303°54.24	145°14.41 9.94	94°23.06 4.30	190°29.37 42.22	304°31.66 0.46	Saturn 0°33.88 23:41
21	318° 56.70	160°13.96 · · 8.88	109° 23.92 · · 4.91	205°31.47 · · 42.17	319°34.31 · · 0.54	Horizontal parallax
22	$333^{\circ}59.16$	175°13.50 7.81	124°24.77 5.52	220°33.57 42.12	334°36.95 0.62	Venus: 0.1
23	349°1.63	190°13.04 6.75	139°25.63 6.12	235°35.67 42.07	349°39.59 0.70	Mars: 0.1
Mer	pass. 23:44	ν-0.5' d-1.1' m-3.93	$\nu$ 0.9' d0.6' m1.59	ν2.1' d-0.0' m-2.09	ν2.6' d0.1' m0.59	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°47.81	N00°17.83	180°29.07	16.3'	S01°32.98	14.8'	55.1'
1	196°48.03	16.85	195°4.39	16.3'	01°47.76	14.8'	55.1'
2	211°48.25 226°48.47	15.88 •• 14.91	209°39.72 224°15.05	16.3' 16.3'	02°2.52 02°17.27	14.7' 14.7'	55.0' 55.0'
4	241°48.69	13.94	238°50.39	16.3'	02°32.00	14.7'	55.0'
5	256°48.91	12.96	253°25.74	16.4'	$02^{\circ}46.71$	14.7'	55.0'
6	271°49.13	N00°11.99	268°1.10	16.4'	S03°1.40	14.7'	55.0'
7 8	286°49.35 301°49.57	11.02 10.04	282°36.46 297°11.82	16.4' 16.4'	03°16.07 03°30.71	14.6' 14.6'	55.0' 54.9'
9	316°49.79	9.07	311°47.19	16.4	03°45.34	14.6	54.9'
10	331°50.01	8.10	326°22.56	16.4'	03°59.94	14.6'	54.9'
11	346°50.22	7.12	340°57.92	16.4'	$04^{\circ}14.52$	14.6'	54.9'
12	1°50.44	N00°6.15	355°33.29	16.4	S04°29.08	14.5'	54.9'
13 14	16°50.66 31°50.88	5.18 4.20	10°8.66 24°44.02	16.4' 16.4'	04°43.60 04°58.11	14.5' 14.5'	54.9' 54.8'
15	46°51.10	• • 3.23	39°19.38	16.4	05°12.58	14.4	54.8'
16	61°51.32	2.26	53°54.74	16.4'	05°27.03	14.4'	54.8'
17	76°51.54	1.28	68°30.09	16.3'	05°41.44	14.4'	54.8'
18	91°51.76 106°51.98	N00°0.31 S00°0.66	83°5.44 97°40.78	16.3' 16.3'	\$05°55.83 06°10.19	14.4'	54.8'
19 20	106 51.98 121°52.20	1.64	97°40.78 112°16.11	16.3	06°10.19	14.3' 14.3'	54.8' 54.7'
21	136°52.42	2.61	126°51.43	16.3'	06°38.80	14.3'	54.7'
22	151°52.63	3.58	141°26.74	16.3'	$06^{\circ}53.06$	14.2'	54.7'
23	166°52.85	4.56	156°2.03	16.3'	07°7.29	14.2'	54.7'
	SD = 15.9'	d = -1.0'		SE	0 = 15.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°53.07	S00°5.53	170°37.32	ν 16.3'	S07°21.48	14.2'	54.7'
1	196°53.29	6.50	185°12.60	16.3'	$07^{\circ}35.63$	14.1'	54.7'
2	211°53.51	7.48	199°47.86	16.2'	07°49.75	14.1'	54.7'
3 4	226°53.73 241°53.95	• • 8.45 9.42	214°23.10 228°58.33	16.2' 16.2'	08°3.83 08°17.87	14.0' 14.0'	54.6' 54.6'
5	256°54.17	10.40	243°33.54	16.2'	08°31.88	14.0'	54.6'
6	271°54.38	S00°11.37	258°8.74	16.2'	S08°45.84	13.9'	54.6'
7	286°54.60	12.34	272°43.91	16.2'	$08^{\circ}59.77$	13.9'	54.6'
8	301°54.82	13.32	287°19.07	16.1'	09°13.65	13.8'	54.6'
9 10	316°55.04 331°55.26	· · 14.29 15.27	301°54.20 316°29.32	16.1' 16.1'	09°27.49 09°41.28	13.8' 13.8'	54.6' 54.5'
11	346°55.48	16.24	331°4.41	16.1	09°55.04	13.7	54.5'
12	1°55.69	\$00°17.21	345°39.48	16.0'	S10°8.74	13.7'	54.5'
13	16°55.91	18.19	0°14.52	16.0'	10°22.41	13.6'	54.5'
14 15	31°56.13 46°56.35	19.16 •• 20.13	14°49.54 29°24.54	16.0' 16.0'	10°36.02 10°49.59	13.6' 13.5'	54.5' 54.5'
16	61°56.57	21.11	43°59.50	15.9'	10 49.59 11°3.11	13.5'	54.5'
17	76°56.78	22.08	58°34.44	15.9'	11°16.59	13.4'	54.4'
18	91°57.00	S00°23.06	73°9.35	15.9'	S11°30.01	13.4'	54.4'
19	106°57.22 121°57.44	24.03	87°44.24 102°19.09	15.9' 15.8'	11°43.38 11°56.70	13.3' 13.3'	54.4' 54.4'
20 21	121 57.44 136°57.65	25.00 •• 25.98	102 19.09 116°53.91	15.8'	11 50.70 12°9.97	13.3	54.4' 54.4'
22	151°57.87	26.95	131°28.70	15.8'	12°23.19	13.2'	54.4'
23	166°58.09	27.92	146°3.45	15.7'	12°36.36	13.1'	54.4'
	SD = 15.9'	d = 1.0'		SE	0 = 14.9'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°58.31	S00°28.90	160°38.17	15.7'	S12°49.47	13.1'	54.4'
1	196°58.52 211°58.74	29.87	175°12.86	15.7'	13°2.52	13.0'	54.4'
2	211°58.74 226°58.96	30.85 · · 31.82	189°47.51 204°22.13	15.6' 15.6'	13°15.52 13°28.46	12.9' 12.9'	54.3' 54.3'
4	241°59.18	32.79	218°56.71	15.5'	13°41.34	12.8'	54.3
5	256°59.39	33.77	233°31.25	15.5'	$13^{\circ}54.17$	12.8'	54.3'
6	271°59.61	S00°34.74	248°5.76	15.5'	\$14°6.94	12.7'	54.3'
7 8	286°59.83 302°0.04	35.72 36.69	262°40.22 277°14.65	15.4' 15.4'	14°19.64 14°32.29	12.6' 12.6'	54.3' 54.3'
9	317° 0.26	37.66	277 14.05 291°49.03	15.4	14 32.29 14°44.88	12.5'	54.3'
10	332° 0.48	38.64	306°23.37	15.3'	14°57.40	12.5'	54.3'
11	347°0.69	39.61	320°57.67	15.3'	15°9.86	12.4'	54.2'
12 13	2°0.91 17°1.13	\$00°40.59 41.56	335°31.93 350°6.15	15.2' 15.2'	\$15°22.25 15°34.58	12.3' 12.3'	54.2' 54.2'
13 14	32° 1.34	41.56 42.53	4°40.32	15.2 15.1'	15° 34.58 15° 46.85	12.3'	54.2'
15	47° 1.56	• • 43.51	19°14.44	15.1'	15°59.05	12.1'	54.2'
16	62°1.78	44.48	33°48.52	15.0'	16°11.18	12.1'	54.2'
17	77°1.99	45.45	48°22.55	15.0'	16°23.25	12.0'	54.2'
18 19	92°2.21 107°2.43	\$00°46.43 47.40	62°56.54 77°30.48	14.9' 14.9'	\$16°35.24 16°47.17	11.9' 11.9'	54.2' 54.2'
20	107 2.43 122° 2.64	48.38	92°4.37	14.8'	16°59.02	11.8'	54.2'
21	137° 2.86	• • 49.35	106°38.21	14.8'	$17^{\circ}10.81$	11.7'	54.2'
22	152° 3.07	50.32	121°12.00	14.7'	17°22.52	11.6'	54.1'
23	167°3.29	51.30	135°45.74	14.7'	17°34.16	11.6'	54.1'
	SD = 15.9'	d = 1.0'		SE	0 = 14.8'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-5%	
22	07:11	07:22	11:53	12:18	-:-		
23	07:32	07:43	11:52	12:59	00:39		
24	07:53	08:04	11:52	13:41	01:20		

# September 25, 26, 27 UT (Thu., Fri., Sat.)

The   GHA   CHA   Dec   CHA	h	Aries	Venu	ıs	Ma	ars	Jup	oiter	Sati	urn		Stars	
19 19 6.50	Thu	GHA	GHA	Dec	GHA	Dec	GHA		GHA	Dec		SHA	Dec
1											Alpheratz	357°33.83	29°14.10
3 0711.46													
4 or   1.5													
1													
8 192*338 300*500 09*321 29*324 11:00 30*503 09*325 00*1.25													
6 12:21.24 3.35*8.85 57.14 22*33.1 1.10 69 30*8.62 1.45 1.45 1.05 1.05 1.05 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.3													
9   1907   2627   330°   18-0   5-6.06   260°   14-17   10-16   12-17   10-16   12-17   10-16   10-1											1		
10   157-2873   395   60   6199   307   500   1142   676-882   41,55   1057-69   1.55   1161   617-1120   1.57													
1997   1997	10			54.99									
13   1997-96.03											1		
14   12   13   15   15   12   13   16   16   16   16   16   16   17   17													46° 1.31
15 229*4105 075-78 - 49.63 19*39.22 1.15.85 116*03.5 - 41.90 20*21.15 1.194 2.05 1.204 2.05*04.0 2.01 17 29*45.96 18*10*14.88 44.96 38*10*31 1.06*13.11*1.04*1.01*1.02*0*27.13*1.05*10*1.05*10*1.00*1.00*1.00*1.00*1.0													
18 276 48.28													
19													
19   289°8901   130°307   43.3   79°40.66   18.77   176°1777   41.09   290°32.41   2.25   Adams   255°5.44   29°40.81   2119°384   10°90.30   42.09													
20 304 (83.37   41.75   52.2   44.26   94°43.53   18.88   191°19.88   41.05   306°35.05   2.32   22.32   23.30°10.77   17.75 (22)   41.01   128°45.23   20.09   221°21.10   40.99   335°40.32   24.88   Avior   224°43.63   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   235°40.23   235°40.31   23													
22 336°8.30 175°26.2 42.10 126°4.32 2009 221°26.10 4009 320°37.70 1.2.0 Policy 247°1.63 275°3.2 221°26.10 4009 320°37.70 1.2.0 Policy 247°1.63 275°3.2 221°26.10 4009 320°37.00 1.2.5 Policy 247°1.63 275°3.2 221°26.10 4009 320°4.00 1.2.5 Policy 247°1.63 25°3.2 25°5. Policy 247°1.63 2009 220°2.01 4009 320°2.01 4													
23 33° 58.03   190° 21.1 1 10° 2.02   42.10   12° 4.0.2   200° 4.21° 4.0.0   23° 4.0.2   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.68   2.00° 4.0.0   2.00° 4.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00° 4.0.0   2.00°		319°55.84				• 19.48							
Mar.   1985   23-60   296-11   296-20													
Fri GHA  0 \$13.32	23	350°0.77	190°2.17	41.03	139°46.08	20.69			350°42.98	2.55			
Fig.   GiA   Dic   CHA   Dic   CHA   Dic   CHA   Dic   CHA   Dic   CHA   Dic   CHA   Dic   Dibble   1973-80   8619-567   1975-80   2071-57   1993-95   1594-93   15	Mer. <sub>I</sub>	pass. 23:40	$\nu$ -0.5' d-1.1	′ m-3.93	$\nu$ 0.9′ d0.	$6^\prime$ m $1.59$	$\nu 2.1' \ d-0.0$	.0′ m-2.09	$\nu$ 2.6′ d0.	$1^\prime$ m0.59			
Fri GHA GHA (GHA )													
0 5-3.33 205-1.72 N09-395 154-403 512-2.130 257-283.1 N21-0.055 5-2.452 203-2.65 1   207-509 207-1.72 38.87 104.74.75 2.190 2667-304.2 40.80 5-2.48.26 203-2.65   207-509 207-1.72 38.87 104.74.75 2.190 2667-304.2 40.80 5-2.48.26 2.176   207-513-30 207-2.90 207-2.77 1044-40.3 2.25 12 311-32.5 40.71 35-50.0 2.77   5 807-15.55 279-94.8 3.65 2.35 2.22 311-32.5 40.61 80°-86.18 2.02   6 867-18.02 2047-99.0 N097-33.47 247-50.3 2.02 2.03 2.03 2.00 2.05 2.00 2.00 2.00 2.00 2.00 2.00	Fri	GHA				Dec	GHA		GHA	Dec			
3 58°8.16   225°0.82   37.79   184°8.68   22.51   281°3.25   40.75   35°5.90   2.79   3 50°1.00   290°0.37   36.71   39°4.94   32.12   290°3.64   40.75   35°5.90   2.79   5 60°15.55   279°5.48   34.55   229°5.18   24.33   320°3.88   40.61   65°5.88   2.94   5 60°15.55   279°5.48   34.55   229°51.18   24.33   320°3.88   40.61   65°5.88   32.90   5 71 110°2.04   309°5.68   32.39   325°5.87   25.35   356°4.30   40.61   65°5.50   32.50   5 110°2.04   309°5.68   32.39   32.50   312°2.49   341°4.09   702°6.50   65°5.51   32.50   5 110°2.04   309°5.68   32.39   32.50   32.50   32.50   32.50   32.50   5 110°2.04   309°5.69   30.32   32.50   32.50   32.50   32.50   32.50   32.50   32.50   5 110°2.04   309°5.69   30.32   32.50											1		
3 50°10062 220°037 35671 199°4948 2312 2296°3464 40.71 50°53.54 2.86											Gienah		
6 65°13.09 26°59.03 35.63 214°59.33 22.72 311°36.75 40.66 65°55.18 2.94 6 65°18.02 295°59.08 43.45 229°51.18 24.33 326°38.66 40.16 80°58.02 3.02 6 65°18.02 295°59.08 100°33.47 246°52.03 512°24.93 312°40.56 40.51 111°4.11 3.17 110°20.45 300°58.58 32.39 25°52.87 224.93 312°40.97 N21°40.05 60°14.6 503°3.09 110°25.41 339°57.69 30.23 31.1 274°53.72 26.14 11°45.19 40.46 126°6.75 3.25 10 155°27.87 356°57.24 20.14 300°55.42 27.35 41°40.41 40.37 156°12.03 3.40 10 155°27.87 356°57.24 20.14 300°55.42 27.35 41°40.41 40.37 156°12.03 3.40 11 10°30.34 9°55.79 28.06 319°55.26 27.95 55°51.53 40.32 11°1146°3 348 11 20°33.26 39°55.09 25.89 346°57.04 20°47.95 55°51.53 40.32 11°1146°3 348 12 21 15°37.28 31°52.26 39°55.00 25.89 430°55.06 20.16 80°55.75 40.22 201°19.05 3.63 14 215'57.73 54°55.45 24.81 4°58.00 25.76 110°57.86 40.17 216°22.59 3.77 15 200°40.19 60°55.01 2.33 41 4°58.00 25.76 110°57.86 40.17 216°22.59 3.77 15 200°40.19 60°55.01 2.33 41 18°59.69 30.37 116°59.00 40.17 216°22.59 3.77 15 200°40.19 60°55.01 2.33 41 18°59.69 30.37 116°59.00 40.17 216°22.59 3.77 15 200°40.12 90°55.01 215°5.00 50°1.34 31.57 147°4.20 40.38 26°50.51 3.94 18 275°47.58 1146°3.67 N09°20.47 40.33 3.77 116°59.00 40.39 226°50.51 3.94 18 275°47.58 1146°3.67 N09°20.47 40.33 3.77 116°59.00 40.39 226°50.51 3.94 18 275°47.58 1146°5.67 81.82 98°3.88 33.38 122°10.54 39.88 306°33.44 40 18 275°47.54 1146°51.89 16.11 112°57.57 3.89 200°10.54 39.89 306°33.44 31.00°91.55 40.00°50.51 1446°5.75 40.17 30.90°50.51 1446°5.75 40.17 30.39 200°50.51 1446°5.75 40.17 30.39 306°33.44 40.40 40.30°50.55 40.40 40.30 40.50 40.40 40.30 40.50 40.40 40.40 40.40 40.40 40.40 40.40 40.40 40.40 40.40 40.40 40.40 40.													
5 6 95°18.55 29°9 59.48 34.55 229°5.18 24.35 326°3.68 40.51 69°1.46 30°3.309 4.09°3.307 4.09°4.09°5.67 40°4.00°4.09°4.09°4.09°5.67 40°4.09°4.09°4.09°4.09°4.09°4.09°4.09°4.													
6 95-18.0 294-99.03 395-98 8 92.3 497 244-92.03 512-24-99 3414-0.97 N21-40.56 99-11.46 503-304 503-31 13 137 141-0.97 N21-40.56 99-11.46 503-304 503-31 137 141-0.97 N21-40.56 99-11.46 503-30.4 503-31 137 141-0.97 N21-40.56 99-11.46 503-304 503-31 141-0.97 N21-40.56 99-11.46 503-31 141-0.97 N21-40.56 99-11.46 503-304 503-31 141-0.97 N21-40.56 99-11.46													
8 126°229.4 338°37.6 9 30.2°3 80°54.5 7 .0°67.4 26°47.30 0.40 4 141°67.5 3.25													
9 140°25.41 33°3°57.69 30.23 28°8'45.57 26.274 26°47.30 40.41 141°9.39 3.33 34 15°47.66 10°5.05 11 170°5.03 49°56.79 28.06 319°56.26 27.35 41°40.41 40.37 156°1.47 11.467 3.34 68°1.47 11.467 3.46 11.170°3.03 4 9°56.79 28.06 319°56.26 27.95 56°51.53 40.32 171°14.67 3.65 11.11°19.03 3.49 11.11°19.03 3.40 11.11°19.11°1													
10 155°2787 394°5724 29.14 304°55.42 27.35 41′40/41 40.37 156°12.03 3.40 Kochab 139°50.63 319°50.62 27.95 65°51.53 40.32 171′467 3.48 Kochab 137°20.63 74°3.12 12 188°32.80 24°55.34 N09°26.99 334°57.96 29.16 86°55.75 40.22 201°19.50 3.63 3.60 14 215°37.73 54°55.45 24.81 4°58.80 29.76 101°57.86 40.17 216°22.99 3.71 Alria 107°91.5 -606°1.61 2245°42.66 84°54.56 22.64 33°0.50 3.03 71 101°57.86 40.17 216°22.99 3.71 Alria 107°91.5 -606°1.12 29°3.15 50°1.02 3.72 19°59.65 50°3.37 116°59.97 4.00 3 261°30.51 3.94 Alria 107°91.5 -606°1.12 29°54.11 21.55 50°1.34 31.57 147°4.20 40.03 261°30.51 3.94 Shall 31.57 147°8.34 39.99 276°33.15 503°4.02 13°1.56°1.20 13°2.20 40.03 261°30.51 3.94 Shall 31.57 147°8.34 39.99 290°50.51 29°53.52 22 19.38 80°3.20 33.278 177°8.34 39.99 290°53.50 4.10 140°52.05 129°53.33 1.72 101°47.92 39.99 276°33.15 503°4.02 1336°55.51 140°56.10 110°47.97 3.39 9.00°12.05 3.94 4.00 4.00 3 261°3.15 503°4.02 1336°57.44 174°51.89 16.11 125°5.57 3.49 9 222°14.77 39.79 336°34.72 4.13 140°50.20 110°4.72 33.99 207°3.15 503°4.02 140°4.04 174°4.50 30°4.04 110°4.72 33.99 207°1.25 5.00°1.04 30°5.05 12.95 30°5.05 12.05 140°6.41 35.19 237°16.88 39.74 351°4.05 4.40 140°4.05 1													
11 170°30.34 9°50.79 28.06 319°50.20 98 334°57.11 512°28.56 7 17°53.64 N21°40.27 186°17.31 502°3.56 13.48 13°20°3.52 39°55.90 25.89 334°57.11 512°28.56 101°57.86 40.17 21°62.25 9 3.61 136°5.63 16°8.88 13°20°3.52 65 40.21 21°55.54 22.2 20°19.99 5 3.63 140; 16°8.88 13°20°3.52 65 40.21 21°55.54 22.2 20°19.99 5 3.63 140; 16°2.88 13°20°3.01 10°59.66 40.17 21°22.59 3.71 11°59.66 40.17 21°22.59 3.71 11°59.66 40.17 21°22.59 3.71 11°59.66 40.17 21°22.59 3.71 11°59.66 40.17 21°22.59 3.79 11°24°22.59 3.71 11°24°22 11°24°24 11°24°22 11°24°24 11°24°22 11°24°24 11°24°2	10												
13 200°\$5.26 39°\$5.90 25.89 346°\$7.96 29.16 86°\$5.75 40.22 20°\$19.95 3.63 Aghlects 126°3.47 26°37.86 A													
14 215°37.73 54°55.45 24.81 4°58.80 29.76 101°57.86 40.17 216°22.59 3.71 16°59.07 40.13 231°25.23 3.79 16°26.50 1.23°3.71 16°59.07 40.13 231°25.23 3.79 16°24.07 40.00 30.00 1													
15 230°40.19 69°55.01 · · · · · · · · · · · · · · · · · · ·													
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10 156°27.01 354°46.58 3.02 305°15.68 41.81 42°40.16 39.21 157°15.40 5.25 11 171°29.47 9°46.14 1.92 320°16.52 42.41 57°42.27 39.17 172°18.04 5.32 12 186°31.94 24°45.70 N09°0.83 335°17.36 512°43.02 72°44.39 N21°39.12 187°20.68 503°5.40 13 201°34.40 39°45.25 08°59.73 350°18.21 43.62 87°46.51 39.07 202°23.32 5.48 14 216°36.87 54°44.81 58.63 5°19.05 44.22 102°48.63 39.02 217°25.96 5.55 15 231°39.33 69°44.37 · 57.54 20°19.89 · 44.82 117°50.75 · 38.98 232°28.61 · 5.63 16 246°41.80 84°43.93 56.44 35°20.73 45.42 132°52.86 38.93 247°31.25 5.70 17 261°44.26 99°43.49 55.34 50°21.57 46.02 147°54.98 38.88 262°33.89 5.78 18 276°46.72 114°43.05 N08°54.25 65°22.41 512°46.62 162°57.10 N21°38.83 277°36.53 503°5.86 19 291°49.19 129°42.62 53.15 80°23.25 47.22 177°59.22 38.79 292°39.17 5.93 20 306°51.65 144°42.18 52.05 95°24.09 47.82 193°1.34 38.74 307°41.81 6.01 21 19°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24 September 1.80 Mars: 0.1 Mars: 0.1 Mars: 0.1 Mars: 0.1 Mars: 0.1							12°35.92						
10 156° 27.01 354° 46.58 3.02 305° 15.08 41.81 42° 40.16 39.21 157° 15.40 5.25 12 170° 9.47 9° 46.14 1.92 320° 16.52 42.41 57° 42.27 39.17 172° 18.04 5.32 12 186° 31.94 24° 45.70 N09° 0.83 335° 17.36 512° 43.02 72° 44.39 N21° 39.12 187° 20.68 503° 5.40 13 201° 34.40 39° 45.25 08° 59.73 350° 18.21 43.62 87° 46.51 39.07 202° 23.32 5.48 14 216° 36.87 54° 44.81 58.63 5° 19.05 44.22 102° 48.63 39.02 217° 25.96 5.55 15 231° 39.33 69° 44.37 · · 57.54 20° 19.89 · · 44.82 117° 50.75 · · 38.98 232° 28.61 · · 5.63 16 246° 41.80 84° 43.93 56.44 35° 20.73 45.42 132° 52.86 38.93 247° 31.25 5.70 17 261° 44.26 99° 43.49 55.34 50° 21.57 46.02 147° 54.98 38.88 262° 33.89 5.78 18 276° 46.72 114° 43.05 N08° 54.25 65° 22.41 512° 46.62 162° 57.10 N21° 38.83 277° 36.53 503° 5.86 19 291° 49.19 129° 42.62 53.15 80° 23.25 47.22 177° 59.22 38.79 292° 39.17 5.93 20 306° 51.65 144° 42.18 52.05 95° 24.09 47.82 193° 1.34 38.74 307° 41.81 6.01 21 321° 54.12 159° 41.74 · · · 50.95 110° 24.92 · · 48.42 208° 3.46 · · 38.69 322° 44.45 · · 6.09 232° 44.45 · · 6.09 233° 55.04 189° 40.86 48.75 140° 26.60 49.62 238° 7.70 38.60 352° 49.73 6.24 Nars: 0.1											Sep 26 Fri	SHA	Mer.pass
12 186°31.94 24°45.70 N09°0.83 335°17.36 S12°43.02 72°44.39 N21°39.12 187°20.68 S03°5.40 13 201°34.40 39°45.25 08°59.73 350°18.21 43.62 87°46.51 39.07 202°23.32 5.48 14 216°36.87 54°44.81 58.63 5°19.05 44.22 102°48.63 39.02 217°25.96 5.55 15 231°39.33 69°44.37 · 57.54 20°19.89 · 44.82 117°50.75 · 38.98 232°28.61 · 5.63 16 246°41.80 84°43.93 56.44 35°20.73 45.42 132°52.86 38.93 247°31.25 5.70 17 261°44.26 99°43.49 55.34 50°21.57 46.02 147°54.98 38.88 262°33.89 5.78 18 276°46.72 114°43.05 N08°54.25 65°22.41 512°46.62 162°57.10 N21°38.83 277°36.53 S03°5.86 19 291°49.19 129°42.62 53.15 80°23.25 47.22 177°59.22 38.79 292°39.17 5.93 20 306°51.65 144°42.18 52.05 95°24.09 47.82 193°1.34 38.74 307°41.81 6.01 21 321°54.12 159°41.74 · 50.95 110°24.92 · 48.42 208°3.46 · 38.69 322°44.45 · 6.09 22 336°56.58 174°41.30 49.85 125°25.76 49.02 223°5.58 38.64 337°47.09 6.16 23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24  Mars 149°43.70 13:40 Jupiter 246°25.08 O7:13 Saturn 0°42.39 23:33  Sep 27 Sat SHA Mer.pass Venus 198°48.63 10:21 Mars 149°4.8 13:39 10:21 321°54.12 159°41.74 · 50.95 110°24.92 · 48.42 208°3.46 · 38.69 322°44.45 · 6.09 23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24													
13 201° 34.40 39° 45.25 08° 59.73 350° 18.21 43.62 87° 46.51 39.07 202° 23.32 5.48 14 216° 36.87 54° 44.81 58.63 5° 19.05 44.22 102° 48.63 39.02 217° 25.96 5.55 15 231° 39.33 69° 44.37 · · 57.54 20° 19.89 · · 44.82 117° 50.75 · · 38.98 232° 28.61 · · 5.63 16 246° 41.80 84° 43.93 56.44 35° 20.73 45.42 132° 52.86 38.93 247° 31.25 5.70 17 261° 44.26 99° 43.49 55.34 50° 21.57 46.02 147° 54.98 38.88 262° 33.89 5.78 18 276° 46.72 114° 43.05 N08° 54.25 65° 22.41 512° 46.62 162° 57.10 N21° 38.83 277° 36.53 503° 5.86 19 291° 49.19 129° 42.62 53.15 80° 23.25 47.22 177° 59.22 38.79 292° 39.17 5.93 20 306° 51.65 144° 42.18 52.05 95° 24.09 47.82 193° 1.34 38.74 307° 41.81 6.01 21 321° 54.12 159° 41.74 · · 50.95 110° 24.92 · · 48.42 208° 3.46 · · 38.69 322° 44.45 · · 6.09 22 336° 56.58 174° 41.30 49.85 125° 25.76 49.02 223° 5.58 38.64 337° 47.09 6.16 23 351° 59.04 189° 40.86 48.75 140° 26.60 49.62 238° 7.70 38.60 352° 49.73 6.24   Jupiter 246° 25.08 O7:13 Saturn 0° 42.39 23:33  Sep 27 Sat SHA Mer.pass Venus 198° 48.63 10:21  Nenus 198° 48.63 10:21  Mars 149° 48.86 3 10:21  Saturn 0° 42.39 23:33  Sep 27 Sat SHA Mer.pass Venus 198° 48.63 10:21  Mars 149° 48.86 3 10:21  Saturn 0° 42.39 23:33													
14 216°36.87 54°44.81 58.63 5°19.05 44.22 102°48.63 39.02 217°25.96 5.55 15 231°39.33 69°44.37 · · 57.54 20°19.89 · · 44.82 117°50.75 · · 38.98 232°28.61 · · 5.63 16 246°41.80 84°43.93 56.44 35°20.73 45.42 132°52.86 38.93 247°31.25 5.70 17 261°44.26 99°43.49 55.34 50°21.57 46.02 147°54.98 38.88 262°33.89 5.78 18 276°46.72 114°43.05 N08°54.25 65°22.41 512°46.62 162°57.10 N21°38.83 277°36.53 S03°5.86 19 291°49.19 129°42.62 53.15 80°23.25 47.22 177°59.22 38.79 292°39.17 5.93 20 306°51.65 144°42.18 52.05 95°24.09 47.82 193°1.34 38.74 307°41.81 6.01 21 321°54.12 159°41.74 · · 50.95 110°24.92 · · 48.42 208°3.46 · · 38.69 322°44.45 · · 6.09 22 336°56.58 174°41.30 49.85 125°25.76 49.02 223°5.58 38.64 337°47.09 6.16 23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24  Sep 27 Sat SHA Mer.pass Venus 198°48.63 10:21 Mars 149°42.89 198°48.63 10:21 Saturn 0°42.39 23:33													
16 246°41.80 84°43.93 56.44 35°20.73 45.42 132°52.86 38.93 247°31.25 5.70 Venus 198°48.63 10:21 17 261°44.26 99°43.49 55.34 50°21.57 46.02 147°54.98 38.88 262°33.89 5.78 Mars 149°4.88 13:39 18 276°46.72 114°43.05 N08°54.25 65°22.41 512°46.62 162°57.10 N21°38.83 277°36.53 S03°5.86 19 291°49.19 129°42.62 53.15 80°23.25 47.22 177°59.22 38.79 292°39.17 5.93 20 306°51.65 144°42.18 52.05 95°24.09 47.82 193°1.34 38.74 307°41.81 6.01 21 321°54.12 159°41.74 · 50.95 110°24.92 · 48.42 208°3.46 · 38.69 322°44.45 · 6.09 22 336°56.58 174°41.30 49.85 125°25.76 49.02 223°5.58 38.64 337°47.09 6.16 23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24 Mars: 0.1	14												25:33
17 261° 44.26 99° 43.49 55.34 50° 21.57 46.02 147° 54.98 38.88 262° 33.89 5.78 18 276° 46.72 114° 43.05 N08° 54.25 65° 22.41 \$12° 46.62 162° 57.10 N21° 38.83 277° 36.53 \$03° 5.86 19 291° 49.19 129° 42.62 53.15 80° 23.25 47.22 177° 59.22 38.79 292° 39.17 5.93 20 306° 51.65 144° 42.18 52.05 95° 24.09 47.82 193° 1.34 38.74 307° 41.81 6.01 21 321° 54.12 159° 41.74 · 50.95 110° 24.92 · · · 48.42 208° 3.46 · · · 38.69 322° 44.45 · · · 6.09 22 336° 56.58 174° 41.30 49.85 125° 25.76 49.02 223° 5.58 38.64 337° 47.09 6.16 23 351° 59.04 189° 40.86 48.75 140° 26.60 49.62 238° 7.70 38.60 352° 49.73 6.24  Mars 149° 4.88 13:39  Jupiter 246° 16.63 07:10  Saturn 0° 46.63 23:29  Horizontal parallax  Venus: 0.1  Mars: 0.1													
18 276°46.72 114°43.05 N08°54.25 65°22.41 S12°46.62 162°57.10 N21°38.83 277°36.53 S03°5.86 19 291°49.19 129°42.62 53.15 80°23.25 47.22 177°59.22 38.79 292°39.17 5.93 20 306°51.65 144°42.18 52.05 95°24.09 47.82 193°1.34 38.74 307°41.81 6.01 21 321°54.12 159°41.74 · 50.95 110°24.92 · 48.42 208°3.46 · 38.69 322°44.45 · 6.09 22 336°56.58 174°41.30 49.85 125°25.76 49.02 223°5.58 38.64 337°47.09 6.16 23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24  Jupiter 246°16.63 07:10 Saturn 0°46.63 23:29  Horizontal parallax Venus: 0.1 Mars: 0.1													
19 291° 49.19 129° 42.62 53.15 80° 23.25 47.22 177° 59.22 38.79 292° 39.17 5.93 20 306° 51.65 144° 42.18 52.05 95° 24.09 47.82 193° 1.34 38.74 307° 41.81 6.01 21 321° 54.12 159° 41.74 · 50.95 110° 24.92 · 48.42 208° 3.46 · 38.69 322° 44.45 · 6.09 22 336° 56.58 174° 41.30 49.85 125° 25.76 49.02 223° 5.58 38.64 337° 47.09 6.16 23 351° 59.04 189° 40.86 48.75 140° 26.60 49.62 238° 7.70 38.60 352° 49.73 6.24    Saturn 0° 46.63 23:29   Horizontal parallax   Venus: 0.1   Mars: 0.1													
21       321°54.12       159°41.74       · · 50.95       110°24.92       · · 48.42       208°3.46       · · 38.69       322°44.45       · · 6.09       Horizontal parallax         22       336°56.58       174°41.30       49.85       125°25.76       49.02       223°5.58       38.64       337°47.09       6.16       Venus:       0.1         23       351°59.04       189°40.86       48.75       140°26.60       49.62       238°7.70       38.60       352°49.73       6.24       Mars:       0.1					80°23.25	47.22				5.93			
22 336°56.58 174°41.30 49.85 125°25.76 49.02 223°5.58 38.64 337°47.09 6.16 Venus: 0.1 23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24 Mars: 0.1											Horizor	ital parallay	
23 351°59.04 189°40.86 48.75 140°26.60 49.62 238°7.70 38.60 352°49.73 6.24 Mars: 0.1											. 10.1201	•	0.1
Mer.pass. 23:32 $\nu$ -0.4' d-1.1' m-3.93 $\nu$ 0.8' d0.6' m1.58 $\nu$ 2.1' d-0.0' m-2.10 $\nu$ 2.6' d0.1' m0.60													
	Mer.	pass. 23:32	ν-0.4' d-1.1	′ m-3.93	$\nu$ 0.8′ d0.	6′ m1.58	$\nu 2.1' \ d-0.1$	.0′ m-2.10	ν2.6′ d0.	1′ m0.60			

h	Su	n					
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°3.51	S00°52.27	150°19.43	14.6'	S17°45.72	11.5'	54.1'
1 2	197°3.72 212°3.94	53.25 54.22	164°53.07 179°26.65	14.6' 14.5'	17°57.22 18°8.63	11.4' 11.3'	54.1' 54.1'
3	212 3.94 227°4.15	• • 55.19	194°0.19	14.5'	18° 19.97	11.3'	54.1'
4	242°4.37	56.17	208°33.67	14.4'	$18^{\circ}31.24$	11.2'	54.1'
5	257°4.58	57.14	223°7.09	14.4'	18°42.42	11.1'	54.1'
6 7	272°4.80 287°5.01	\$00°58.12 00°59.09	237°40.47 252°13.78	14.3' 14.3'	\$18°53.53 19°4.56	11.0' 10.9'	54.1' 54.1'
8	302°5.23	00 39.09 01°0.06	266° 47.04	14.2'	19° 4.50	10.9	54.1
9	317°5.44	• • 1.04	281°20.25	14.1'	19°26.38	10.8'	54.1'
10	332°5.66 347°5.88	2.01	295°53.40 310°26.49	14.1'	19°37.17	10.7'	54.1'
11 12	347 5.88 2°6.09	2.99 S01°3.96	310°26.49 324°59.53	14.0' 14.0'	19°47.87 \$19°58.49	10.6' 10.5'	54.1' 54.1'
13	17°6.31	4.93	339°32.50	13.9'	20° 9.03	10.5	54.0'
14	32°6.52	5.91	354° 5.42	13.9'	20°19.48	10.4'	54.0'
15 16	47°6.73 62°6.95	· · 6.88 7.85	8°38.28 23°11.08	13.8' 13.7'	20°29.85 20°40.13	10.3' 10.2'	54.0' 54.0'
17	77°7.16	7.03 8.83	25 11.06 37°43.82	13.7'	20°50.32	10.2	54.0'
18	92°7.38	S01°9.80	52°16.50	13.6'	S21°0.42	10.0'	54.0'
19	107°7.59	10.78	66°49.12	13.6'	21°10.44	9.9'	54.0'
20 21	122°7.81 137°8.02	11.75 •• 12.72	81°21.68 95°54.18	13.5' 13.4'	21°20.37 21°30.20	9.8' 9.7'	54.0' 54.0'
22	157 8.02 152°8.24	13.70	95 54.16 110°26.62	13.4'	21 30.20 21°39.94	9.7' 9.7'	54.0'
23	167°8.45	14.67	124°59.00	13.3'	21°49.60	9.6'	54.0'
	SD = 15.9'	d = 1.0'		SE	0 = 14.8'		
Fri	GHA	Dec	GHA	ν 12.2'	Dec	d o.r.	HP
0 1	182°8.66 197°8.88	S01°15.65 16.62	139°31.31 154°3.56	13.3' 13.2'	\$21°59.16 22°8.62	9.5' 9.4'	54.0' 54.0'
2	212°9.09	17.59	168°35.75	13.1'	22°17.99	9.3'	54.0'
3	227°9.31	• • 18.57	183°7.88	13.1'	$22^{\circ}27.27$	9.2'	54.0'
4	242°9.52 257°9.73	19.54	197°39.95	13.0'	22°36.45	9.1'	54.0'
5 6	257° 9.73 272° 9.95	20.51 \$01°21.49	212°11.95 226°43.88	12.9' 12.9'	22°45.53 \$22°54.51	9.0' 8.9'	54.0' 54.0'
7	287° 10.16	22.46	241°15.76	12.8'	23°3.40	8.8'	54.0'
8	302° 10.38	23.43	255° 47.57	12.7'	23°12.19	8.7'	54.0'
9	317° 10.59	• • 24.41	270°19.32	12.7'	23°20.87	8.6'	54.0'
10 11	332°10.80 347°11.02	25.38 26.36	284°51.00 299°22.62	12.6' 12.6'	23°29.46 23°37.94	8.5' 8.4'	54.0' 54.0'
12	2°11.23	S01°27.33	313°54.18	12.5'	S23°46.32	8.3	54.0'
13	17° 11.44	28.30	328°25.67	12.4'	23°54.60	8.2'	54.0'
14 15	32°11.65 47°11.87	29.28 •• 30.25	342°57.10 357°28.46	12.4' 12.3'	24°2.78 24°10.85	8.1' 8.0'	54.0' 54.0'
16	62° 12.08	31.22	11°59.76	12.3	24°10.65 24°18.81	7.9'	54.0'
17	$77^{\circ}12.29$	32.20	26°30.99	12.2'	$24^{\circ}26.67$	7.7'	54.0'
18	92°12.51	S01°33.17	41°2.17	12.1'	\$24°34.41	7.6'	54.0'
19 20	107°12.72 122°12.93	34.14 35.12	55°33.27 70°4.32	12.0' 12.0'	24°42.06 24°49.59	7.5' 7.4'	54.0' 54.0'
21	137° 13.14	36.09	84°35.30	11.9'	24°57.01	7.3	54.0'
22	152° 13.36	37.06	99° 6.21	11.9'	$25^{\circ}4.32$	7.2'	54.0'
23	167° 13.57	38.04	113°37.07	11.8'	25°11.52	7.1'	54.0'
	SD = 15.9'	d = 1.0'		SE	0 = 14.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	НР
0 0	182° 13.78	S01°39.01	128°7.86	11.7'	\$25°18.61	7.0'	54.0'
1	197°13.99	39.98	142°38.58	11.7'	$25^{\circ}25.59$	6.9'	54.0'
2	212°14.21 227°14.42	40.96 •• 41.93	157° 9.25 171° 39.85	11.6' 11.5'	25°32.45 25°39.20	6.7'	54.0'
3 4	227° 14.42 242° 14.63	42.90	171°39.85 186°10.39	11.5'	25° 39.20 25° 45.84	6.6' 6.5'	54.0' 54.0'
5	257° 14.84	43.88	200°40.86	11.4'	$25^{\circ}52.35$	6.4'	54.0'
6	272°15.05	S01°44.85	215°11.28	11.4'	\$25°58.76	6.3'	54.0'
7 8	287°15.26 302°15.48	45.82 46.80	229°41.63 244°11.93	11.3' 11.2'	26° 5.04 26° 11.21	6.2' 6.0'	54.1' 54.1'
9	302 15.48 317° 15.69	40.80	244 11.93 258°42.16	11.2'	26°17.25	5.9'	54.1'
10	332° 15.90	48.74	273°12.33	11.1'	26°23.18	5.8'	54.1'
11	347°16.11	49.72	287°42.44	11.1'	26°28.99	5.7'	54.1'
12 13	2°16.32 17°16.53	S01°50.69 51.66	302°12.49 316°42.49	11.0' 10.9'	\$26°34.68 26°40.24	5.6' 5.4'	54.1' 54.1'
14	32° 16.74	52.64	331°12.42	10.9'	26°45.69	5.3'	54.1'
15	47° 16.95	• • 53.61	345°42.30	10.8'	26°51.01	5.2'	54.1'
16	62°17.16	54.58	0°12.12	10.8'	26°56.21	5.1'	54.1'
17 18	77° 17.38 92° 17.59	55.55 \$01°56.53	14°41.88 29°11.58	10.7' 10.6'	27° 1.28 \$27° 6.23	4.9' 4.8'	54.1' 54.1'
19	107° 17.80	57.50	43°41.23	10.6'	$27^{\circ}11.05$	4.7	54.1
20	122°18.01	58.47	58°10.83	10.5'	27°15.74	4.6'	54.1'
21 22	137° 18.22 152° 18.43	01°59.45 02°0.42	72°40.37 87°9.85	10.5' 10.4'	27°20.31 27°24.75	4.4' 4.3'	54.2' 54.2'
23	152 18.43 167°18.64	1.39	87 9.85 101°39.29	10.4	27°29.07	4.3 4.2'	54.2'
	SD = 15.9'	d = 1.0'			0 = 14.7'		-
		u — 1.0		JL	- 17.1		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	9-23%	
25	08:14	08:24	11:52	14:24	02:02		
26	08:35	08:45	11:51	15:10	02:47		
27	08:55	09:05	11:51	15:59	03:34		

#### September 28, 29, 30 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	7°1.51	204°40.42 N08°47.65	155°27.44 \$12°50.22	253°9.82 N21°38.55	7°52.37 <b>S</b> 03°6.32	
1	22°3.97	219°39.98 46.55	170°28.28 50.82	268°11.94 38.50	22°55.01 6.39	Alpheratz 357°33.82 29°14.11
2	37°6.44	234°39.55 45.45	185°29.12 51.42	283°14.07 38.46	37°57.65 6.47	Ankaa 353°6.12 -42°9.84   Schedar 349°29.83 56°40.80
3	52°8.90	249°39.11 · · 44.35	200°29.95 · · 52.01	298°16.19 · · 38.41	53°0.29 · · 6.54	Diphda 348°46.37 -17°50.56
4	67° 11.37	264°38.67 43.24	215°30.79 52.61	313°18.31 38.36	68°2.93 6.62	Achernar 335°19.16 -57°6.17
5	82°13.83	279°38.23 42.14	230°31.63 53.21	328°20.43 38.31	83°5.57 6.70	Hamal 327°50.23 23°35.15
6 7	97° 16.29 112° 18.76	294°37.80 N08°41.04 309°37.36 39.93	245°32.47 \$12°53.81 260°33.30 54.41	343°22.55 N21°38.27 358°24.68 38.22	98°8.21 S03°6.77 113°10.85 6.85	Polaris 313°22.62 89°22.16
8	112 16.70 127°21.22	324°36.93 38.83	275°34.14 55.01	358°24.68 38.22 13°26.80 38.17	113°10.85 6.85 128°13.49 6.93	Acamar 315°10.98 -40°11.81
9	142°23.69	339°36.49 · · 37.72	290°34.98 · · 55.61	28°28.92 · · 38.13	143°16.13 · · 7.00	Menkar 314°5.29 4°11.60
10	157°26.15	354°36.05 36.62	305°35.81 56.20	43°31.05 38.08	158°18.77 7.08	Mirfak 308°27.07 49°57.09
11	172°28.61	9°35.62 35.51	320°36.65 56.80	58°33.17 38.03	173°21.41 7.15	Aldebaran 290°38.79 16°33.74
12	187°31.08	24°35.18 N08°34.41	335°37.48 \$12°57.40	73°35.29 N21°37.98	188°24.05 <b>S</b> 03°7.23	Rigel 281°3.20 -8°10.10
13	202°33.54	39°34.75 33.30	350°38.32 58.00	88°37.42 37.94	203°26.69 7.31	Capella 280°20.89 46°1.31 Bellatrix 278°22.16 6°22.51
14	217°36.01	54°34.31 32.20	5°39.15 58.59	103°39.54 37.89	218°29.33 7.38	Elnath 278°1.03 28°37.73
15	232°38.47	69°33.88 · · 31.09	20°39.99 · · 59.19	118°41.67 · · 37.84	233°31.97 · · 7.46	Alnilam 275°37.06 -1°10.95
16	247° 40.94	84°33.44 29.98	35°40.82 12°59.79	133°43.79 37.80	248°34.60 7.53	Betelgeuse 270°51.41 7°24.83
17	262° 43.40	99°33.01 28.87	50°41.66 13°0.39	148°45.92 37.75	263°37.24 7.61	Canopus 263°52.13 -52°42.15
18 19	277° 45.86 292° 48.33	114°32.57 N08°27.76 129°32.14 26.65	65°42.49 \$13°0.98 80°43.33 1.58	163°48.04 N21°37.70 178°50.17 37.66	278°39.88 S03°7.69 293°42.52 7.76	Sirius 258°25.74 -16°44.83
20	307°50.79	144°31.71 25.55	95°44.16 2.18	193°52.29 37.61	308°45.16 7.84	Adhara 255°5.46 -29°0.10
21	322°53.26	159°31.27 · · 24.44	110°44.99 · · 2.77	208°54.42 · · 37.56	323°47.80 · · 7.91	Procyon 244°50.31 5°9.66
22	337°55.72	174°30.84 23.33	125° 45.83 3.37	223°56.55 37.52	338°50.44 7.99	Pollux 243°16.70 27°57.82
23	352°58.18	189°30.41 22.21	140°46.66 3.97	238°58.67 37.47	353°53.08 8.06	Avior 234°14.83 -59°35.16 Suhail 222°46.18 -43°31.90
Morr	pass. 23:28	ν-0.4' d-1.1' m-3.93	ν0.8' d0.6' m1.58	ν2.1' d-0.0' m-2.11	$\nu 2.6' \ d0.1' \ m0.60$	Miaplacidus 221°38.82 -69°49.05
ivier.	Dass. 23.20	ν-0.4 u-1.1 III-3.93	νο.8 do.0 iii1.38	ν2.1 α-0.0 III-2.11	V2.0 U0.1 III0.00	Alphard 217°47.41 -8°46.04
						Regulus 207°34.08 11°50.57
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.87 61°36.68
0	8°0.65	204°29.98 N08°21.10	155° 47.49 \$13° 4.56	254°0.80 N21°37.42	8°55.72	Denebola 182°24.67 14°25.79
1	23°3.11	219°29.54 19.99	170°48.33 5.16	269° 2.93 37.38	23°58.36 8.22	Gienah 175°43.32 -17°40.98
2	38°5.58 53°8.04	234°29.11 18.88 249°28.68 •• 17.77	185°49.16 5.75 200°49.99 • 6.35	284° 5.05 37.33 299° 7.18 · · · 37.28	39°1.00 8.29 54°3.64 •• 8.37	Acrux 173°0.20 -63°14.46
3 4	68° 10.51	264°28.25 16.65	215° 50.82 6.95	314° 9.31 37.24	69°6.28 8.44	Gacrux 171°51.61 -57°15.39
5	83° 12.97	279°27.82 15.54	230° 51.65 7.54	329°11.44 37.19	84°8.92 8.52	Alioth 166°12.97 55°49.28
6	98° 15.43	294°27.38 N08°14.43	245°52.48 \$13°8.14	344°13.57 N21°37.14	99°11.56 \$03°8.59	Spica 158°22.00 -11°17.65
7	113° 17.90	309°26.95 13.31	260° 53.32 8.73	359°15.69 37.10	114°14.20 8.67	Alkaid 152°51.97 49°11.21 Hadar 148°35.79 -60°29.89
8	128°20.36	324°26.52 12.20	275°54.15 9.33	14°17.82 37.05	129°16.84 8.75	Hadar 148°35.79 -60°29.89   Menkent 147°57.29 -36°29.79
9	143°22.83	339°26.09 · · 11.08	290°54.98 · · 9.92	29°19.95 · · 37.00	144°19.48 •• 8.82	Arcturus 145°47.66 19°3.03
10	158° 25.29	354°25.66 9.97	305°55.81 10.52	44°22.08 36.96	159°22.11 8.90	Rigil Kent. 139°40.08 -60°56.60
11	173°27.75	9°25.23 8.85	320°56.64 11.11	59°24.21 36.91	174°24.75 8.97	Kochab 137°20.68 74°3.10
12	188° 30.22	24°24.80 N08°7.74	335°57.47 \$13°11.71	74°26.34 N21°36.87	189°27.39	Zuben'ubi 136°55.64 -16°8.88
13 14	203°32.68 218°35.15	39°24.37 6.62 54°23.94 5.50	350°58.30 12.30 5°59.13 12.90	89°28.47 36.82 104°30.60 36.77	204°30.03 9.12 219°32.67 9.20	Alphecca 126°3.48 26°37.85
15	216 35.15 233°37.61	69°23.51 · · 4.38	20°59.96 · · 13.49	104°30.60 36.77 119°32.73 · · 36.73	219°32.67 9.20 234°35.31 • 9.27	Antares 112°15.29 -26°29.37
16	248° 40.07	84°23.08 3.27	36°0.79 14.08	134°34.86 36.68	249°37.95 9.35	Atria 107°9.18 -69°4.63
17	263° 42.54	99°22.65 2.15	51°1.61 14.68	149°37.00 36.64	264°40.59 9.42	Sabik 102°2.22 -15°45.38
18	278°45.00	114°22.22 N08°1.03	66°2.44 \$13°15.27	164°39.13 N21°36.59	279°43.23 \$03°9.50	Shaula 96°9.66 -37°7.43 Rasalhague 95°58.08 12°32.63
19	293°47.47	129°21.80 07°59.91	81°3.27 15.86	179°41.26 36.54	294°45.87 9.57	Eltanin 90°41.98 51°29.38
20	308°49.93	144°21.37 58.79	96°4.10 16.46	194°43.39 36.50	309°48.50 9.65	Kaus Aust. 83°31.74 -34°22.41
21	323°52.40	159°20.94 · · 57.67	111°4.93 · · 17.05	209°45.52 · · 36.45	324°51.14 · · 9.73	Vega 80°32.81 38°48.69
22	338° 54.86	174°20.51 56.55	126°5.76 17.64	224°47.66 36.41	339°53.78 9.80	Nunki 75°46.99 -26°15.91
23	353° 57.32	189°20.08 55.43	141°6.58 18.24	239°49.79 36.36	354°56.42 9.88	Altair 61°59.28 8°56.33
Mer.p	pass. 23:24	$\nu$ -0.4 $'$ d-1.1 $'$ m-3.93	$ u 0.8' \; d0.6' \; { m m} 1.58$	$\nu 2.1' \ d$ -0.0 $' \ m$ -2.11	$ u 2.6' \ d0.1' \ m0.61$	Peacock 53°4.50 -56°39.27
						Deneb 49°25.17 45°22.58
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°37.98 9°59.75
0	8°59.79	204°19.66 N07°54.31	156°7.41 \$13°18.83	254°51.92 N21°36.31	9°59.06 \$03°9.95	Al Na'ir 27°31.78 -46°50.21 Fomalhaut 15°13.52 -29°29.08
1	24°2.25	219°19.23 53.19	171°8.24 19.42	269°54.06 36.27	25°1.70 10.03	Scheat 13°44.31 28°13.53
2	39°4.72	234°18.80 52.06	186°9.06 20.02	284°56.19 36.22	40°4.34 10.10	Markab 13°29.01 15°20.80
3	54°7.18	249°18.37 · · 50.94	201°9.89 · · 20.61	299°58.32 · · 36.18	55°6.98 · · 10.18	
4	69°9.64	264°17.95 49.82	216° 10.72 21.20	315° 0.46 36.13	70°9.61 10.25	Sep 28 Sun SHA Mer.pass
5	84°12.11	279°17.52 48.70	231°11.54 21.79	330°2.59 36.08	85°12.25 10.33	Venus 197°38.91 10:22
6	99° 14.57	294°17.09 N07°47.57	246°12.37 \$13°22.38	345°4.73 N21°36.04	100°14.89 \$03°10.40	Mars 148°25.93 13:37 Jupiter 246°8.32 07:06
7	114° 17.04	309°16.67 46.45	261°13.19 22.98	0°6.86 35.99	115°17.53 10.48	Jupiter 246°8.32 07:06   Saturn 0°50.86 23:24
8 9	129° 19.50 144° 21.97	324°16.24 45.32 339°15.82 •• 44.20	276°14.02 23.57 291°14.84 •• 24.16	15°9.00 35.95 30°11.13 · · 35.90	130°20.17 10.55 145°22.81 · · 10.63	Jatum 0 50.00 23:24
10	159° 24.43	354°15.39 43.07	306°15.67 24.75	45°13.27 35.86	160°25.45 10.70	Sep 29 Mon SHA Mer.pass
11	174° 26.89	9°14.97 41.95	321°16.49 25.34	60°15.41 35.81	175°28.08 10.78	Venus 196°29.33 10:22
12	189°29.36	24°14.54 N07°40.82	336°17.32 \$13°25.93	75°17.54 N21°35.76	190°30.72 S03°10.85	Mars 147°46.84 13:36
13	204°31.82	39°14.12 39.69	351°18.14 26.52	90°19.68 35.72	205°33.36 10.93	Jupiter 246°0.15 07:03
14	219°34.29	54°13.69 38.57	6°18.97 27.12	105°21.81 35.67	220°36.00 11.00	Saturn 0°55.07 23:20
15	234° 36.75	69°13.27 · · 37.44	21°19.79 · · 27.71	120°23.95 · · 35.63	235°38.64 · · 11.08	Sep 30 Tue SHA Mer.pass
16	249°39.21	84°12.84 36.31	36°20.61 28.30	135°26.09 35.58	250°41.28 11.15	Venus 195°19.87 10:23
17	264°41.68	99°12.42 35.18	51°21.44 28.89	150°28.23 35.54	265°43.91 11.23	Mars 147°7.62 13:35
18	279° 44.14	114°12.00 N07°34.06	66°22.26 \$13°29.48	165°30.36 N21°35.49	280°46.55 S03°11.30	Jupiter 245°52.13 07:00
19	294°46.61	129°11.57 32.93	81°23.08 30.07	180°32.50 35.45	295°49.19 11.38	Saturn 0°59.27 23:16
20 21	309° 49.07 324° 51.54	144°11.15 31.80 159°10.72 · · · 30.67	96°23.90 30.66 111°24.73 · · 31.25	195°34.64 35.40 210°36.78 · · 35.36	310°51.83 11.45 325°54.47 •• 11.52	Horizontal parallax
22	339°54.00	174°10.30 29.54	111 24.75 · · · 31.25 126°25.55	210 30.76 · · · 35.30 225°38.92       35.31	340°57.10 11.60	Venus: 0.1
23	354° 56.46	189°9.88 28.41	141°26.37 32.43	240°41.06 35.27	355°59.74 11.67	Mars: 0.1
ivier.	pass. 23:20	ν-0.4' d-1.1' m-3.93	ν0.8′ d0.6′ m1.57	ν2.1' d-0.0' m-2.12	ν2.6' d0.1' m0.61	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°18.85	S02°2.36	$116^{\circ}8.67$	10.3'	S27°33.25	4.1'	54.2'
1	197°19.06	3.34	130°37.99	10.3'	27°37.31	3.9'	54.2'
2	212°19.27 227°19.48	4.31 •• 5.28	145°7.27 159°36.50	10.2' 10.2'	27°41.23 27°45.02	3.8' 3.7'	54.2' 54.2'
4	242°19.69	6.25	174°5.67	10.1	27°48.69	3.5'	54.2'
5	257°19.90	7.23	188°34.80	10.1'	$27^{\circ}52.22$	3.4'	54.2'
6	272°20.11	S02°8.20	203°3.88	10.0'	\$27°55.61	3.3'	54.3'
7 8	287°20.32 302°20.53	9.17 10.14	217°32.91 232°1.90	10.0' 9.9'	27°58.88 28°2.01	3.1' 3.0'	54.3' 54.3'
9	317°20.74	11.12	246°30.84	9.9'	28°5.01	2.9'	54.3'
10	332°20.94	12.09	$260^{\circ}59.74$	9.9'	$28^{\circ}7.87$	2.7'	54.3'
11	347°21.15 2°21.36	13.06 \$02°14.03	275°28.59 289°57.40	9.8'	28°10.60 528°13.19	2.6'	54.3'
12 13	17°21.57	15.01	304°26.17	9.8' 9.7'	28° 15.64	2.5' 2.3'	54.3' 54.3'
14	32°21.78	15.98	318°54.90	9.7'	28°17.96	2.2'	54.4'
15	47°21.99	•• 16.95	333°23.58	9.6'	28°20.14	2.0'	54.4'
16	62°22.20 77°22.41	17.92	347°52.23 2°20.84	9.6'	28°22.18 28°24.09	1.9'	54.4'
17 18	92°22.61	18.90 \$02° 19.87	2 20.84 16°49.41	9.6' 9.5'	28 24.09 \$28°25.85	1.8' 1.6'	54.4' 54.4'
19	107°22.82	20.84	31° 17.95	9.5'	28°27.48	1.5'	54.4'
20	122°23.03	21.81	45° 46.45	9.5'	28°28.96	1.3'	54.4'
21	137°23.24 152°23.45	· · 22.78 23.75	60°14.92 74°43.36	9.4' 9.4'	28°30.31 28°31.52	1.2'	54.5' 54.5'
22 23	152 23.45 167°23.65	23.75 24.73	74 43.36 89°11.76	9.4 9.4'	28°32.58	1.1' 0.9'	54.5'
	SD = 16.0'	d = 1.0'			0 = 14.8'		
	JD = 10.0′	u = 1.0°		20	- 14.δ		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°23.86	S02°25.70	103°40.13	9.3'	\$28°33.51	0.8'	54.5'
1 2	197°24.07 212°24.28	26.67 27.64	118°8.47 132°36.79	9.3' 9.3'	28°34.29 28°34.93	0.6' 0.5'	54.5' 54.6'
3	212 24.20 227°24.49	. 28.61	147°5.08	9.3'	28°35.43	0.4	54.6'
4	242°24.69	29.59	$161^{\circ}33.34$	9.2'	28°35.78	0.2'	54.6'
5	257°24.90	30.56	176°1.57	9.2'	28°36.00	0.1'	54.6'
6 7	272°25.11 287°25.31	S02°31.53 32.50	190°29.78 204°57.97	9.2' 9.2'	\$28°36.07 28°35.99	-0.1' -0.2'	54.6' 54.6'
8	302°25.52	33.47	219°26.14	9.1'	28°35.78	-0.4	54.7'
9	317°25.73	• • 34.44	233°54.29	9.1'	$28^{\circ}35.41$	-0.5'	54.7'
10	332°25.93	35.41	248°22.41 262°50.52	9.1'	28°34.91	-0.7'	54.7'
11 12	347°26.14 2°26.35	36.39 \$02°37.36	262°50.52 277°18.61	9.1' 9.1'	28°34.26 \$28°33.46	-0.8' -0.9'	54.7' 54.7'
13	17°26.55	38.33	291°46.69	9.1'	28°32.52	-1.1'	54.8'
14	32°26.76	39.30	306° 14.75	9.0'	28°31.43	-1.2'	54.8'
15 16	47°26.97 62°27.17	· · 40.27 41.24	320° 42.80 335° 10.83	9.0' 9.0'	28°30.20 28°28.83	-1.4' -1.5'	54.8' 54.8'
17	77°27.38	42.21	349°38.86	9.0'	26 26.63 28°27.30	-1.5 -1.7'	54.6 54.9'
18	92°27.59	S02°43.18	4°6.87	9.0'	S28°25.63	-1.8'	54.9'
19	107°27.79	44.15	18° 34.87	9.0'	28°23.82	-2.0'	54.9'
20 21	122°28.00 137°28.20	45.12 •• 46.10	33°2.87 47°30.86	9.0' 9.0'	28°21.86 28°19.75	-2.1' -2.3'	54.9' 54.9'
22	157 26.20 152°28.41	47.07	61°58.85	9.0' 9.0'	28°17.50	-2.3 -2.4'	55.0'
23	167°28.61	48.04	76°26.83	9.0'	28°15.10	-2.5'	55.0'
	SD = 16.0'	d = 1.0'		SD	0 = 14.9'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	182°28.82 197°29.02	\$02°49.01 49.98	90°54.80 105°22.78	9.0' 9.0'	\$28°12.55 28°9.86	-2.7' -2.8'	55.0' 55.0'
2	212°29.23	50.95	119°50.75	9.0'	28°7.02	-3.0'	55.1'
3	227°29.43	• • 51.92	134° 18.73	9.0'	28°4.04	-3.1'	55.1'
4 5	242°29.64 257°29.84	52.89 53.86	148°46.70 163°14.68	9.0' 9.0'	28° 0.91 27° 57.63	-3.3' -3.4'	55.1' 55.1'
6	272°30.05	53.60 \$02°54.83	103 14.06 177° 42.66	9.0'	\$27°54.20	-3.6'	55.2'
7	287°30.25	55.80	$192^{\circ}10.65$	9.0'	27°50.63	-3.7'	55.2'
8	302°30.46	56.77	206°38.64	9.0'	27°46.92	-3.9'	55.2'
9 10	317°30.66 332°30.87	•• 57.74 58.71	221°6.64 235°34.65	9.0' 9.0'	27°43.05 27°39.05	-4.0' -4.2'	55.2' 55.3'
11	347°31.07	02°59.68	250°2.66	9.0'	27°34.89	-4.2 -4.3'	55.3'
12	2°31.27	S03°0.65	264°30.69	9.0'	S27°30.59	-4.4'	55.3'
13	17°31.48	1.62	278°58.73	9.0'	27°26.14	-4.6'	55.3'
14 15	32°31.68 47°31.88	2.59 · · 3.56	293°26.78 307°54.84	9.1' 9.1'	27°21.55 27°16.81	-4.7' -4.9'	55.4' 55.4'
16	62°32.09	4.53	322°22.91	9.1'	27°11.93	-4.9 -5.0'	55.4
17	77°32.29	5.50	$336^{\circ}51.01$	9.1'	27°6.90	-5.2'	55.5'
18	92°32.49	S03°6.47	351°19.11 5°47.24	9.1'	\$27°1.73	-5.3'	55.5'
19 20	107°32.70 122°32.90	7.44 8.41	5°47.24 20°15.38	9.1' 9.2'	26°56.41 26°50.95	-5.5' -5.6'	55.5' 55.5'
21	137°33.10	• • 9.38	34°43.54	9.2'	$26^{\circ}45.35$	-5.7'	55.6'
22	152°33.31	10.35	49°11.72	9.2'	26°39.60	-5.9'	55.6'
23	167°33.51	11.32	63°39.92	9.2'	26°33.71	-6.0'	55.6'
	SD = 16.0'	d = 1.0'		SD	0 = 15.0'		

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

Lat.		Moonris	е		Moonset	:
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
<b>N</b> 70°						
68°						
66°						
64°						
62°			17:33			19:46
60°	15:26	16:22	16:44	18:12	19:06	20:34
N 58°	14:46	15:41	16:14	18:52	19:46	21:05
56°	14:18	15:13	15:50	19:20	20:14	21:28
54°	13:57	14:51	15:31	19:42	20:36	21:47
52°	13:39	14:33	15:15	20:00	20:54	22:02
50°	13:23	14:18	15:01	20:15	21:09	22:16
45°	12:53	13:47	14:33	20:46	21:40	22:44
N 40°	12:29	13:23	14:10	21:10	22:04	23:06
35°	12:09	13:03	13:52	21:30	22:24	23:24
30°	11:53	12:46	13:36	21:47	22:41	23:39
20° <b>N</b> 10°	11:24 11:00	12:18 11:53	13:08 12:45	22:16 22:40	23:09 23:33	
0°	10:38	11:33	12:45	23:03	23:56	
					23.30	00.10
<b>S</b> 10° 20°	10:15 09:51	11:07 10:43	12:01 11:38	23:26 23:50		00:18 00:42
30°	09:51	10:43	11:36	23:50	00:19	01:10
35°	09:23	09:57	10:54		00:19	01:10
40°	08:48	09:38	10:34		00:55	01:46
45°	08:25	09:14	10:13	00:21	01:19	02:09
<b>S</b> 50°	07:55	08:43	09:43	00:51	01:50	02:39
52°	07:40	08:27	09:49	01:05	02:06	02:54
54°	07:23	08:09	09:12	01:22	02:24	03:11
56°	07:03	07:47	08:52	01:42	02:45	03:31
58°	06:38	07:19	08:27	02:07	03:13	03:57
<b>S</b> 60°	06:03	06:39	07:52	02:41	03:54	04:32

		Sun		Moon			
Day	Eqn.of Time		Mer. Mer.Pass.		Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	31-50%	
28	09:15	09:25	11:51	16:50	04:24		
29	09:35	09:45	11:50	17:43	05:16		
30	09:55	10:05	11:50	18:36	06:09		

### October 01, 02, 03 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	9°58.93	204°9.46 N07°27.28	156°27.19 \$13°33.02	255°43.20 N21°35.22	11°2.38 <b>S</b> 03°11.75	
1	25°1.39	219°9.03 26.14	171°28.01 33.61	270°45.34 35.18	26°5.02 11.82	Alpheratz 357°33.81 29°14.12
2	40°3.86	234°8.61 25.01	186°28.83 34.19	285°47.48 35.13	41°7.66 11.90	Ankaa 353°6.11 -42°9.84
3	55°6.32	249°8.19 · · 23.88	201°29.65 · · 34.78	300°49.62 · · 35.09	56°10.29 · · 11.97	Schedar 349°29.82 56°40.81 Diphda 348°46.36 -17°50.56
4	70°8.78	264°7.77 22.75	216°30.47 35.37	315°51.76 35.04	71°12.93 12.05	Achernar 335°19.14 -57°6.18
5	85° 11.25	279°7.35 21.61	231°31.29 35.96	330°53.90 35.00	86°15.57 12.12	Hamal 327°50.21 23°35.16
6	100° 13.71	294°6.92 N07°20.48	246°32.11 \$13°36.55	345°56.04 N21°34.95	101°18.21 S03°12.20	Polaris 313°21.40 89°22.18
7 8	115° 16.18 130° 18.64	309°6.50 19.35 324°6.08 18.21	261°32.93 37.14 276°33.75 37.73	0°58.18 34.91 16°0.32 34.86	116°20.85 12.27 131°23.48 12.34	Acamar 315°10.96 -40°11.81
9	145°21.11	339°5.66 · · 17.08	291°34.57 · · 38.31	31°2.47 · · 34.82	146°26.12 · · 12.42	Menkar 314°5.27 4°11.60
10	160°23.57	354°5.24 15.94	306°35.39 38.90	46° 4.61 34.77	161°28.76 12.49	Mirfak 308°27.04 49°57.10
11	175°26.03	9°4.82 14.81	321°36.21 39.49	61°6.75 34.73	176°31.40 12.57	Aldebaran 290°38.77 16°33.74
12	190°28.50	24°4.40 N07°13.67	336°37.03 <b>S</b> 13°40.08	76°8.89 N21°34.68	191°34.03 <b>S</b> 03°12.64	Rigel 281°3.18 -8°10.10
13	$205^{\circ}30.96$	39°3.98 12.54	351°37.85 40.67	91°11.04 34.64	206°36.67 12.72	Capella 280°20.85 46°1.32 Bellatrix 278°22.14 6°22.51
14	220°33.43	54°3.56 11.40	6°38.67 41.25	106°13.18 34.59	221°39.31 12.79	Elnath 278°1.00 28°37.74
15	235° 35.89	69°3.14 · · 10.26	21°39.48 · · 41.84	121°15.32 · · 34.55	236°41.95 · · 12.86	Alnilam 275°37.04 -1°10.95
16	250° 38.35	84°2.72 9.13	36°40.30 42.43	136°17.47 34.50	251°44.58 12.94	Betelgeuse 270°51.38 7°24.83
17 18	265° 40.82 280° 43.28	99°2.30 7.99 114°1.88 N07°6.85	51°41.12 43.01 66°41.94 \$13°43.60	151°19.61 34.46 166°21.75 N21°34.41	266°47.22 13.01 281°49.86 \$03°13.09	Canopus 263°52.10 -52°42.15
19	295° 45.75	129°1.46 5.71	81°42.75 44.19	181°23.90 34.37	296°52.49 13.16	Sirius 258°25.72 -16°44.83
20	310°48.21	144°1.04 4.57	96° 43.57 44.77	196°26.04 34.32	311°55.13 13.23	Adhara 255°5.43 -29°0.10
21	325°50.68	159°0.62 · · 3.44	111°44.39 · · 45.36	211°28.19 · · 34.28	326°57.77 · · 13.31	Procyon 244°50.29 5°9.66
22	$340^{\circ}53.14$	174°0.21 2.30	126° 45.20 45.95	226°30.33 34.24	342°0.41 13.38	Pollux 243°16.68 27°57.82 Avior 234°14.79 -59°35.15
23	355°55.60	188°59.79 1.16	141°46.02 46.53	241°32.48 34.19	357°3.04 13.46	Avior 234°14.79 -59°35.15 Suhail 222°46.16 -43°31.89
Mer	pass. 23:16	ν-0.4' d-1.1' m-3.93	ν0.8' d0.6' m1.57	$\nu 2.1' \ d$ -0.0' m-2.12	ν2.6' d0.1' m0.62	Miaplacidus 221°38.78 -69°49.04
- IVICI.	Pa33. 23.10	- U.4 U 1.1 III 3.33				Alphard 217°47.39 -8°46.04
						Regulus 207°34.06 11°50.57
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.84 61°36.66
0 1	10°58.07 26°0.53	203°59.37 N07°0.02 218°58.95 06°58.88	156° 46.83 S13° 47.12 171° 47.65 47.70	256°34.63 N21°34.15 271°36.77 34.10	12°5.68 S03°13.53 27°8.32 13.60	Denebola 182°24.65 14°25.78
2	41°3.00	233°58.53 57.73	171° 47.65 47.70 186° 48.46 48.29	271°36.77 34.10 286°38.92 34.06	27°8.32 13.60 42°10.95 13.68	Gienah 175°43.31 -17°40.98
3	56°5.46	248°58.12 · · 56.59	201°49.28 · · 48.88	301°41.06 · · 34.01	57°13.59 · · 13.75	Acrux 173°0.19 -63°14.45
4	71°7.92	263°57.70 55.45	216°50.09 49.46	316°43.21 33.97	72°16.23 13.83	Gacrux 171°51.61 -57°15.38
5	86° 10.39	278°57.28 54.31	231°50.91 50.05	331°45.36 33.93	87°18.87 13.90	Alioth 166°12.97 55°49.26 Spica 158°21.99 -11°17.66
6	101°12.85	293°56.87 N06°53.17	246°51.72 \$13°50.63	346°47.51 N21°33.88	102°21.50 <b>S</b> 03°13.97	Alkaid 152°51.97 49°11.19
7	$116^{\circ}15.32$	308° 56.45 52.02	261°52.54 51.22	1°49.65 33.84	117°24.14 14.05	Hadar 148°35.79 -60°29.88
8	131° 17.78	323° 56.03 50.88	276°53.35 51.80	16°51.80 33.79	132°26.78 14.12	Menkent 147°57.29 -36°29.79
9	146° 20.24	338°55.62 · · 49.74	291°54.16 · · 52.38	31°53.95 · · 33.75	147°29.41 · · 14.20	Arcturus 145°47.66 19°3.02
10	161°22.71	353°55.20 48.59	306°54.98 52.97	46°56.10 33.70	162°32.05 14.27	Rigil Kent. 139°40.08 -60°56.59
11 12	176° 25.17 191° 27.64	8°54.78 47.45 23°54.37 N06°46.31	321°55.79 53.55 336°56.60 \$13°54.14	61°58.25 33.66 77°0.40 N21°33.62	177°34.69 14.34 192°37.32 \$03°14.42	Kochab 137°20.71 74°3.08
13	206° 30.10	38°53.95 45.16	351°57.42 54.72	92°2.55 33.57	207°39.96 14.49	Zuben'ubi 136°55.64 -16°8.88
14	221° 32.57	53°53.54 44.02	6°58.23 55.31	107° 4.70 33.53	222°42.59 14.56	Alphecca 126°3.48 26°37.84
15	236°35.03	68°53.12 · · 42.87	21°59.04 · · 55.89	122°6.85 · · 33.49	237°45.23 · · 14.64	Antares 112°15.30 -26°29.37 Atria 107°9.21 -69°4.63
16	251°37.49	83°52.71 41.72	36°59.85 56.47	137° 9.00 33.44	252°47.87 14.71	Sabik 102°2.22 -15°45.38
17	266°39.96	98°52.29 40.58	52°0.66 57.06	152°11.15 33.40	267°50.50 14.78	Shaula 96°9.67 -37°7.43
18	281°42.42	113°51.88 N06°39.43	67°1.47 \$13°57.64	167°13.30 N21°33.35	282°53.14 S03°14.86	Rasalhague 95°58.09 12°32.63
19	296° 44.89	128°51.46 38.28	82°2.29 58.22	182°15.45 33.31	297°55.78 14.93	Eltanin 90°42.00 51°29.37
20 21	311° 47.35 326° 49.81	143°51.05 37.14 158°50.63 · · 35.99	97°3.10 58.80 112°3.91 13°59.39	197°17.60 33.27 212°19.75 · · 33.22	312°58.41 15.00 328°1.05 •• 15.08	Kaus Aust. 83°31.75 -34°22.41
22	341°52.28	173° 50.22 34.84	127°4.72 13°59.97	212 13.73 33.22 227°21.90 33.18	343°3.69 15.15	Vega 80°32.83 38°48.69
23	356° 54.74	188°49.80 33.69	142°5.53 0.55	242°24.05 33.14	358°6.32 15.22	Nunki 75°46.99 -26°15.91
						Altair 61°59.28 8°56.33 Peacock 53°4.51 -56°39.28
ivier.	pass. 23:12	ν-0.4' d-1.1' m-3.93	$\nu$ 0.8′ d0.6′ m1.57	ν2.1' d-0.0' m-2.13	$\nu 2.6' \ d0.1' \ \text{m}0.62$	Peacock 53°4.51 -56°39.28 Deneb 49°25.19 45°22.59
						Enif 33°37.99 9°59.75
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.78 -46°50.21
0	11°57.21	203°49.39 N06°32.54	157°6.34 \$14°1.13	257°26.21 N21°33.09	13°8.96 \$03°15.30	Fomalhaut 15°13.52 -29°29.09
1 2	26°59.67 42°2.13	218° 48.98 31.39 233° 48.56 30.24	172°7.15 1.72 187°7.96 2.30	272°28.36 33.05 287°30.51 33.00	28°11.59 15.37 43°14.23 15.44	Scheat 13°44.31 28°13.54
3	42 2.13 57°4.60	233°48.56 30.24 248°48.15 • 29.09	187°7.96 2.30 202°8.77 •• 2.88	287°30.51 33.00 302°32.67 · · · 32.96	43°14.23 15.44 58°16.87 · · 15.52	Markab 13°29.01 15°20.80
4	72°7.06	263°47.74 27.94	217°9.57 3.46	317°34.82 32.92	73°19.50 15.59	Oct 01 Wed SHA Mer.pass
5	87°9.53	278° 47.32 26.79	232°10.38 4.04	332°36.97 32.87	88°22.14 15.66	Venus 194°10.53 10:24
6	102°11.99	293°46.91 N06°25.64	247°11.19 \$14°4.62	347°39.13 N21°32.83	103°24.77 <b>S</b> 03°15.74	Mars 146°28.26 13:33
7	$117^{\circ}14.45$	308°46.50 24.49	262°12.00 5.21	2°41.28 32.79	118°27.41 15.81	Jupiter 245°44.27 06:56
8	132° 16.92	323°46.09 23.34	277° 12.81 5.79	17°43.43 32.74	133°30.04 15.88	Saturn 1°3.45 23:12
9	147° 19.38	338°45.67 · · 22.19	292°13.62 · · 6.37	32°45.59 · · 32.70	148°32.68 · · 15.96	Oct 02 Thu SHA Mer.pass
10	162°21.85	353°45.26 21.04	307°14.42 6.95	47°47.74 32.66	163°35.32 16.03	Venus 193°1.30 10:24
11 12	177° 24.31 192° 26.78	8°44.85 19.88 23°44.44 N06°18.73	322°15.23 7.53 337°16.04 \$14°8.11	62°49.90 32.61 77°52.06 N21°32.57	178°37.95 16.10 193°40.59 \$03°16.18	Mars 145°48.77 13:32
13	192 20.78 207° 29.24	38°44.03 17.58	352°16.84 8.69	92°54.21 32.53	208°43.22 16.25	Jupiter 245°36.56 06:53
14	222°31.70	53° 43.61 16.42	7°17.65 9.27	107°56.37 32.48	223°45.86 16.32	Saturn 1°7.61 23:08
15	237° 34.17	68°43.20 · · 15.27	22°18.46 · · 9.85	122°58.52 · · 32.44	238°48.49 · · 16.39	Oct 03 Fri SHA Mer.pass
16	252°36.63	83°42.79 14.11	37°19.26 10.43	138° 0.68 32.40	253°51.13 16.47	Venus 191°52.18 10:25
17	$267^{\circ}39.10$	98°42.38 12.96	52°20.07 11.01	153°2.84 32.36	268°53.76 16.54	Mars 145°9.13 13:31
18	282°41.56	113°41.97 N06°11.80	67°20.87 \$14°11.59	168°4.99 N21°32.31	283°56.40 \$03°16.61	Jupiter 245°29.00 06:49
19	297° 44.02	128°41.56 10.65	82°21.68 12.17	183°7.15 32.27	298°59.03 16.69	Saturn 1°11.75 23:03
20	312°46.49	143°41.15 9.49	97°22.48 12.75	198° 9.31 32.23	314°1.67 16.76	Horizontal parallax
21 22	327° 48.95 342° 51.42	158° 40.74 · · · 8.34 173° 40.33 7.18	112°23.29 · · 13.33 127°24.09 13.90	213°11.47 · · 32.18 228°13.63 32.14	329°4.30 · · 16.83 344°6.94 16.90	Venus: 0.1
23	357° 53.88	188°39.92 6.02	142°24.90 14.48	243°15.78 32.10	359°9.57 16.98	Mars: 0.1
Wer.	pass. 23:08	ν-0.4' d-1.1' m-3.92	ν0.8′ d0.6′ m1.56	ν2.2' d-0.0' m-2.13	ν2.6' d0.1' m0.63	

h	Su	n	Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°33.71	S03°12.29	78°8.14	9.2'	S26°27.67	-6.2'	55.7'
1	197°33.91	13.26	92°36.38	9.3'	26°21.50	-6.3'	55.7'
2	212°34.12	14.22	107° 4.65	9.3'	26°15.17 26°8.71	-6.5'	55.7'
3 4	227°34.32 242°34.52	· · 15.19 16.16	121°32.94 136°1.25	9.3' 9.3'	26° 8.71 26° 2.11	-6.6' -6.7'	55.8' 55.8'
5	257° 34.72	17.13	150° 1.25 150° 29.59	9.3 9.4'	25°55.36	-6.9'	55.8'
6	272°34.92	S03°18.10	164°57.95	9.4'	S25°48.48	-7.0'	55.9'
7	287°35.13	19.07	179°26.34	9.4'	25°41.45	-7.2'	55.9'
8	302°35.33	20.04	193°54.76	9.4'	25°34.28	-7.3'	55.9'
9	317°35.53 332°35.73	• • 21.01	208°23.21 222°51.68	9.5'	25°26.97 25°19.53	-7.4'	56.0'
10 11	332 35.73 347°35.93	21.97 22.94	237°20.19	9.5' 9.5'	25 19.53 25°11.94	-7.6' -7.7'	56.0' 56.0'
12	2°36.13	S03°23.91	251°48.72	9.6'	S25°4.22	-7.9	56.0'
13	17°36.33	24.88	266°17.29	9.6'	$24^{\circ}56.35$	-8.0'	56.1'
14	32°36.54	25.85	280°45.88	9.6'	24°48.35	-8.1'	56.1'
15	47° 36.74	• • 26.82	295°14.51	9.7'	24°40.22	-8.3'	56.1'
16 17	62°36.94 77°37.14	27.78 28.75	309°43.16 324°11.85	9.7' 9.7'	24°31.95 24°23.54	-8.4' -8.5'	56.2' 56.2'
18	92°37.34	503°29.72	338°40.58	9.8'	\$24°14.99	-8.7	56.3'
19	107°37.54	30.69	353° 9.33	9.8'	24°6.31	-8.8'	56.3'
20	122°37.74	31.66	7°38.12	9.8'	23°57.50	-8.9'	56.3'
21	137°37.94	• • 32.62	22°6.95	9.9'	23°48.55	-9.1'	56.4'
22	152°38.14 167°38.34	33.59 34.56	36°35.80 51°4.70	9.9'	23°39.47	-9.2' -9.3'	56.4'
23			51-4.70	9.9'	23°30.26	-9.3	56.4'
	SD = 16.0'	d = 1.0'		SI	O = 15.2'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 38.54	S03°35.53	65°33.62	10.0'	\$23°20.92	-9.5'	56.5'
1	197°38.74	36.50	80°2.59	10.0'	23°11.44	-9.6'	56.5'
2	212°38.94	37.46	94°31.58	10.0'	23°1.84	-9.7'	56.5'
3 4	227°39.14 242°39.33	· · 38.43 39.40	109°0.62 123°29.69	10.1' 10.1'	22°52.10 22°42.23	-9.9' -10.0'	56.6' 56.6'
5	242 39.33 257°39.53	40.36	125 29.09 137°58.79	10.1	22° 42.23	-10.0	56.6'
6	272°39.73	S03°41.33	152°27.93	10.2	S22°22.12	-10.2	56.7'
7	287°39.93	42.30	166°57.11	10.2'	22°11.87	-10.4'	56.7'
8	302°40.13	43.27	181°26.32	10.3'	22°1.50	-10.5'	56.7'
9	317° 40.33	• • 44.23	195°55.57	10.3'	21°50.99	-10.6'	56.8'
10 11	332°40.53 347°40.72	45.20 46.17	210°24.86 224°54.19	10.3' 10.4'	21°40.37 21°29.62	-10.8' -10.9'	56.8' 56.9'
11	2°40.92	40.17 S03°47.13	224 54.19 239°23.55	10.4	S21°18.74	-10.9	56.9
13	17°41.12	48.10	253°52.94	10.4	21°7.75	-11.1'	56.9'
14	32°41.32	49.07	268°22.37	10.5'	20°56.63	-11.2'	57.0'
15	47°41.52	• • 50.03	282°51.84	10.5'	20°45.39	-11.4'	57.0'
16 17	62°41.71 77°41.91	51.00 51.96	297°21.35 311°50.89	10.5' 10.6'	20°34.03 20°22.55	-11.5' -11.6'	57.0' 57.1'
18	92° 42.11	51.96 S03°52.93	311 50.89 326°20.47	10.6'	20 22.55 \$20°10.95	-11.0	57.1'
19	107° 42.31	53.90	340°50.08	10.6'	19°59.23	-11.8'	57.2'
20	122°42.50	54.86	355°19.73		19°47.40	-12.0'	57.2'
21	137° 42.70	• • 55.83	9°49.42	10.7'	19°35.45	-12.1'	57.2'
22	152° 42.90 167° 43.09	56.79 57.76	24°19.14 38°48.90	10.8'	19°23.38 19°11.20	-12.2' -12.3'	57.3'
23		57.76	38 48.90	10.8'		-12.3	57.3'
	SD = 16.0'	d = 1.0'		SI	D = 15.4'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°43.29	S03°58.73	53°18.69	10.8'	\$18°58.91	-12.4'	57.4'
1	197° 43.49	03°59.69	67°48.51	10.9'	18°46.50	-12.5'	57.4
2 3	212° 43.68 227° 43.88	04°0.66 •• 1.62	82°18.37 96°48.26	10.9' 10.9'	18°33.98 18°21.35	-12.6' -12.7'	57.4' 57.5'
3 4	242°44.07	2.59	96 48.26 111°18.19	10.9	18° 21.35	-12.7 -12.8'	57.5'
5	257° 44.27	3.55	125°48.15	11.0'	17°55.76	-13.0'	57.5
6	272°44.46	S04°4.52	140°18.14	11.0'	<b>S</b> 17°42.80	-13.1'	57.6'
7	287° 44.66	5.48	154°48.16	11.1'	17°29.74	-13.2'	57.6'
8 9	302°44.86 317°45.05	6.45 •• 7.41	169°18.22 183°48.31	11.1' 11.1'	17°16.57 17°3.29	-13.3' -13.4'	57.7' 57.7'
9 10	317 45.05 332° 45.25	8.38	183°48.31 198°18.43	11.1	17° 3.29 16° 49.91	-13.4 -13.5'	57.7' 57.7'
11	347° 45.44	9.34	212°48.57	11.1	16°36.43	-13.6'	57.7 57.8'
12	2°45.64	S04°10.31	227°18.75	11.2'	S16°22.84	-13.7'	57.8'
13	17° 45.83	11.27	241°48.96	11.2'	16°9.16	-13.8'	57.9'
14	32°46.03	12.24	256°19.20	11.3'	15°55.37	-13.9'	57.9'
15 16	47° 46.22 62° 46.41	· · 13.20 14.17	270°49.46 285°19.75	11.3' 11.3'	15°41.48 15°27.50	-14.0' -14.1'	57.9' 58.0'
17	77°46.61	14.17	285 19.75 299°50.07	11.3	15 27.50 15°13.42	-14.1 -14.2'	58.0'
18	92°46.80	S04°16.09	314°20.42	11.4'	\$14°59.24	-14.3'	58.1'
19	107°47.00	17.06	328°50.79	11.4'	14°44.97	-14.4'	58.1'
20	122°47.19	18.02	343°21.18	11.4'	14°30.60	-14.5'	58.1'
21	137° 47.38	• 18.99	357°51.61	11.4'	14°16.14	-14.6'	58.2'
22 23	152° 47.58 167° 47.77	19.95 20.91	12°22.05 26°52.52	11.5' 11.5'	14°1.59 13°46.95	-14.6' -14.7'	58.2' 58.2'
23						-14.1	30.2
	SD = 16.0'	d = 1.0'		SI	O = 15.6'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	60-79%
01	10:15	10:25	11:50	19:28	07:02	
02	10:34	10:44	11:49	20:19	07:54	
03	10:53	11:03	11:49	21:09	08:44	

### October 04, 05, 06 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	12°56.34	203°39.51 N06°4.87	157°25.70 \$14°15.06	258°17.94 N21°32.06	14°12.21 \$03°17.05	
1	27°58.81	218°39.10 3.71	172°26.51 15.64	273°20.10 32.01	29°14.84 17.12	Alpheratz 357°33.81 29°14.13
2	43°1.27	233°38.69 2.55	187° 27.31 16.22	288°22.26 31.97	44°17.48 17.19	Ankaa 353°6.10 -42°9.86
3	58°3.74	248°38.28 · · 1.39	202°28.11 · · 16.80	303°24.42 · · 31.93	59°20.11 · · 17.27	Schedar 349° 29.82 56° 40.83
4	73°6.20	263°37.87 06°0.23	217°28.92 17.37	318°26.58 31.88	74°22.75 17.34	Diphda 348°46.36 -17°50.57 Achernar 335°19.13 -57°6.19
5	88°8.66	278°37.46 05°59.08	232°29.72 17.95	333°28.74 31.84	89°25.38 17.41	Achernar 335°19.13 -57°6.19 Hamal 327°50.20 23°35.17
6	$103^{\circ}11.13$	293°37.05 N05°57.92	247°30.52 \$14°18.53	348°30.90 N21°31.80	104°28.02 <b>S</b> 03°17.48	Polaris 313°20.46 89°22.19
7	118° 13.59	308°36.64 56.76	262°31.32 19.11	3°33.06 31.76	119°30.65 17.56	Acamar 315°10.95 -40°11.82
8	133° 16.06	323°36.23 55.60	277°32.13 19.68	18°35.22 31.71	134°33.29 17.63	Menkar 314°5.25 4°11.60
9	148° 18.52	338°35.83 · · 54.44	292°32.93 · · 20.26	33°37.39 · · 31.67	149°35.92 · · 17.70	Mirfak 308°27.02 49°57.11
10 11	163°20.98 178°23.45	353°35.42 53.28 8°35.01 52.12	307°33.73 20.84 322°34.53 21.41	48°39.55 31.63 63°41.71 31.59	164°38.56 17.77 179°41.19 17.85	Aldebaran 290°38.75 16°33.75
12	176 23.45 193°25.91	23°34.60 N05°50.96	337°35.33 \$14°21.99	78°43.87 N21°31.55	194°43.83 S03°17.92	Rigel 281°3.16 -8°10.10
13	208° 28.38	38°34.19 49.79	352°36.13 22.57	93°46.03 31.50	209°46.46 17.99	Capella 280°20.82 46°1.32
14	223°30.84	53°33.79 48.63	7°36.93 23.14	108°48.20 31.46	224°49.09 18.06	Bellatrix 278°22.12 6°22.51
15	238°33.31	68°33.38 · · 47.47	22° 37.73 · · · 23.72	123°50.36 · · 31.42	239°51.73 · · 18.13	Elnath 278°0.98 28°37.74
16	253°35.77	83°32.97 46.31	37°38.53 24.29	138°52.52 31.38	254°54.36 18.21	Alnilam 275°37.02 -1°10.95
17	268°38.23	98°32.56 45.15	52°39.33 24.87	153°54.69 31.33	269°57.00 18.28	Betelgeuse 270°51.36 7°24.83 Canopus 263°52.07 -52°42.15
18	283°40.70	113°32.16 N05°43.98	67°40.13 \$14°25.45	168°56.85 N21°31.29	284°59.63 <b>S</b> 03°18.35	Sirius 258°25.70 -16°44.83
19	298°43.16	128°31.75 42.82	82°40.93 26.02	183°59.01 31.25	300°2.27 18.42	Adhara 255°5.41 -29°0.10
20	313°45.63	143°31.34 41.66	97° 41.73 26.60	199° 1.18 31.21	315°4.90 18.49	Procyon 244°50.27 5°9.66
21	328° 48.09	158°30.94 · · 40.49	112° 42.53 · · · 27.17	214°3.34 · · 31.17	330°7.53 · · 18.57	Pollux 243°16.65 27°57.81
22	343°50.55	173°30.53 39.33	127° 43.33 27.75	229° 5.51 31.12	345°10.17 18.64	Avior 234°14.76 -59°35.14
23	358° 53.02	188°30.12 38.16	142°44.13 28.32	244°7.67 31.08	0°12.80 18.71	Suhail 222°46.14 -43°31.88
Mer.	pass. 23:04	$\nu$ -0.4 $'$ <i>d</i> -1.2 $'$ m-3.92	$ u 0.8' \ d0.6' \ m1.56$	$\nu$ 2.2′ d-0.0′ m-2.14	$\nu 2.6' \ d0.1' \ m0.63$	Miaplacidus 221°38.74 -69°49.03
						Alphard 217°47.37 -8°46.04
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.04 11°50.56
0	13°55.48	203°29.72 N05°37.00	157°44.93 \$14°28.90	259°9.84 N21°31.04	15°15.43	Dubhe 193°40.82 61°36.64
1	28° 57.95	218°29.31 35.83	172°45.72 29.47	274°12.00 31.00	30°18.07 18.85	Denebola 182°24.65 14°25.77 Gienah 175°43.31 -17°40.98
2	44°0.41	233°28.90 34.67	187°46.52 30.05	289°14.17 30.96	45°20.70 18.93	Acrux 173°0.18 -63°14.44
3	59°2.87	248°28.50 · · 33.50	202°47.32 · · 30.62	304°16.34 · · 30.91	60°23.34 · · 19.00	Gacrux 171°51.60 -57°15.37
4	74°5.34	263°28.09 32.34	217°48.12 31.19	319°18.50 30.87	75°25.97 19.07	Alioth 166°12.96 55°49.24
5	89°7.80	278°27.69 31.17	232°48.91 31.77	334°20.67 30.83	90°28.60 19.14	Spica 158°21.99 -11°17.66
6	104° 10.27	293°27.28 N05°30.00	247°49.71 \$14°32.34	349°22.84 N21°30.79	105°31.24 S03°19.21	Alkaid 152°51.97 49°11.17
7	119° 12.73	308°26.88 28.84	262°50.51 32.91	4°25.00 30.75	120°33.87 19.28	Hadar 148°35.80 -60°29.87
8	134° 15.19	323°26.47 27.67	277°51.30 33.49 292°52.10 · · 34.06	19°27.17 30.71 34°29.34 · · 30.66	135°36.50 19.36	Menkent 147°57.30 -36°29.78
9 10	149° 17.66 164° 20.12	338°26.07 · · 26.50 353°25.66 25.33	292°52.10 · · 34.06 307°52.89 34.63	34°29.34 · · 30.66 49°31.51 30.62	150°39.14 · · 19.43 165°41.77 19.50	Arcturus 145°47.67 19°3.01
11	179° 22.59	8°25.26 24.16	322°53.69 35.21	64°33.68 30.58	180°44.40 19.57	Rigil Kent. 139°40.10 -60°56.58
12	194°25.05	23°24.85 N05°23.00	337°54.48 \$14°35.78	79°35.84 N21°30.54	195°47.04 \$03°19.64	Kochab 137°20.74 74°3.07
13	209°27.51	38°24.45 21.83	352°55.28 36.35	94°38.01 30.50	210°49.67 19.71	Zuben'ubi 136°55.64 -16°8.88 Alphecca 126°3.49 26°37.83
14	224°29.98	53°24.04 20.66	7°56.07 36.92	109°40.18 30.46	225°52.30 19.78	Alphecca 126°3.49 26°37.83 Antares 112°15.31 -26°29.36
15	239°32.44	68°23.64 · · 19.49	22°56.87 · · 37.50	124°42.35 · · 30.41	240°54.94 · · 19.86	Atria 107°9.25 -69°4.62
16	254°34.91	83°23.23 18.32	37°57.66 38.07	139°44.52 30.37	255°57.57 19.93	Sabik 102°2.24 -15°45.38
17	269° 37.37	98°22.83 17.15	52°58.46 38.64	154°46.69 30.33	271°0.20 20.00	Shaula 96°9.69 -37°7.43
18 19	284° 39.83 299° 42.30	113°22.43 N05°15.98 128°22.02 14.81	67°59.25 \$14°39.21 83°0.04 39.78	169°48.86 N21°30.29 184°51.03 30.25	286°2.83 S03°20.07 301°5.47 20.14	Rasalhague 95°58.10 12°32.62
20	314° 44.76	143°21.62 13.64	98°0.84 40.35	199°53.20 30.21	316°8.10 20.21	Eltanin 90°42.03 51°29.37
21	329° 47.23	158°21.22 · · 12.46	113°1.63 · · 40.92	214°55.38 · · 30.17	331°10.73 · · 20.28	Kaus Aust. 83°31.76 -34°22.41
22	344°49.69	173°20.81 11.29	128°2.42 41.50	229°57.55 30.13	346°13.37 20.36	Vega 80° 32.85 38° 48.69
23	$359^{\circ}52.15$	188°20.41 10.12	143°3.21 42.07	244°59.72 30.08	1°16.00 20.43	Nunki 75°47.01 -26°15.91 Altair 61°59.30 8°56.33
Mor	pass. 23:01	ν-0.4' d-1.2' m-3.92	$\nu$ 0.8' d0.6' m1.56	$\nu 2.2' \ d$ -0.0' m-2.15	$\nu 2.6' \ d0.1' \ m0.63$	Peacock 53°4.53 -56°39.29
14161.	23. 23.01	V 0.∓ U-1.∠ III-J.9∠		ν Δ. Δ - U. U III- Δ. I J		Deneb 49°25.21 45°22.59
						Enif 33°37.99 9°59.75
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 31.79 -46° 50.22
0	14° 54.62	203°20.01 N05°8.95	158°4.01 \$14°42.64	260°1.89 N21°30.04	16°18.63 \$03°20.50	Fomalhaut 15°13.52 -29°29.09
1 2	29° 57.08 44° 59.55	218° 19.60 7.78 233° 19.20 6.60	173°4.80 43.21 188°5.59 43.78	275° 4.06 30.00 290° 6.24 29.96	31°21.26 20.57 46°23.90 20.64	Scheat 13°44.32 28°13.55
3	60°2.01	248°18.80 · · 5.43	203°6.38 · · 44.35	305°8.41 · · 29.92	61°26.53 · · 20.71	Markab 13°29.02 15°20.81
4	75°4.47	263°18.40 4.26	218°7.17 44.92	320°10.58 29.88	76°29.16 20.78	Oct 04 Sat SHA Mer.pass
5	90°6.94	278°17.99 3.08	233°7.96 45.49	335°12.76 29.84	91°31.79 20.85	Venus 190° 43.16 10:26
6	105°9.40	293°17.59 N05°1.91	248°8.75 \$14°46.06	350°14.93 N21°29.80	106°34.42 <b>S</b> 03°20.92	Mars 144° 29.36 13:30
7	$120^{\circ}11.87$	308°17.19 05°0.74	263°9.54 46.63	5°17.10 29.76	121°37.06 20.99	Jupiter 245°21.60 06:46
8	135° 14.33	323°16.79 04°59.56	278° 10.33 47.20	20°19.28 29.72	136°39.69 21.06	Saturn 1°15.87 22:59
9	150° 16.79	338°16.38 · · 58.39	293°11.12 · · 47.77	35°21.45 · · 29.67	151°42.32 · · 21.14	Oct 05 Sun SHA Mer.pass
10	165° 19.26	353°15.98 57.21	308°11.91 48.33	50°23.63 29.63	166°44.95 21.21	Venus 189°34.24 10:26
11	180°21.72 195°24.19	8°15.58 56.04 23°15.18 N04°54.86	323°12.70 48.90 338°13.49 \$14°49.47	65°25.80 29.59 80°27.98 N21°29.55	181°47.59 21.28 196°50.22 \$03°21.35	Mars 143°49.44 13:28
12 13	210° 26.65	38°14.78 53.68	358 13.49 514 49.47 353°14.28 50.04	95°30.15 29.51	211°52.85 21.42	Jupiter 245°14.36 06:42
14	225°29.11	53°14.38 52.51	8°15.07 50.61	110°32.33 29.47	226°55.48 21.49	Saturn 1°19.95 22:55
15	240°31.58	68°13.98 · · 51.33	23°15.86 · · 51.18	125°34.51 · · 29.43	241°58.11 · · 21.56	Oct 06 Mon SHA Mer.pass
16	255° 34.04	83°13.57 50.15	38°16.65 51.74	140°36.68 29.39	257°0.74 21.63	Venus 188°25.39 10:27
17	270° 36.51	98°13.17 48.98	53°17.43 52.31	155°38.86 29.35	272°3.38 21.70	Mars 143°9.39 13:27
18	285° 38.97	113°12.77 N04°47.80	68°18.22 \$14°52.88	170°41.04 N21°29.31	287°6.01 \$03°21.77	Jupiter 245°7.27 06:39
19	300°41.43	128°12.37 46.62	83°19.01 53.45	185°43.21 29.27	302°8.64 21.84	Saturn 1°24.01 22:51
20	315°43.90	143°11.97 45.45	98°19.80 54.01	200°45.39 29.23	317°11.27 21.91	Horizontal parallax
21 22	330° 46.36 345° 48.83	158°11.57 · · 44.27 173°11.17 43.09	113°20.58 · · 54.58 128°21.37 55.15	215°47.57 · · 29.19 230°49.75 29.15	332°13.90 · · 21.98 347°16.53 22.05	Venus: 0.1
23	0°51.29	173 11.17 43.09 188°10.77 41.91	128 21.37 55.15 143°22.16 55.72	245°51.93 29.11	2°19.16 22.12	Mars: 0.1
ivier.	pass. 22:57	ν-0.4' d-1.2' m-3.92	$\nu 0.8' \ d0.6' \ m1.56$	ν2.2' d-0.0' m-2.15	ν2.6' d0.1' m0.64	

Sat   GHA   Dec   CHA   V   Dec   d   HP	<u></u>	C	+0.0930 sec			Moon		
1   192°47 66   504°21.88   41°23.00   11.5   513°32.22   21.48.   58.3°   2   212°48.54   -24.77   34°64.95   11.6   13°2.49   -15.0°   58.4°   3   227°48.54   -24.77   34°64.95   11.6   13°2.49   -15.0°   58.4°   4   242°48.73   26.69   113°55.75   11.6°   12°27.77   -15.2°   58.4°   5   277°49.91   294°27.66   128°26.55   11.6°   12°17.27   -15.2°   58.4°   6   272°49.12   504°27.66   128°26.55   11.6°   12°17.27   -15.2°   58.4°   7   287°49.91   28.62   142°56.98   11.6°   11°3.10   -15.5°   58.6°   8   302°49.50   29.98   157°27.61   11.7°   11°3.13   -15.5°   58.6°   9   317°49.99   -30.54   171°58.26   11.7°   11°3.13   -15.5°   58.6°   10   332°49.99   -30.51   186°3.93   11.7°   11°0.26   -15.6°   58.7°   11   347°50.08   32.47   200°59.61   11.7°   11°0.26   -15.6°   58.7°   12   2°50.75   504°3.33   125°3.30   11.7°   10°4.46   -15.6°   58.7°   13   17°50.46   34.39   230°1.00   11.7°   10°4.46   -15.9°   58.8°   14   32°50.65   33.36   244°31.71   11.7°   09°57.27   15.9°   58.8°   15   47°50.84   -36.32   259°2.43   11.7°   09°57.27   15.9°   58.8°   16   62°51.03   37.28   273°3.316   11.7°   09°57.27   15.9°   58.8°   17   777°51.22   38.24   288°3.89   11.7°   09°2.53   51.6°   56.6°   56.7°   18   92°51.41   504°9.20   302°3.46   11.8°   09°3.55   51.6°   59.1°   19   107°51.60   40.17   313°5.38   11.8°   08°3.65   51.6°   59.2°   20   122°51.79   41.13   311°5.38   11.8°   08°3.65   51.6°   59.2°   21   137°51.98   -44.09   11.8°   06°8.47   16.6°   59.2°   22   122°5.36   504°5.74   11.8°   11.7°   06°51.88   -16.8°   59.1°   23   227°53.69   504°50.74   11.8°   06°8.45   16.6°   59.2°   24   242°53.31   44.82   37°4.41   11.7°   06°51.88   -16.8°   59.1°   25   25   25   25   25   25   25   25	h							
197°48.16								
2								
227°48.54								
5		227°48.54		84° 54.59		12°47.50		
	4	242°48.73	25.73	99°25.16	11.6'	12°32.43	-15.2'	58.4'
The color of the								
Section   Sect								
9   317°49.69   · · · · · · · · · · · · · · · · · ·								
10   332°49.89   31.51   186°28.93   11.7°   11°0.26   -15.6°   58.7°   11   347°50.08   32.47   200°59.61   11.7°   10°44.62   -15.7°   58.7°   13   17°50.46   34.39   230°1.00   11.7°   10°13.13   -15.9°   58.8°   14   32°50.65   35.36   244°31.71   11.7°   09°57.27   -15.9°   58.8°   15.8°   47°50.84   36.32   259°2.43   11.7°   09°25.3°   -16.1°   58.9°   16.6°   25°51.03   37.28   273°33.16   11.7°   09°25.3°   -16.1°   58.9°   17°   77°51.22   38.24   288°3.89   11.7°   09°25.3°   -16.1°   58.9°   18.8°   25°51.41   504°39.20   302°34.63   11.7°   09°25.3°   -16.2°   590°   19   107°51.60   40.17   317°5.38   11.8°   08°36.95   -16.3°   590°   122°51.79   41.13   331°36.13   11.8°   08°36.95   -16.3°   590°   22   152°52.17   43.05   0°37.64   11.8°   07°31.53   -16.5°   591°   17°52.36   44.01   15°8.40   11.8°   07°31.53   -16.5°   591°   19°52.74   45.93   46°9.91   11.8°   07°31.53   -16.5°   591°   19°52.74   45.93   46°9.91   11.8°   06°58.47   -16.6°   59.2°   22   212°52.93   46.89   58°40.66   11.8°   06°58.47   -16.6°   59.2°   22   212°52.93   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.31   48.82   87°42.16   11.7°   06°25.18   -16.6°   59.2°   24°253.31   48.82   87°42.16   11.7°   06°25.18   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50   46.89   58°40.66   11.8°   06°68.45   -16.6°   59.2°   24°253.50								
11 347°50.08 32.47 200°59.61 11.7' 10°44.62 15.7' 58.7' 12 2°50.27 S04°3.43 215°30.30 11.7' S10°28.91 15.8' 58.7' 13 17°50.46 34.39 230°1.00 11.7' 10°13.13 -1.59' 58.8' 14 32°50.65 35.36 244°31.71 11.7' 09°43.13 1.60' 58.9' 15 47°50.84 36.32 259°2.43 11.7' 09°43.13 1.60' 58.9' 16 62°51.03 37.28 273°33.16 11.7' 09°25.35 -16.1' 58.9' 17 77°51.22 38.24 288°3.89 11.7' 09°25.35 -16.1' 58.9' 18 92°51.41 S04°39.20 302°34.63 11.7' 508°53.15 -16.2' 59.0' 19 107°51.60 40.17 317°5.38 11.8' 08°20.69 -16.3' 59.0' 20 122°51.79 41.13 331°36.13 11.8' 08°20.69 -16.3' 59.0' 21 137°51.98 42.09 346°6.68 11.8' 08°20.69 -16.4' 59.1' 22 152°52.17 43.05 0°37.64 11.8' 07°47.98 -16.4' 59.1' 23 167°52.36 44.01 15°8.40 11.8' 07°47.98 -16.4' 59.1' 24 197°52.74 45.93 44°9.91 11.8' 05°48.74 -16.6' 59.2' 25 122°52.39 44.89 58°40.66 11.8' 06°41.85 16.7' 59.3' 3 227°53.12 47.86 58°40.66 11.8' 06°48.5 16.7' 59.3' 4 242°53.31 48.82 87°42.16 11.7' 06°25.18 -16.7' 59.3' 4 242°53.31 48.82 87°42.16 11.7' 06°68.45 -16.8' 59.4' 5 257°53.50 49.79 87.8 102°12.90 11.7' 05°51.68 -16.8' 59.4' 7 287°53.87 51.70 131'14.36 11.7' 05°51.68 -16.8' 59.4' 8 302°54.06 52.66 145°45.08 11.7' 05°1.05 -17.0' 59.5' 10 332°54.44 54.88 174°46.48 11.7' 06°25.18 -16.8' 59.3' 8 302°54.06 52.66 145°45.08 11.7' 06°1.05 -17.0' 59.5' 10 332°54.44 54.88 174°46.48 11.7' 04°42.07 -17.1' 59.5' 11 347°54.25 5.50 62 160'15.78 11.7' 04°42.07 -17.1' 59.5' 12 2°54.81 504°55.00 203°47.83 11.7' 503°52.93 -17.1' 59.6' 13 17°55.00 57.46 218°18.49 11.6' 03°38.62 -17.2' 59.6' 14 2°55.59 50.59 60 10°5.78 11.1' 04°4.00 21.71' 59.5' 15 47°55.38 04°59.38 247°17.5 11.6' 02°4.11 1.7' 59.5' 59.9' 17 77°55.75 1.30 276°2.04 11.5' 01°3.49 0.17.4' 59.9' 18 92°55.94 805°2.26 290°51.50 11.5' 01°3.49 0.17.4' 59.9' 21 137°56.49 5.13 343°2.50 11.5' 01°3.49 0.17.4' 59.5' 19 107°56.67 00.2 32.3 34.80 11.4' 00°42.6 0.17.5' 59.9' 19 107°56.87 7.05 39.3 406°56.91 11.0' 02°4.70 17.1' 59.5' 19 107°57.24 8.97 32°4.76 11.4' 500°7.73 17.5' 60.0' 21 22°57.74 9.93 46°55.1 11.1' 01°34.90 17.7' 59.6' 22 12°57.79 12.80 90°2								
13								
14   32°50.65   33.36   244°31.71   11.7'   09°57.27   15.9'   58.8'     15   47°50.84   36.32   259°2.43   11.7'   09°41.34   16.0'   58.9'     16   62°51.03   37.28   273°33.16   11.7'   09°41.34   16.0'   58.9'     17   77°51.22   38.24   288°3.89   11.7'   09°42.85   -16.1'   58.9'     18   92°51.41   504°3.92   302°44.63   11.7'   508°53.15   -16.2'   59.0'     19   107°51.60   40.17   317°53.81   11.8'   68°36.95   -16.3'   59.0'     20   122°51.79   41.13   331°36.13   11.8'   68°36.95   -16.3'   59.0'     21   137°51.98   42.09   346°6.88   11.8'   60°4.37   -16.4'   59.1'     22   152°52.17   43.05   0°37.64   11.8'   07°47.98   -16.4'   59.1'     23   167°52.36   44.01   15°8.40   11.8'   07°41.53   -16.5'   59.1'     25   212°52.93   46.89   58°40.66   11.8'   50°7°15.03   -16.6'   59.2'     2   212°52.93   46.89   58°40.66   11.8'   60°58.47   -16.6'   59.2'     3   222°53.12   47.86   73°11.41   11.7'   60°58.45   -16.7'   59.2'     4   242°53.31   48.82   87°42.16   11.7'   60°58.45   -16.7'   59.2'     5   257°53.50   49.78   102°12.90   11.7'   50°51.68   -16.8'   59.4'     6   272°53.69   504°50.74   166°43.63   11.7'   505°34.85   -16.9'   594'     8   302°54.06   52.66   148°4.50   11.7'   505°34.85   -16.9'   594'     9   317°54.25   53.62   160°15.78   11.7'   04°47.07   -17.1'   59.5'     11   34°54.63   55.54   189°17.16   11.7'   04°47.07   -17.1'   59.5'     12   2°54.81   504°55.30   203°47.83   11.7'   504°44.08   -17.0'   59.5'     14   32°55.19   58.42   232°49.13   11.6'   03°35.79   -17.1'   59.5'     15   47°55.30   57.46   218°18.49   11.6'   03°35.79   -17.1'   59.5'     15   47°55.30   505°8.01   348°35.52   11.4'   00°40.66   -17.5'   50.0'     14   32°55.94   505°2.26   295°5.15   11.5'   00°52.26   -17.4'   59.9'     15   47°55.80   505°8.01   27.46   11.4'   00°40.66   -17.5'   50.0'     15   47°55.80   505°8.01   11.9'   503°4.80   17.5'   50.0'     16   62°55.56   05°0.34   26°50.51   10.0'   03°44.17   17.3'   59.7'     17   77°55.70   50.8'   508°6.01   10.9'   500°4	12	2°50.27	S04°33.43	215°30.30	11.7'	S10°28.91	-15.8'	58.7'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	13	17°50.46	34.39		11.7'		-15.9'	58.8'
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	21	137°51.98	• • 42.09	346°6.88	11.8'	08°4.37	-16.4'	59.1'
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	23	167°52.36	44.01	15°8.40	11.8'	07°31.53	-16.5'	59.1'
182°\$2.55   S04°44.97   29°39.15   11.8'   S07°15.03   -16.6'   59.2'		SD = 16.0'	d = 1.0'		SI	D = 15.9'		
182°\$2.55   S04°44.97   29°39.15   11.8'   S07°15.03   -16.6'   59.2'								
1 197°52.74								
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6 272°53.69 S04°50.74 116°43.63 11.7' S05°34.85 -16.9' 59.4' 7 287°53.87 51.70 131°14.36 11.7' O6°17.97 -16.9' 59.4' 8 302°54.06 52.66 145°64.08 11.7' O5°1.05' -17.0' 59.5' 9 317°54.25 · · 53.62 160°15.78 11.7' O4°44.08 -17.0' 59.5' 10 332°54.44 54.58 174°46.48 11.7' O4°27.07 -17.1' 59.5' 11 347°54.63 55.54 189°17.16 11.7' O4°27.07 -17.1' 59.5' 12 2°54.81 504°56.50 203°47.83 11.7' 503°52.93 -17.1' 59.6' 13 17°55.00 57.46 218°18.49 11.6' 03°35.79 -17.2' 59.6' 14 32°55.19 58.42 232°49.13 11.6' 03°35.79 -17.2' 59.6' 15 47°55.38 04°59.38 247°19.75 11.6' 03°18.62 -17.2' 59.6' 16 62°55.56 05°0.34 261°50.35 11.6' 03°41.1 -17.2' 59.7' 17 77°55.75 1.30 276°20.94 11.6' 02°44.17 -17.3' 59.7' 18 92°55.94 505°2.26 290°51.50 11.5' 502°9.59 -17.3' 59.7' 20 122°56.31 4.17 319°52.56 11.5' 01°34.90 -17.4' 59.8' 21 137°56.49 · · 5.13 334°23.51 11.5' 01°34.90 -17.4' 59.8' 22 152°56.68 6.09 348°53.52 11.4' 01°0.10 -17.4' 59.9' 22 152°57.61 · · 10.88 61°25.43 11.3' 00°42.66 -17.5' 59.9'  SD = 16.0' d = 1.0'  Mon CHA Dec CHA Dec CHA V Dec								
7	5	257°53.50		$102^{\circ}12.90$	11.7'	05°51.68	-16.8'	59.4'
8								
$\begin{array}{c} 9 \\ 10 \\ 332^{\circ}54.42 \\ 5.4.44 \\ 5.4.63 \\ 5.5.4 \\ 11 \\ 347^{\circ}54.63 \\ 5.5.4 \\ 189^{\circ}17.16 \\ 11.7 \\ 04^{\circ}27.07 \\ -17.1^{\circ} 59.5^{\circ} \\ 11 \\ 347^{\circ}55.00 \\ 57.46 \\ 218^{\circ}18.49 \\ 11.6 \\ 03^{\circ}35.79 \\ -17.2^{\circ} 59.6 \\ 13 \\ 17^{\circ}55.00 \\ 57.46 \\ 218^{\circ}18.49 \\ 11.6 \\ 03^{\circ}35.79 \\ -17.2^{\circ} 59.6 \\ 14 \\ 32^{\circ}55.19 \\ 58.42 \\ 232^{\circ}49.13 \\ 11.6 \\ 03^{\circ}18.62 \\ -17.2^{\circ} 59.6 \\ 15 \\ 47^{\circ}55.38 \\ 04^{\circ}59.38 \\ 247^{\circ}19.75 \\ 11.6 \\ 03^{\circ}18.62 \\ -17.2^{\circ} 59.6 \\ 15 \\ 47^{\circ}55.75 \\ 1.30 \\ 276^{\circ}20.94 \\ 11.6 \\ 02^{\circ}44.17 \\ -17.3^{\circ} 59.7 \\ 17 \\ 77^{\circ}55.75 \\ 1.30 \\ 276^{\circ}20.94 \\ 11.6 \\ 02^{\circ}44.17 \\ -17.3^{\circ} 59.7 \\ 18 \\ 92^{\circ}55.94 \\ 505^{\circ}2.26 \\ 290^{\circ}51.50 \\ 11.5 \\ 11.5^{\circ} \\ 01^{\circ}52.99 \\ 11.5^{\circ} \\ 502^{\circ}9.59 \\ 17.3^{\circ} 59.7 \\ 19 \\ 107^{\circ}56.12 \\ 3.21 \\ 305^{\circ}22.04 \\ 11.5^{\circ} \\ 01^{\circ}52.56 \\ 11.5^{\circ} \\ 01^{\circ}32.49 \\ 11.6^{\circ} \\ 02^{\circ}44.17 \\ -17.3^{\circ} \\ 59.7^{\circ} \\ 18 \\ 92^{\circ}55.94 \\ 505^{\circ}2.26 \\ 290^{\circ}51.50 \\ 11.5^{\circ} \\ 01^{\circ}52.9.9 \\ 17.3^{\circ} \\ 59.7^{\circ} \\ 19 \\ 107^{\circ}56.49 \\ -17.4^{\circ} \\ 59.8^{\circ} \\ 31^{\circ}56.49 \\ -17.4^{\circ} \\ 59.8^{\circ} \\ 32^{\circ}22.04 \\ 11.5^{\circ} \\ 01^{\circ}34.90 \\ -17.4^{\circ} \\ 59.8^{\circ} \\ 22 \\ 152^{\circ}56.87 \\ 7.05 \\ 30^{\circ}23.96 \\ 11.4^{\circ} \\ 00^{\circ}42.66 \\ -17.5^{\circ} \\ 59.9^{\circ} \\ \hline \\ SD = 16.0^{\prime} \\ d = 1.0^{\prime} \\ \hline \\ SD = 16.0^{\prime} \\ d = 1.0^{\prime} \\ \hline \\ SD = 16.1^{\prime} \\ \hline \\ SD = 16.0^{\prime} \\ d = 1.0^{\prime} \\ \hline \\ SD = 16.1^{\prime} \\ \hline \\ SD = 16.0^{\prime} \\ d = 1.0^{\prime} \\ SD = 10.1^{\prime} \\ \hline \\ SD = 10.0^{\prime} \\ SD = 10$								
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15		17°55.00	57.46	218° 18.49	11.6'	03°35.79	-17.2'	59.6'
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	14						-17.2'	59.6'
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		122°56.31	4.17	319°52.56	11.5'	01°34.90	-17.4	59.8'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		137°56.49	• • 5.13	334°23.05	11.5'	$01^{\circ}17.51$	-17.4'	59.9'
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Mon         GHA         Dec         GHA         ν         Dec         d         HP           0         182°57.05         S05°8.01         17°54.37         11.4'         S00°25.20         -17.5'         60.0'           1         197°57.24         8.97         32°24.76         11.4'         S00°25.20         -17.5'         60.0'           2         212°57.42         9.93         46°55.11         11.3'         N00°9.77         17.5'         60.0'           3         227°57.61         · 10.88         61°25.43         11.3'         00°27.27         17.5'         60.0'           4         242°57.79         11.84         75°55.72         11.3'         00°44.80         17.5'         60.1'           5         257°57.98         12.80         90°25.97         11.2'         N01°19.88         17.6'         60.1'           7         287°58.35         14.72         119°26.37         11.1'         01°37.43         17.6'         60.1'           8         302°58.93         15.67         133°56.52         11.1'         01°54.99         17.6'         60.2'           9         317°58.71         · 16.63         148°26.62         11.1'         02°30.13         17.6'	23	167°56.87	7.05	3°23.96	11.4'	00°42.66	-17.5'	59.9'
0         182°57.05         S05°8.01         17°54.37         11.4'         S00°25.20         -17.5'         60.0'           1         197°57.24         8.97         32°24.76         11.4'         S00°7.73         -17.5'         60.0'           2         212°57.42         9.93         46°55.11         11.3'         N00°9.77         17.5'         60.0'           3         227°57.61         · 10.88         61°25.43         11.3'         00°27.27         17.5'         60.1'           4         242°57.79         11.84         75°55.72         11.3'         00°44.80         17.5'         60.1'           5         257°57.98         12.80         90°25.97         11.2'         N01°19.88         17.6'         60.1'           6         272°58.16         S05°13.76         104°56.19         11.2'         N01°19.88         17.6'         60.1'           7         287°58.35         14.72         119°26.37         11.1'         01°37.43         17.6'         60.1'           8         302°58.53         15.67         133°56.52         11.1'         01°54.99         17.6'         60.2'           9         317°58.71         · 16.63         148°26.62         11.1'         02°12.		SD = 16.0'	d = 1.0'		SI	O = 16.1'		
0         182°57.05         S05°8.01         17°54.37         11.4'         S00°25.20         -17.5'         60.0'           1         197°57.24         8.97         32°24.76         11.4'         S00°7.73         -17.5'         60.0'           2         212°57.42         9.93         46°55.11         11.3'         N00°9.77         17.5'         60.0'           3         227°57.61         · 10.88         61°25.43         11.3'         00°27.27         17.5'         60.1'           4         242°57.79         11.84         75°55.72         11.3'         00°44.80         17.5'         60.1'           5         257°57.98         12.80         90°25.97         11.2'         N01°19.88         17.6'         60.1'           6         272°58.16         S05°13.76         104°56.19         11.2'         N01°19.88         17.6'         60.1'           7         287°58.35         14.72         119°26.37         11.1'         01°37.43         17.6'         60.1'           8         302°58.53         15.67         133°56.52         11.1'         01°54.99         17.6'         60.2'           9         317°58.71         · 16.63         148°26.62         11.1'         02°12.	Man	CHA	Dee			Doo		μп
1       197°57.24       8.97       32°24.76       11.4'       S00°7.73       -17.5'       60.0'         2       212°57.42       9.93       46°55.11       11.3'       N00°9.77       17.5'       60.0'         3       227°57.61       · 10.88       61°25.43       11.3'       00°27.27       17.5'       60.0'         4       242°57.79       11.84       75°55.72       11.3'       00°44.80       17.5'       60.1'         5       257°57.98       12.80       90°25.97       11.2'       N01°19.88       17.5'       60.1'         6       272°58.16       S05°13.76       104°56.19       11.2'       N01°19.88       17.6'       60.1'         7       287°58.35       14.72       119°26.37       11.1'       01°37.43       17.6'       60.1'         8       302°58.53       15.67       133°56.52       11.1'       01°54.99       17.6'       60.2'         9       317°58.71       · 16.63       148°26.62       11.1'       02°12.56       17.6'       60.2'         10       332°58.90       17.59       162°56.69       11.0'       02°47.70       17.6'       60.2'         11       347°59.08       18.55       177°6.								
2       212°57.42       9.93       46°55.11       11.3'       N00°9.77       17.5'       60.0'         3       227°57.61       · 10.88       61°25.43       11.3'       00°27.27       17.5'       60.0'         4       242°57.79       11.84       75°55.72       11.3'       00°44.80       17.5'       60.1'         5       257°57.98       12.80       90°25.97       11.2'       01°2.33       17.5'       60.1'         6       272°58.16       S05°13.76       104°56.19       11.2'       N01°19.88       17.6'       60.1'         7       287°58.35       14.72       119°26.37       11.1'       01°37.43       17.6'       60.1'         8       302°58.53       15.67       133°56.52       11.1'       01°54.99       17.6'       60.2'         9       317°58.71       · 16.63       148°26.62       11.1'       02°12.56       17.6'       60.2'         10       332°58.90       17.59       162°56.69       11.0'       02°30.13       17.6'       60.2'         11       347°59.08       18.55       177°26.71       11.0'       02°47.70       17.6'       60.2'         12       2°59.27       505°19.50       191°								
4         242°57.79         11.84         75°55.72         11.3'         00°44.80         17.5'         60.1'           5         257°57.98         12.80         90°25.97         11.2'         01°2.33         17.5'         60.1'           6         272°58.16         S05°13.76         104°56.19         11.2'         N01°19.88         17.6'         60.1'           7         287°58.35         14.72         119°26.37         11.1'         01°37.43         17.6'         60.1'           8         302°58.53         15.67         133°56.52         11.1'         01°54.99         17.6'         60.2'           9         317°58.71         · 16.63         148°26.62         11.1'         02°12.56         17.6'         60.2'           10         332°58.90         17.59         162°56.69         11.0'         02°47.70         17.6'         60.2'           11         347°59.08         18.55         177°26.71         11.0'         02°47.70         17.6'         60.2'           12         2°59.27         S05°19.50         191°56.69         10.9'         N03°5.27         17.6'         60.3'           13         17°59.45         20.46         206°26.62         10.9'         03°22	2				11.3'			60.0'
5         257°57.98         12.80         90°25.97         11.2'         01°2.33         17.5'         60.1'           6         272°58.16         S05°13.76         104°56.19         11.2'         N01°19.88         17.6'         60.1'           7         287°58.35         14.72         119°26.37         11.1'         01°37.43         17.6'         60.1'           8         302°58.53         15.67         133°56.52         11.1'         01°54.99         17.6'         60.2'           9         317°58.71         · 16.63         148°26.62         11.1'         02°12.56         17.6'         60.2'           10         332°58.90         17.59         162°56.69         11.0'         02°30.13         17.6'         60.2'           11         347°59.08         18.55         177°26.71         11.0'         02°47.70         17.6'         60.2'           12         2°59.27         S05°19.50         191°56.69         10.9'         N03°5.27         17.6'         60.3'           13         17°59.45         20.46         206°26.62         10.9'         03°22.84         17.6'         60.3'           14         32°59.63         21.42         220°56.51         10.8'         03°4								
6         272°58.16         S05°13.76         104°56.19         11.2'         N01°19.88         17.6'         60.1'           7         287°58.35         14.72         119°26.37         11.1'         01°37.43         17.6'         60.1'           8         302°58.53         15.67         133°56.52         11.1'         01°54.99         17.6'         60.2'           9         317°58.71         · 16.63         148°26.62         11.1'         02°12.56         17.6'         60.2'           10         332°58.90         17.59         162°56.69         11.0'         02°30.13         17.6'         60.2'           11         347°59.08         18.55         177°26.71         11.0'         02°47.70         17.6'         60.2'           12         2°59.27         S05°19.50         191°56.69         10.9'         N03°5.27         17.6'         60.3'           13         17°59.45         20.46         206°26.62         10.9'         03°22.84         17.6'         60.3'           14         32°59.63         21.42         220°56.51         10.8'         03°40.40         17.6'         60.3'           15         47°59.82         · 22.37         235°26.35         10.8'								
7 287°58.35 14.72 119°26.37 11.1' 01°37.43 17.6' 60.1' 8 302°58.53 15.67 133°56.52 11.1' 01°54.99 17.6' 60.2' 9 317°58.71 · 16.63 148°26.62 11.1' 02°12.56 17.6' 60.2' 10 332°58.90 17.59 162°56.69 11.0' 02°30.13 17.6' 60.2' 11 347°59.08 18.55 177°26.71 11.0' 02°47.70 17.6' 60.2' 12 2°59.27 505°19.50 191°56.69 10.9' N03°5.27 17.6' 60.3' 13 17°59.45 20.46 206°26.62 10.9' 03°22.84 17.6' 60.3' 14 32°59.63 21.42 220°56.51 10.8' 03°40.40 17.6' 60.3' 15 47°59.82 · 22.37 235°26.35 10.8' 03°57.96 17.5' 60.3' 16 63°0.00 23.33 249°56.14 10.7' 04°15.50 17.5' 60.4' 17 78°0.18 24.29 264°25.89 10.7' 04°33.04 17.5' 60.4' 18 93°0.36 505°25.24 278°55.58 10.6' N04°50.57 17.5' 60.4' 19 108°0.55 26.20 293°25.22 10.6' 05°8.08 17.5' 60.4' 20 123°0.73 27.16 307°54.81 10.5' 05°25.58 17.5' 60.4' 21 138°0.91 · 28.11 322°24.34 10.5' 05°43.06 17.5' 60.5' 22 153°1.09 29.07 336°53.82 10.4' 06°0.52 17.4' 60.5' 23 168°1.27 30.02 351°23.25 10.4' 06°17.95 17.4' 60.5'								
8       302°58.53       15.67       133°56.52       11.1'       01°54.99       17.6'       60.2'         9       317°58.71       · 16.63       148°26.62       11.1'       02°12.56       17.6'       60.2'         10       332°58.90       17.59       162°56.69       11.0'       02°30.13       17.6'       60.2'         11       347°59.08       18.55       177°26.71       11.0'       02°47.70       17.6'       60.2'         12       2°59.27       S05°19.50       191°56.69       10.9'       N03°5.27       17.6'       60.3'         13       17°59.45       20.46       206°26.62       10.9'       03°22.84       17.6'       60.3'         14       32°59.63       21.42       220°56.51       10.8'       03°40.40       17.6'       60.3'         15       47°59.82       · 22.37       235°26.35       10.8'       03°57.96       17.5'       60.3'         16       63°0.00       23.33       249°56.14       10.7'       04°15.50       17.5'       60.4'         17       78°0.18       24.29       264°25.89       10.7'       04°33.04       17.5'       60.4'         18       93°0.36       S05°25.24       27								
9       317°58.71       · · 16.63       148°26.62       11.1'       02°12.56       17.6'       60.2'         10       332°58.90       17.59       162°56.69       11.0'       02°30.13       17.6'       60.2'         11       347°59.08       18.55       177°26.71       11.0'       02°47.70       17.6'       60.2'         12       2°59.27       S05°19.50       191°56.69       10.9'       N03°5.27       17.6'       60.3'         13       17°59.45       20.46       206°26.62       10.9'       03°22.84       17.6'       60.3'         14       32°59.63       21.42       220°56.51       10.8'       03°40.40       17.6'       60.3'         15       47°59.82       · · 22.37       235°26.35       10.8'       03°57.96       17.5'       60.3'         16       63°0.00       23.33       249°56.14       10.7'       04°15.50       17.5'       60.4'         17       78°0.18       24.29       264°25.89       10.7'       04°33.04       17.5'       60.4'         18       93°0.36       S05°25.24       278°55.58       10.6'       N04°50.57       17.5'       60.4'         19       108°0.55       26.20       <								
11         347°59.08         18.55         177°26.71         11.0'         02°47.70         17.6'         60.2'           12         2°59.27         S05°19.50         191°56.69         10.9'         N03°5.27         17.6'         60.3'           13         17°59.45         20.46         206°26.62         10.9'         03°22.84         17.6'         60.3'           14         32°59.63         21.42         220°56.51         10.8'         03°40.40         17.6'         60.3'           15         47°59.82         · 22.37         235°26.35         10.8'         03°57.96         17.5'         60.4'           16         63°0.00         23.33         249°56.14         10.7'         04°15.50         17.5'         60.4'           17         78°0.18         24.29         264°25.89         10.7'         04°33.04         17.5'         60.4'           18         93°0.36         S05°25.24         278°55.58         10.6'         N04°50.57         17.5'         60.4'           19         108°0.55         26.20         293°25.22         10.6'         05°8.08         17.5'         60.4'           20         123°0.73         27.16         307°54.81         10.5'         05°25.5								
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14         32°59.63         21.42         220°56.51         10.8'         03°40.40         17.6'         60.3'           15         47°59.82         · 22.37         235°26.35         10.8'         03°57.96         17.5'         60.3'           16         63°0.00         23.33         249°56.14         10.7'         04°15.50         17.5'         60.4'           17         78°0.18         24.29         264°25.89         10.7'         04°33.04         17.5'         60.4'           18         93°0.36         S05°25.24         278°55.58         10.6'         N04°50.57         17.5'         60.4'           19         108°0.55         26.20         293°25.22         10.6'         05°8.08         17.5'         60.4'           20         123°0.73         27.16         307°54.81         10.5'         05°25.58         17.5'         60.4'           21         138°0.91         · 28.11         322°24.34         10.5'         05°43.06         17.5'         60.5'           22         153°1.09         29.07         336°53.82         10.4'         06°0.52         17.4'         60.5'           23         168°1.27         30.02         351°23.25         10.4'         06°17.95 </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>								
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17         78°0.18         24.29         264°25.89         10.7'         04°33.04         17.5'         60.4'           18         93°0.36         S05°25.24         278°55.58         10.6'         N04°50.57         17.5'         60.4'           19         108°0.55         26.20         293°25.22         10.6'         05°8.08         17.5'         60.4'           20         123°0.73         27.16         307°54.81         10.5'         05°25.58         17.5'         60.4'           21         138°0.91         · 28.11         322°24.34         10.5'         05°43.06         17.5'         60.5'           22         153°1.09         29.07         336°53.82         10.4'         06°0.52         17.4'         60.5'           23         168°1.27         30.02         351°23.25         10.4'         06°17.95         17.4'         60.5'								
18     93°0.36     S05°25.24     278°55.58     10.6'     N04°50.57     17.5'     60.4'       19     108°0.55     26.20     293°25.22     10.6'     05°8.08     17.5'     60.4'       20     123°0.73     27.16     307°54.81     10.5'     05°25.58     17.5'     60.4'       21     138°0.91     28.11     322°24.34     10.5'     05°43.06     17.5'     60.5'       22     153°1.09     29.07     336°53.82     10.4'     06°0.52     17.4'     60.5'       23     168°1.27     30.02     351°23.25     10.4'     06°17.95     17.4'     60.5'								
20     123°0.73     27.16     307°54.81     10.5'     05°25.58     17.5'     60.4'       21     138°0.91     28.11     322°24.34     10.5'     05°43.06     17.5'     60.5'       22     153°1.09     29.07     336°53.82     10.4'     06°0.52     17.4'     60.5'       23     168°1.27     30.02     351°23.25     10.4'     06°17.95     17.4'     60.5'		93°0.36						
21 138°0.91 · · 28.11 322°24.34 10.5' 05°43.06 17.5' 60.5' 22 153°1.09 29.07 336°53.82 10.4' 06°0.52 17.4' 60.5' 23 168°1.27 30.02 351°23.25 10.4' 06°17.95 17.4' 60.5'								
22 153°1.09 29.07 336°53.82 10.4' 06°0.52 17.4' 60.5' 23 168°1.27 30.02 351°23.25 10.4' 06°17.95 17.4' 60.5'								
23 168°1.27 30.02 351°23.25 10.4' 06°17.95 17.4' 60.5'								
SD = 16.0' $d = 1.0'$ $SD = 16.4'$	23			331 23.23			11.4	00.5
		SD = 16.0'	d = 1.0'		SI	J = 16.4'		

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

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
- 43	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	87-98%	
04	11:12	11:21	11:49	21:57	09:33		
05	11:30	11:39	11:48	22:46	10:22		
06	11:48	11:57	11:48	23:36	11:11		

#### October 07, 08, 09 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	15°53.75	203°10.37 N04°40.73	158°22.94 <b>S</b> 14°56.28	260°54.11 N21°29.07	17°21.80 <b>S</b> 03°22.19	
1	30°56.22	218°9.97 39.55	173°23.73 56.85	275°56.28 29.03	32°24.43 22.26	Alpheratz 357°33.82 29°14.13 Ankaa 353°6.11 -42°9.87
2	45°58.68	233°9.57 38.37	188°24.51 57.41	290°58.46 28.99	47°27.06 22.33	Schedar 349°29.82 56°40.84
3	61°1.15	248°9.17 · · 37.19	203°25.30 · · 57.98	306°0.64 · · 28.95	62°29.69 · · 22.40	Diphda 348°46.36 -17°50.57
4	76°3.61	263°8.77 36.01	218° 26.08 58.55	321°2.82 28.91	77°32.32 22.47	Achernar 335°19.12 -57°6.21
5 6	91°6.07 106°8.54	278°8.37 34.83 293°7.97 N04°33.65	233°26.87 59.11 248°27.65 \$14°59.68	336°5.00 28.87 351°7.18 N21°28.83	92°34.95 22.54 107°37.58 \$03°22.61	Hamal 327°50.19 23°35.17
7	121°11.00	308°7.57 32.47	263°28.44 15°0.24	6°9.37 28.79	122°40.21 22.68	Polaris 313°19.50 89°22.21
8	136° 13.47	323°7.17 31.29	278°29.22 0.81	21°11.55 28.75	137°42.84 22.75	Acamar 315°10.93 -40°11.83
9	151° 15.93	338°6.77 · · 30.11	293°30.01 · · 1.37	36°13.73 · · 28.71	152°45.47 · · 22.82	Menkar 314°5.24 4°11.60 Mirfak 308°27.00 49°57.12
10	166° 18.40	353°6.37 28.93	308°30.79 1.94	51°15.91 28.67	167°48.10 22.89	Aldebaran 290°38.73 16°33.75
11	181°20.86	8°5.97 27.74	323°31.57 2.50	66°18.09 28.63	182°50.73 22.96	Rigel 281°3.14 -8°10.10
12 13	196°23.32 211°25.79	23°5.58 N04°26.56 38°5.18 25.38	338°32.36	81°20.27 N21°28.59 96°22.46 28.55	197°53.37 S03°23.03 212°56.00 23.10	Capella 280°20.80 46°1.33
14	211 23.79 226°28.25	53°4.78 24.20	8°33.92 4.20	111°24.64 28.51	212 50.00 23.10 227°58.63 23.17	Bellatrix 278°22.10 6°22.51
15	241°30.72	68°4.38 · · 23.01	23°34.70 · · 4.76	126°26.82 · · 28.47	243°1.26 · · 23.24	Elnath 278°0.96 28°37.74
16	256°33.18	83°3.98 21.83	38°35.49 5.32	141°29.00 28.43	258°3.89 23.31	Alnilam 275°37.00 -1°10.95 Betelgeuse 270°51.34 7°24.83
17	271°35.64	98°3.58 20.65	53°36.27 5.89	156°31.19 28.39	273°6.52 23.38	Betelgeuse 270°51.34 7°24.83 Canopus 263°52.04 -52°42.16
18	286°38.11	113°3.18 N04°19.46	68°37.05 \$15°6.45	171°33.37 N21°28.35	288°9.15 S03°23.45	Sirius 258°25.68 -16°44.83
19	301°40.57	128°2.79 18.28	83°37.83 7.01	186°35.56 28.31	303°11.78 23.52	Adhara 255°5.39 -29°0.11
20 21	316° 43.04 331° 45.50	143°2.39 17.09 158°1.99 · · 15.91	98°38.61 7.58 113°39.39 • 8.14	201°37.74 28.27 216°39.93 · · 28.23	318°14.41 23.59 333°17.04 · · 23.66	Procyon 244°50.25 5°9.66
22	346° 47.96	173°1.59 14.72	128° 40.17 8.70	231°42.11 28.19	348°19.67 23.73	Pollux 243°16.63 27°57.81
23	1°50.43	188°1.19 13.54	143°40.95 9.27	246°44.30 28.15	3°22.30 23.80	Avior 234°14.73 -59°35.14
						Suhail 222°46.12 -43°31.88
ivier.p	pass. 22:53	ν-0.4' d-1.2' m-3.92	$\nu 0.8' \ d0.6' \ m1.55$	ν2.2' d-0.0' m-2.16	ν2.6' d0.1' m0.64	Miaplacidus 221°38.70 -69°49.03 Alphard 217°47.36 -8°46.04
						Regulus 207°34.03 11°50.56
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.80 61°36.63
0	16°52.89	203°0.80 N04°12.35	158°41.73 \$15°9.83	261°46.48 N21°28.11	18°24.93	Denebola 182°24.64 14°25.76
1 2	31°55.36 46°57.82	218° 0.40 11.17 233° 0.00 9.98	173° 42.51 10.39 188° 43.29 10.95	276°48.67 28.07 291°50.85 28.03	33°27.56 23.94 48°30.19 24.01	Gienah 175°43.30 -17°40.97
3	62°0.28	247°59.60 · · 8.80	203°44.07 · · 11.51	306°53.04 · · 27.99	63°32.82 · · 24.08	Acrux 173°0.18 -63°14.43
4	77°2.75	262°59.21 7.61	218°44.85 12.08	321°55.23 27.96	78°35.45 24.15	Gacrux 171°51.60 -57°15.36
5	92°5.21	277°58.81 6.42	233°45.63 12.64	336°57.41 27.92	93°38.08 24.22	Alioth 166°12.97 55°49.22 Spica 158°21.99 -11°17.65
6	107°7.68	292°58.41 N04°5.24	248°46.41 \$15°13.20	351°59.60 N21°27.88	108°40.70 S03°24.28	Alkaid 152°51.98 49°11.16
7	122°10.14	307°58.02 4.05	263°47.19 13.76	7°1.79 27.84	123°43.33 24.35	Hadar 148°35.81 -60°29.86
8 9	137°12.60	322°57.62 2.86	278° 47.97 14.32 293° 48.74 •• 14.88	22° 3.98 27.80	138°45.96 24.42	Menkent 147°57.31 -36°29.77
10	152° 15.07 167° 17.53	337°57.22 ·· 1.67 352°56.83 04°0.49	293°48.74 · · 14.88 308°49.52 15.44	$37^{\circ}6.16  \cdot \cdot  27.76$ $52^{\circ}8.35 \qquad 27.72$	153°48.59 · · 24.49 168°51.22 24.56	Arcturus 145°47.68 19°3.01
11	182°20.00	7°56.43 03°59.30	323°50.30 16.00	67°10.54 27.68	183°53.85 24.63	Rigil Kent. 139°40.12 -60°56.57
12	197°22.46	22°56.03 N03°58.11	338°51.07 \$15°16.56	82°12.73 N21°27.64	198°56.48 S03°24.70	Kochab 137°20.78 74°3.05
13	212°24.92	37°55.64 56.92	353°51.85 17.12	97°14.92 27.60	213°59.11 24.77	Zuben'ubi 136°55.65 -16°8.87 Alphecca 126°3.51 26°37.82
14	227°27.39	52°55.24 55.73	8°52.63 17.68	112°17.11 27.57	229°1.74 24.84	Antares 112°15.32 -26°29.36
15	242°29.85	67°54.84 · · 54.54	23°53.40 · · 18.24	127°19.30 · · 27.53	244°4.37 · · 24.91	Atria 107°9.29 -69°4.62
16	257°32.32	82°54.45 53.35	38° 54.18 18.80	142°21.49 27.49	259°7.00 24.97	Sabik 102°2.25 -15°45.38
17 18	272°34.78 287°37.25	97°54.05 52.16 112°53.65 N03°50.97	53°54.96 19.36 68°55.73 \$15°19.92	157°23.68 27.45 172°25.87 N21°27.41	274°9.62 25.04 289°12.25 \$03°25.11	Shaula 96°9.71 -37°7.43
19	302°39.71	127°53.26 49.78	83°56.51 20.48	187°28.06 27.37	304°14.88 25.18	Rasalhague 95°58.12 12°32.62
20	317° 42.17	142°52.86 48.59	98°57.28 21.04	202°30.25 27.33	319°17.51 25.25	Eltanin 90°42.05 51°29.37 Kaus Aust. 83°31.78 -34°22.41
21	332°44.64	157°52.47 · · 47.40	113°58.06 · · 21.60	217°32.45 · · 27.29	334°20.14 · · 25.32	Kaus Aust. 83°31.78 -34°22.41 Vega 80°32.87 38°48.69
22	347°47.10	172°52.07 46.21	128°58.83 22.16	232°34.64 27.26	349°22.77 25.39	Nunki 75°47.03 -26°15.91
23	2°49.57	187°51.68 45.02	143°59.60 22.72	247°36.83 27.22	4°25.40 25.45	Altair 61°59.31 8°56.33
Mer.p	pass. 22:49	ν-0.4' d-1.2' m-3.92	ν0.8' d0.6' m1.55	ν2.2' d-0.0' m-2.16	ν2.6' d0.1' m0.65	Peacock 53°4.56 -56°39.29
						Deneb 49°25.23 45°22.60
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.01 9°59.75
0	17° 52.03	202°51.28 N03°43.83	159°0.38 \$15°23.27	262°39.02 N21°27.18	19°28.02 \$03°25.52	Al Na'ir 27°31.81 -46°50.23 Fomalhaut 15°13.53 -29°29.10
1	$32^{\circ}54.49$	217°50.88 42.64	174°1.15 23.83	277°41.21 27.14	34°30.65 25.59	Scheat 13°44.33 28°13.55
2	47°56.96	232°50.49 41.45	189°1.93 24.39	292°43.41 27.10	49°33.28 25.66	Markab 13°29.02 15°20.81
3	62°59.42	247°50.09 · · 40.26	204°2.70 · · 24.95	307°45.60 · · 27.06	64°35.91 · · 25.73	
4 5	78°1.89 93°4.35	262°49.70 39.06 277°49.30 37.87	219°3.47 25.50 234°4.24 26.06	322°47.79 27.03 337°49.99 26.99	79°38.54 25.80 94°41.16 25.87	Oct 07 Tue SHA Mer.pass Venus 187°16.62 10:28
6	93°4.35 108°6.81	292°48.91 N03°36.68	249°5.02 S15°26.62	352°52.18 N21°26.95	94°41.16 25.87 109°43.79 \$03°25.93	Mars 142°29.19 13:26
7	123° 9.28	307°48.51 35.49	264° 5.79 27.18	7°54.38 26.91	124°46.42 26.00	Jupiter 245°0.35 06:35
8	138° 11.74	322°48.12 34.29	279°6.56 27.73	22°56.57 26.87	139°49.05 26.07	Saturn 1°28.04 22:47
9	153° 14.21	337°47.72 · · 33.10	294°7.33 ·· 28.29	37°58.77 · · 26.84	154°51.68 · · 26.14	Oct 08 Wed SHA Mer.pass
10	168° 16.67	352°47.33 31.91	309°8.10 28.85	53° 0.96 26.80	169°54.30 26.21	Venus 186°7.91 10:28
11	183°19.14	7°46.93 30.71	324°8.87 29.40	68° 3.16 26.76	184°56.93 26.27	Mars 141°48.84 13:25
12 13	198°21.60 213°24.06	22°46.54 N03°29.52 37°46.14 28.32	339°9.64 \$15°29.96 354°10.41 30.51	83°5.35 N21°26.72 98°7.55 26.68	199°59.56	Jupiter 244°53.59 06:32
14	213 24.00 228° 26.53	52° 45.75 27.13	9°11.19 31.07	113° 9.75 26.65	230°4.81 26.48	Saturn 1°32.04 22:42
15	243°28.99	67°45.36 · · 25.93	24°11.96 · · 31.62	128°11.94 · · 26.61	245°7.44 · · 26.55	Oct 09 Thu SHA Mer.pass
16	258° 31.46	82°44.96 24.74	39°12.72 32.18	143°14.14 26.57	260°10.07 26.61	Venus 184°59.25 10:29
17	273°33.92	97°44.57 23.54	54° 13.49 32.73	158°16.34 26.53	275°12.69 26.68	Mars 141°8.35 13:23
18	288° 36.38	112°44.17 N03°22.35	69°14.26 \$15°33.29	173°18.54 N21°26.49	290°15.32 \$03°26.75	Jupiter 244°46.99 06:28
19	303°38.85	127°43.78 21.15 142°43.38 19.96	84° 15.03 33.84	188°20.73 26.46 203°22.93 26.42	305°17.95 26.82	Saturn 1°35.99 22:38
20 21	318° 41.31 333° 43.78	142°43.38 19.96 157°42.99 · · 18.76	99°15.80 34.40 114°16.57 · · 34.95	203°22.93 26.42 218°25.13 • 26.38	320°20.58 26.89 335°23.20 • 26.95	Horizontal parallax
22	348° 46.24	172°42.60 17.57	129° 17.34 35.51	233°27.33 26.34	350°25.83 27.02	Venus: 0.1
23	3°48.71	187°42.20 16.37	144°18.11 36.06	248°29.53 26.31	5°28.46 27.09	Mars: 0.1
Merr	pass. 22:45	ν-0.4' d-1.2' m-3.92	ν0.8' d0.6' m1.55	ν2.2' d-0.0' m-2.17	ν2.6' d0.1' m0.65	
				J 0.0 III 2.11		

h	Su	n	Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°1.46	S05°30.98	5°52.61	10.3'	$N06^{\circ}35.37$	17.4'	60.5'
1	198° 1.64	31.94	20°21.91	10.2'	06°52.75	17.4	60.5'
2 3	213° 1.82 228° 2.00	32.89 · · 33.85	34°51.16 49°20.34	10.2' 10.1'	07°10.11 07°27.44	17.3' 17.3'	60.6' 60.6'
4	243°2.18	34.80	63°49.46	10.1	07°44.74	17.3	60.6
5	258°2.36	35.76	78°18.52	10.0'	$08^{\circ}2.00$	17.2'	60.6'
6	273°2.54	S05°36.71	92°47.51	9.9'	N08°19.23	17.2'	60.6'
7 8	288° 2.72 303° 2.90	37.67 38.62	107°16.43 121°45.29	9.9' 9.8'	08°36.42 08°53.57	17.1' 17.1'	60.6' 60.7'
9	318° 3.08	• • 39.58	136°14.08	9.7'	00° 33.57 09° 10.67	17.1	60.7
10	333° 3.26	40.53	150°42.80	9.6'	09°27.73	17.0'	60.7'
11	348° 3.44	41.49	165°11.45	9.6'	09°44.75	17.0'	60.7'
12 13	3°3.62 18°3.80	\$05°42.44 43.39	179°40.03 194°8.53	9.5' 9.4'	N10°1.71 10°18.63	16.9' 16.9'	60.7' 60.7'
14	33° 3.98	44.35	208°36.96	9.4'	10°15.03	16.8	60.7
15	48°4.16	• • 45.30	223°5.31	9.3'	$10^{\circ}52.30$	16.8'	60.7'
16	63°4.34	46.26	237°33.59	9.2'	11°9.05	16.7'	60.8'
17 18	78° 4.51 93° 4.69	47.21 \$05°48.16	252°1.80 266°29.92	9.1' 9.0'	11°25.74 N11°42.37	16.6' 16.6'	60.8' 60.8'
19	108° 4.87	49.12	280°57.96	9.0'	11°58.94	16.5	60.8
20	123° 5.05	50.07	295°25.93	8.9'	12°15.44	16.4	60.8'
21	138° 5.23	•• 51.02	309°53.81	8.8'	12°31.87	16.4'	60.8'
22	153° 5.40 168° 5.58	51.98	324°21.62 338°49.34	8.7' 8.6'	12°48.24 13°4.53	16.3'	60.8'
23		52.93	330 49.34			16.2'	60.8'
	SD = 16.0'	d = 1.0'		SE	O = 16.5'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°5.76	S05°53.88	353°16.97	8.6'	N13°20.74	16.1'	60.8
1 2	198° 5.94 213° 6.11	54.83 55.79	7°44.52 22°11.99	8.5' 8.4'	13°36.88 13°52.94	16.1' 16.0'	60.8' 60.8'
3	213°6.11 228°6.29	55.79 •• 56.74	36°39.37	8.4	13°52.94 14°8.92	16.0 15.9'	60.8
4	243°6.46	57.69	51°6.66	8.2'	14°24.82	15.8'	60.8
5	258° 6.64	58.64	65°33.87	8.1'	14°40.63	15.7'	60.8'
6 7	273° 6.82 288° 6.99	\$05°59.59 06°0.55	80°0.99 94°28.02	8.0' 7.9'	N14°56.35 15°11.98	15.6' 15.5'	60.9' 60.9'
8	303°7.17	1.50	108°54.96	7.9 7.8'	15 11.96 15°27.53	15.4	60.9
9	318°7.34	• • 2.45	123°21.80	7.8'	15°42.97	15.4'	60.9
10	333°7.52	3.40	137°48.56	7.7'	15°58.32	15.3'	60.9'
11	348°7.69	4.35	152°15.23	7.6'	16°13.58	15.2'	60.9'
12 13	3°7.87 18°8.04	\$06°5.30 6.25	166°41.81 181°8.29	7.5' 7.4'	N16°28.73 16°43.78	15.0' 14.9'	60.9' 60.9'
14	33°8.22	7.21	195°34.68	7.3'	16°58.72	14.8'	60.9
15	48°8.39	• 8.16	210°0.98	7.2'	17°13.56	14.7'	60.9'
16	63°8.57 78°8.74	9.11	224°27.18 238°53.29	7.1'	17°28.29 17°42.90	14.6'	60.9'
17 18	78°8.74 93°8.91	10.06 \$06°11.01	238°53.29 253°19.31	7.0' 6.9'	17°42.90 N17°57.40	14.5' 14.4'	60.9' 60.9'
19	108° 9.09	11.96	267°45.23	6.8	18°11.79	14.3	60.9
20	123° 9.26	12.91	282°11.05	6.7'	18°26.06		60.9'
21	138° 9.43 153° 9.61	13.86	296°36.78	6.6'	18°40.21 18°54.23	14.0' 13.9'	60.8'
22 23	153°9.61 168°9.78	14.81 15.76	311°2.42 325°27.96	6.5' 6.4'	18°54.23 19°8.14	13.9° 13.8'	60.8' 60.8'
_	SD = 16.0'	d=1.0'			0 = 16.6'		
Thu	GHA	Dec	GHA	ν 6 Δ'	Dec	d 12.6'	HP
0 1	183° 9.95 198° 10.12	\$06°16.71 17.66	339°53.41 354°18.76	6.4' 6.3'	N19°21.91 19°35.56	13.6' 13.5'	60.8' 60.8'
2	213°10.30	18.60	8°44.02	6.2	19°49.07	13.4	60.8
3	228°10.47	• 19.55	23°9.18	6.1'	$20^{\circ}2.46$	13.2'	60.8'
4	243°10.64	20.50	37°34.25	6.0'	20°15.71	13.1'	60.8'
5 6	258°10.81 273°10.98	21.45 <b>S</b> 06°22.40	51°59.22 66°24.10	5.9' 5.8'	20°28.82 N20°41.79	13.0' 12.8'	60.8' 60.8'
7	288°11.15	23.35	80°48.88	5.7'	20°54.62	12.7'	60.8
8	303°11.33	24.30	95°13.58	5.6'	21°7.31	12.5'	60.8'
9	318°11.50	• • 25.25	109°38.17	5.5'	21°19.86	12.4'	60.8'
10 11	333°11.67 348°11.84	26.19 27.14	124°2.68 138°27.09	5.4' 5.3'	21°32.26 21°44.51	12.2' 12.1'	60.8' 60.7'
12	3°12.01	S06°28.09	150° 27.09 152° 51.41	5.2'	N21°56.61	11.9'	60.7
13	18°12.18	29.04	$167^{\circ}15.64$	5.1'	22°8.55	11.8'	60.7'
14	33°12.35	29.98	181°39.78	5.1'	22°20.35	11.6'	60.7'
15 16	48°12.52 63°12.69	· · 30.93 31.88	196°3.83 210°27.79	5.0' 4.9'	22°31.98 22°43.46	11.5' 11.3'	60.7' 60.7'
17	78°12.86	32.83	210 27.79 224°51.67	4.9 4.8'	22°54.78	11.3	60.7'
18	93°13.02	S06°33.77	239°15.45	4.7'	N23°5.93	11.0'	60.7'
19	108°13.19	34.72	253°39.16	4.6'	23°16.93	10.8'	60.6'
20 21	123°13.36 138°13.53	35.67 •• 36.61	268°2.77 282°26.30	4.5' 4.4'	23°27.76 23°38.42	10.7' 10.5'	60.6' 60.6'
22	158 15.55 153°13.70	37.56	282 26.30 296°49.75	4.4 4.4'	23 38.42 23°48.91	10.5	60.6
23	168°13.87	38.51	311°13.12	4.3'	23°59.23	10.2'	60.6'
	SD = 16.0'	d = 0.9'		SE	0 = 16.6'		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper Lower		16-18	
	mm:ss mm:ss		hh:mm	hh:mm	hh:mm hh:mm		
07	12:06	12:14	11:48	-:-	12:01		
08	12:23	12:31	11:47	00:28	12:55		
09	12:40	12:48	11:47	01:24	13:53		

### October 10, 11, 12 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	18°51.17	202°41.81 N03°15.17	159°18.87 \$15°36.62	263°31.73 N21°26.27	20°31.08	
1	33°53.63	217°41.42 13.98	174°19.64 37.17	278°33.93 26.23	35°33.71 27.22	Alpheratz 357°33.81 29°14.14
2	48°56.10	232°41.02 12.78	189° 20.41 37.72	293°36.13 26.19	50°36.34 27.29	Ankaa 353°6.11 -42°9.88
3	63°58.56	247°40.63 · · 11.58	204°21.17 · · 38.28	308°38.33 · · 26.16	65°38.96 · · 27.36	Schedar 349°29.81 56°40.86
4	79°1.03	262°40.23 10.38	219°21.94 38.83	323°40.53 26.12	80°41.59 27.43	Diphda 348°46.35 -17°50.58 Achernar 335°19.12 -57°6.22
5	94°3.49	277°39.84 9.19	234°22.71 39.38	338°42.73 26.08	95°44.22 27.49	Hamal 327°50.18 23°35.18
6	109°5.95	292°39.45 N03°7.99	249°23.47 \$15°39.94	353°44.93 N21°26.04	110°46.84 S03°27.56	Polaris 313°18.22 89°22.22
7	124°8.42	307°39.05 6.79	264°24.24 40.49	8°47.13 26.01	125°49.47 27.63	Acamar 315°10.92 -40°11.84
8	139° 10.88	322°38.66 5.59	279°25.01 41.04	23°49.33 25.97	140°52.09 27.69	Menkar 314°5.23 4°11.60
9	154° 13.35	337°38.27 · · 4.39 352°37.87 3.19	294°25.77 · · 41.59 309°26.54 42.14	38°51.53 · · 25.93	155°54.72 · · · 27.76 170°57.35 27.83	Mirfak 308°26.97 49°57.13
10 11	169° 15.81 184° 18.28	352°37.87 3.19 7°37.48 1.99	309°26.54 42.14 324°27.30 42.70	53°53.74 25.90 68°55.94 25.86	170°57.35 27.83 185°59.97 27.90	Aldebaran 290°38.71 16°33.74
12	199°20.74	22°37.09 N03°0.80	339°28.06 \$15°43.25	83°58.14 N21°25.82	201°2.60 S03°27.96	Rigel 281°3.12 -8°10.10
13	214° 23.20	37°36.70 02°59.60	354°28.83 43.80	99° 0.35 25.78	216°5.22 28.03	Capella 280°20.76 46°1.33
14	229°25.67	52°36.30 58.40	9°29.59 44.35	114° 2.55 25.75	231°7.85 28.10	Bellatrix 278°22.08 6°22.51
15	244°28.13	67°35.91 · · 57.20	24°30.36 · · 44.90	129° 4.75 · · 25.71	246°10.47 · · 28.16	Elnath 278° 0.93 28° 37.74 Alnilam 275° 36.98 -1° 10.96
16	259°30.60	82°35.52 56.00	39°31.12 45.45	144°6.96 25.67	261°13.10 28.23	Alnilam 275°36.98 -1°10.96 Betelgeuse 270°51.32 7°24.83
17	274°33.06	97°35.12 54.80	54°31.88 46.00	159° 9.16 25.64	276°15.73 28.30	Canopus 263°52.01 -52°42.17
18	289°35.52	112°34.73 N02°53.60	69°32.65 \$15°46.55	174°11.37 N21°25.60	291°18.35 <b>S</b> 03°28.36	Sirius 258°25.65 -16°44.84
19	304°37.99	127°34.34 52.40	84°33.41 47.10	189°13.57 25.56	306°20.98 28.43	Adhara 255°5.36 -29°0.11
20	319° 40.45	142°33.95 51.19	99°34.17 47.65	204°15.78 25.53	321°23.60 28.50	Procyon 244°50.23 5°9.65
21 22	334° 42.92 349° 45.38	157°33.55 · · 49.99 172°33.16 48.79	114°34.93 · · 48.20 129°35.70 48.75	219°17.98 · · 25.49	336°26.23 · · 28.57 351°28.85 28.63	Pollux 243°16.61 27°57.80
23	349 45.36 4°47.85	172°33.16 48.79 187°32.77 47.59	129°35.70 48.75 144°36.46 49.30	234°20.19 25.45 249°22.39 25.42	351°28.85 28.63 6°31.48 28.70	Avior 234°14.69 -59°35.14
	4 47.05	-				Suhail 222°46.09 -43°31.88
Mer.	pass. 22:41	$\nu$ -0.4 $'$ d-1.2 $'$ m-3.92	$ u 0.8' \ d0.6' \ m1.54$	$\nu$ 2.2′ <i>d</i> -0.0′ m-2.17	$ u 2.6' \ d0.1' \ m0.66$	Miaplacidus 221°38.65 -69°49.02
						Alphard 217°47.34 -8°46.04
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°34.01 11°50.55 Dubhe 193°40.78 61°36.61
0	$19^{\circ}50.31$	202°32.38 N02°46.39	159°37.22 \$15°49.85	264°24.60 N21°25.38	21°34.10 \$03°28.77	Denebola 182°24.63 14°25.76
1	34°52.77	217°31.98 45.19	174°37.98 50.40	279°26.81 25.34	36°36.73 28.83	Gienah 175°43.29 -17°40.97
2	49°55.24	232°31.59 43.99	189°38.74 50.95	294°29.01 25.31	51°39.35 28.90	Acrux 173°0.16 -63°14.41
3	64° 57.70	247°31.20 · · 42.78	204°39.50 · · 51.50	309°31.22 · · 25.27	66°41.98 · · 28.96	Gacrux 171°51.58 -57°15.35
4 5	80°0.17 95°2.63	262°30.81 41.58 277°30.41 40.38	219° 40.26 52.05 234° 41.02 52.60	324°33.43 25.24 339°35.64 25.20	81°44.60 29.03 96°47.23 29.10	Alioth 166°12.96 55°49.21
6	110°5.09	292°30.02 N02°39.18	249°41.78 \$15°53.15	354°37.84 N21°25.16	111°49.85 S03°29.16	Spica 158°21.99 -11°17.65
7	125°7.56	307°29.63 37.97	264° 42.54 53.69	9°40.05 25.13	126°52.48 29.23	Alkaid 152°51.98 49°11.14
8	140° 10.02	322°29.24 36.77	279° 43.30 54.24	24°42.26 25.09	141°55.10 29.30	Hadar 148°35.81 -60°29.84
9	$155^{\circ}12.49$	337°28.85 · · 35.57	294°44.06 · · 54.79	39°44.47 · · 25.05	156°57.72 · · 29.36	Menkent 147°57.30 -36°29.76 Arcturus 145°47.68 19°3.00
10	$170^{\circ}14.95$	352°28.45 34.36	309°44.82 55.34	54°46.68 25.02	172°0.35 29.43	Rigil Kent. 139°40.11 -60°56.55
11	$185^{\circ}17.42$	7°28.06 33.16	324°45.58 55.88	69°48.89 24.98	187°2.97 29.49	Kochab 137°20.82 74°3.04
12	$200^{\circ}19.88$	22°27.67 N02°31.96	339°46.33 \$15°56.43	84°51.10 N21°24.95	202°5.60 \$03°29.56	Zuben'ubi 136°55.65 -16°8.87
13	215°22.34	37°27.28 30.75	354°47.09 56.98	99°53.31 24.91	217°8.22 29.63	Alphecca 126°3.51 26°37.82
14	230°24.81	52°26.89 29.55	9°47.85 57.53	114°55.52 24.87	232°10.85 29.69	Antares 112°15.33 -26°29.36
15 16	245°27.27 260°29.74	67°26.49 · · 28.34 82°26.10 27.14	24° 48.61 · · 58.07 39° 49.36 58.62	129°57.73 · · 24.84 144°59.94 24.80	247°13.47 · · · 29.76 262°16.09	Atria 107° 9.31 -69° 4.61
17	275° 32.20	97°25.71 25.93	54°50.12 59.16	160°2.15 24.77	202 10.09 29.82 277°18.72 29.89	Sabik 102°2.26 -15°45.38
18	290°34.66	112°25.32 N02°24.73	69°50.88 S15°59.71	175° 4.37 N21° 24.73	292°21.34 S03°29.96	Shaula 96°9.72 -37°7.42
19	305°37.13	127°24.93 23.52	84°51.63 16°0.26	190° 6.58 24.70	307°23.96 30.02	Rasalhague 95°58.13 12°32.62 Eltanin 90°42.08 51°29.37
20	320°39.59	142°24.54 22.32	99°52.39 0.80	205° 8.79 24.66	322°26.59 30.09	Eltanin 90°42.08 51°29.37 Kaus Aust. 83°31.80 -34°22.41
21	335°42.06	157°24.14 · · 21.11	114°53.15 · · 1.35	220°11.00 · · 24.62	337°29.21 · · 30.15	Vega 80°32.89 38°48.69
22	350°44.52	172°23.75 19.91	129°53.90 1.89	235°13.22 24.59	352°31.83 30.22	Nunki 75°47.04 -26°15.91
23	5°46.99	187°23.36 18.70	144°54.66 2.44	250°15.43 24.55	7°34.46 30.29	Altair 61°59.32 8°56.34
Mer.	pass. 22:37	ν-0.4' d-1.2' m-3.92	$\nu$ 0.8' d0.5' m1.54	ν2.2' d-0.0' m-2.18	$\nu$ 2.6' $d$ 0.1' $m$ 0.66	Peacock 53°4.58 -56°39.30
						Deneb 49°25.25 45°22.61
c	CHA	CHA De-	CHA D	CHA D	CHA D	Enif 33°38.01 9°59.76
Sun 0	<b>GHA</b> 20° 49.45	<b>GHA Dec</b> 202°22.97 N02°17.50	<b>GHA Dec</b> 159°55.41 <b>S</b> 16°2.98	<b>GHA Dec</b> 265°17.64 N21°24.52	<b>GHA Dec</b> 22°37.08 <b>S</b> 03°30.35	Al Na'ir 27°31.82 -46°50.24
1	20 49.45 35°51.91	202 22.97 NO2 17.50 217°22.58 16.29	174°56.17 3.53	280°19.86 24.48	37°39.70 30.42	Fomalhaut 15°13.54 -29°29.11
2	50° 54.38	232°22.19 15.08	189° 56.92 4.07	295°22.07 24.45	52°42.33 30.48	Scheat 13°44.33 28°13.56
3	65° 56.84	247°21.80 · · 13.88	204°57.67 · · 4.62	310°24.28 · · 24.41	67°44.95 · · 30.55	Markab 13°29.02 15°20.82
4	80° 59.31	262°21.40 12.67	219°58.43 5.16	325°26.50 24.38	82°47.57 30.61	Oct 10 Fri SHA Mer.pass
5	96°1.77	277°21.01 11.46	234°59.18 5.70	340°28.71 24.34	97°50.20 30.68	Venus 183°50.64 10:29
6	111°4.24	292°20.62 N02°10.26	249°59.94 \$16°6.25	355°30.93 N21°24.31	112°52.82 <b>S</b> 03°30.74	Mars 140°27.70 13:22
7	126°6.70	307°20.23 9.05	265°0.69 6.79	10°33.15 24.27	127°55.44 30.81	Jupiter 244°40.56 06:25
8	141°9.16	322°19.84 7.84	280°1.44 7.33	25°35.36 24.24	142°58.06 30.87	Saturn 1°39.91 22:34
9	156° 11.63	337°19.45 · · 6.63	295°2.19 · · 7.88	40°37.58 · · 24.20	158°0.69 · · 30.94 173°3.31 31.00	Oct 11 Sat SHA Mer.pass
10 11	171° 14.09 186° 16.56	352°19.06 5.43 7°18.67 4.22	310°2.95 8.42 325°3.70 8.96	55°39.79 24.17 70°42.01 24.13	173°3.31 31.00 188°5.93 31.07	Venus 182°42.07 10:30
12	201° 19.02	22°18.27 N02°3.01	340°4.45 \$16°9.51	85°44.23 N21°24.10	203°8.55 S03°31.13	Mars 139°46.91 13:21
13	216°21.48	37°17.88 1.80	355°5.20 10.05	100°46.45 24.06	218°11.18 31.20	Jupiter 244°34.29 06:21
14	$231^{\circ}23.95$	52°17.49 02°0.59	10°5.95 10.59	115°48.66 24.03	233°13.80 31.26	Saturn 1°43.79 22:30
15	246°26.41	67°17.10 01°59.39	25°6.70 · · 11.13	130°50.88 · · 23.99	248°16.42 · · 31.33	Oct 12 Sun SHA Mer.pass
16	261°28.88	82°16.71 58.18	40°7.46 11.67	145°53.10 23.96	263°19.04 31.39	Venus 181°33.52 10:31
17	276°31.34 291°33.81	97°16.32 56.97 112°15.93 N01°55.76	55°8.21 12.22 70°8.96 \$16°12.76	160°55.32 23.92 175°57.54 N21°23.89	278°21.66 31.46	Mars 139°5.96 13:20
18 19	306° 36.27	112°15.93 N01°55.76 127°15.54 54.55	85°9.71 13.30	175°57.54 N21°23.89 190°59.76 23.85	293°24.29 S03°31.52 308°26.91 31.59	Jupiter 244°28.19 06:18 Saturn 1°47.63 22:26
20	321°38.73	142°15.15 53.34	100°10.46 13.84	206° 1.98 23.82	323°29.53 31.65	Saturn 1°47.63 22:26
21	336°41.20	157°14.76 · · 52.13	115°11.20 · · 14.38	221° 4.20 · · 23.78	338°32.15 · · 31.72	Horizontal parallax
22	351°43.66	172°14.37 50.92	130°11.95 14.92	236° 6.42 23.75	353°34.77 31.78	Venus: 0.1
23	6°46.13	187°13.97 49.71	145°12.70 15.46	251°8.64 23.71	8°37.40 31.85	Mars: 0.1
Mer.	pass. 22:33	ν-0.4' d-1.2' m-3.92	ν0.8' d0.5' m1.54	ν2.2' d-0.0' m-2.19	ν2.6' d0.1' m0.67	

h	Su	Moon					
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°14.03	S06°39.45	325°36.41	4.2'	N24°9.38	10.0'	60.6'
1 2	198°14.20 213°14.37	40.40 41.34	339°59.61 354°22.74	4.1' 4.1'	24°19.36 24°29.16	9.8' 9.6'	60.5' 60.5'
3	228° 14.53	42.29	8°45.80	4.0'	24°29.10 24°38.79	9.4	60.5
4	243°14.70	43.23	23°8.78	3.9'	24°48.24	9.3'	60.5'
5	258° 14.87	44.18	37°31.68	3.8'	24°57.50	9.1'	60.5'
6 7	273° 15.03 288° 15.20	\$06°45.12 46.07	51°54.52 66°17.28	3.8' 3.7'	N25°6.59 25°15.50	8.9' 8.7'	60.5' 60.4'
8	303° 15.37	47.01	80°39.98	3.6'	25°24.22	8.5'	60.4
9	318° 15.53	• • 47.96	$95^{\circ}2.61$	3.6'	25°32.76	8.4'	60.4'
10	333° 15.70 348° 15.86	48.90	109°25.17 123°47.67	3.5' 3.4'	25°41.11 25°49.27	8.2' 8.0'	60.4
11 12	348 15.86 3°16.03	49.85 \$06°50.79	123 47.07 138°10 11	3.4	25 49.27 N25°57.25	8.0 7.8'	60.4' 60.3'
13	18° 16.19	51.74	152°32.49	3.3'	26°5.03	7.6'	60.3
14	33°16.36	52.68	166°54.82	3.3'	26°12.63	7.4'	60.3'
15 16	48° 16.52 63° 16.69	· · 53.62 54.57	181°17.09 195°39.31	3.2' 3.2'	26°20.03 26°27.24	7.2' 7.0'	60.3' 60.3'
17	78° 16.85	55.51	210° 1.48	3.1'	26°34.25	6.8	60.2'
18	93°17.02	S06°56.45	224°23.59	3.1'	N26°41.07	6.6'	60.2'
19	108°17.18	57.40	238°45.67	3.0'	26°47.70	6.4'	60.2'
20 21	123° 17.34 138° 17.51	58.34 06°59.28	253°7.70 267°29.68	3.0' 2.9'	26°54.12 27°0.35	6.2' 6.0'	60.2' 60.1'
22	153° 17.67	07°0.22	281°51.63	2.9'	27°6.38	5.8'	60.1
23	168° 17.83	1.17	$296^{\circ}13.55$	2.9'	$27^{\circ}12.22$	5.6'	60.1'
	SD = 16.0'	d = 0.9'	-	SI	D = 16.5'		
Sat 0	<b>GHA</b> 183° 17.99	<b>Dec</b> <b>S</b> 07° 2.11	<b>GHA</b> 310°35.42	ν 2.8'	Dec N27°17.85	<i>d</i> 5.4'	HP 60.1'
1	198° 18.16	3.05	324°57.27	2.8'	27°23.28	5.2'	60.0'
2	213° 18.32	3.99	$339^{\circ}19.09$	2.8'	$27^{\circ}28.51$	5.0'	60.0'
3	228° 18.48	• • 4.94	353°40.88 8°2.65	2.8'	27°33.54	4.8'	60.0'
4 5	243° 18.64 258° 18.80	5.88 6.82	8° 2.05 22° 24.39	2.7' 2.7'	27°38.37 27°42.99	4.6' 4.4'	60.0' 59.9'
6	273° 18.96	S07°7.76	36°46.12	2.7'	N27°47.42	4.2'	59.9'
7	288° 19.13	8.70	51°7.83	2.7'	27°51.63	4.0'	59.9'
8 9	303°19.29 318°19.45	9.64 •• 10.58	65°29.53 79°51.22	2.7' 2.7'	27°55.65 27°59.46	3.8' 3.6'	59.9' 59.8'
10	333° 19.45	11.52	94°12.90	2.7'	27 59.40 28°3.07	3.4	59.8'
11	348° 19.77	12.46	108°34.57	2.7'	28°6.47	3.2'	59.8'
12	3°19.93	S07°13.40	122°56.25	2.7'	N28°9.67	3.0'	59.8'
13 14	18° 20.09 33° 20.25	14.34 15.28	137°17.92 151°39.60	2.7' 2.7'	28°12.66 28°15.45	2.8' 2.6'	59.7' 59.7'
15	48° 20.41	. 16.22	166° 1.28	2.7'	28°18.03	2.4	59.7'
16	63°20.57	17.16	180°22.97	2.7'	28°20.41	2.2'	59.6'
17 18	78° 20.72 93° 20.88	18.10 \$07°19.04	194°44.68 209°6.40	2.7'	28°22.59 N28°24.56	2.0'	59.6'
19	93 20.88 108°21.04	19.04	209 6.40 223°28.13	2.7	28°26.32	1.8' 1.6'	59.6' 59.6'
20	123°21.20	20.92	237°49.89	2.8'	28°27.89	1.4'	59.5'
21	138°21.36	• • 21.86	252°11.67	2.8'	28°29.25	1.2'	59.5'
22 23	153°21.52 168°21.67	22.80 23.74	266°33.47 280°55.30	2.8' 2.9'	28°30.40 28°31.36	1.0' 0.8'	59.5' 59.4'
23	SD = 16.0'		200 33.30			0.0	39.4
	חכר = חכר	d = 0.9'		51	D = 16.4'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	183°21.83 198°21.99	\$07°24.68 25.61	295°17.17 309°39.07	2.9' 2.9'	N28°32.11 28°32.66	0.5' 0.3'	59.4' 59.4'
2	213°22.14	26.55	309 39.07 324°1.00	2.9 3.0'	28°33.01	0.3	59.4 59.4'
3	228° 22.30	• • 27.49	338°22.98	3.0'	28°33.16	-0.1'	59.3'
4	243°22.46	28.43	352°44.99	3.1'	28°33.10	-0.3'	59.3'
5 6	258°22.61 273°22.77	29.36 \$07°30.30	7°7.06 21°29.17	3.1' 3.2'	28°32.85 N28°32.40	-0.5' -0.6'	59.3' 59.2'
7	288°22.92	31.24	35°51.33	3.2'	28°31.75	-0.8	59.2
8	303°23.08	32.18	50°13.54	3.3'	28°30.91	-1.0'	59.2'
9 10	318°23.24 333°23.39	· · 33.11 34.05	64°35.80 78°58.13	3.3' 3.4'	28°29.86 28°28.63	-1.2' -1.4'	59.1' 59.1'
11	333 23.39 348°23.54	34.05 34.99	93°20.51	3.4'	28°27.19	-1.4 -1.6'	59.1'
12	3°23.70	S07°35.92	107°42.96	3.5'	N28°25.57	-1.8'	59.1'
13	18°23.85	36.86	122°5.47	3.6'	28°23.75	-2.0'	59.0'
14 15	33°24.01 48°24.16	37.79 •• 38.73	136°28.05 150°50.70	3.6' 3.7'	28°21.73 28°19.53	-2.2' -2.4'	59.0' 59.0'
16	63°24.32	39.67	165°13.43	3.8'	28°17.14	-2.6'	58.9'
17	78°24.47	40.60	179°36.22	3.9'	28°14.56	-2.8'	58.9'
18 19	93°24.62 108°24.77	S07°41.54 42.47	193°59.09 208°22.05	4.0' 4.0'	N28°11.79 28°8.83	-3.0' -3.1'	58.9' 58.8'
20	108° 24.77 123° 24.93	42.47 43.41	208° 22.05 222° 45.08	4.0 4.1'	28° 5.69	-3.1' -3.3'	58.8'
21	138° 25.08	• • 44.34	$237^{\circ}8.19$	4.2'	28°2.37	-3.5'	58.8'
22	153°25.23	45.27	251°31.39	4.3'	27°58.86	-3.7'	58.7'
23	168°25.38	46.21	265°54.68	4.4'	27°55.17	-3.9'	58.7'
	SD = 16.0'	d = 0.9'		SI	D = 16.2'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	88-69%	
10	12:56	13:04	11:47	02:23	14:55		
11	13:12	13:20	11:47	03:26	15:58		
12	13:27	13:35	11:46	04:30	17:02		

### October 13, 14, 15 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	21°48.59	202°13.58 N01°48.50	160°13.45 \$16°16.00	266°10.86 N21°23.68	23°40.02 \$03°31.91	
1	36°51.06	217°13.19 47.29	175°14.20 16.54	281°13.08 23.65	38°42.64 31.98	Alpheratz 357°33.80 29°14.16
2	51°53.52	232°12.80 46.08	190°14.95 17.08	296°15.30 23.61	53°45.26 32.04	Ankaa 353°6.10 -42°9.89 Schedar 349°29.80 56°40.88
3	66° 55.98	247°12.41 · · 44.87	205° 15.70 · · 17.62	311°17.52 · · 23.58	68°47.88 · · 32.11	Diphda 348°46.34 -17°50.58
4	81°58.45	262°12.02 43.66	220°16.44 18.16	326°19.74 23.54	83°50.50 32.17	Achernar 335°19.11 -57°6.23
5	97°0.91	277°11.63 42.45	235°17.19 18.70	341°21.96 23.51	98°53.12 32.23	Hamal 327°50.16 23°35.18
6 7	112°3.38 127°5.84	292°11.24 N01°41.24 307°10.85 40.03	250°17.94 S16°19.24 265°18.68 19.78	356°24.19 N21°23.47 11°26.41 23.44	113°55.74 \$03°32.30 128°58.36 32.36	Polaris 313°17.07 89°22.24
8	142°8.30	307 10.05 40.03 322°10.46 38.82	280° 19.43 20.32	26°28.63 23.41	144°0.98 32.43	Acamar 315°10.90 -40°11.85
9	157° 10.77	337°10.07 · · 37.61	295°20.18 · · 20.86	41°30.86 · · 23.37	159°3.61 · · 32.49	Menkar 314°5.21 4°11.60
10	172° 13.23	352°9.68 36.40	310° 20.92 21.39	56°33.08 23.34	174°6.23 32.56	Mirfak 308°26.94 49°57.14 Aldebaran 290°38.68 16°33.75
11	187° 15.70	7°9.29 35.18	325°21.67 21.93	71°35.30 23.30	189°8.85 32.62	Rigel 281°3.09 -8°10.11
12	202°18.16	22°8.89 N01°33.97	340°22.41 \$16°22.47	86°37.53 N21°23.27	204°11.47 <b>S</b> 03°32.68	Capella 280°20.72 46°1.33
13 14	217°20.63 232°23.09	37°8.50 32.76 52°8.11 31.55	355°23.16 23.01 10°23.90 23.54	101°39.75 23.24 116°41.98 23.20	219°14.09 32.75 234°16.71 32.81	Bellatrix 278°22.05 6°22.51
15	247° 25.55	67°7.72 · · 30.34	25°24.65 · · 24.08	131°44.20 · · 23.17	249°19.33 · · 32.88	Elnath 278°0.90 28°37.74
16	262°28.02	82°7.33 29.13	40°25.39 24.62	146°46.43 23.14	264°21.95 32.94	Alnilam 275°36.95 -1°10.96
17	277°30.48	97°6.94 27.91	55°26.14 25.16	161°48.65 23.10	279°24.57 33.00	Betelgeuse 270°51.29 7°24.83
18	292°32.95	112°6.55 N01°26.70	70°26.88 <b>S</b> 16°25.69	176°50.88 N21°23.07	294°27.19 <b>S</b> 03°33.07	Canopus 263°51.97 -52°42.17 Sirius 258°25.62 -16°44.84
19	307°35.41	127°6.16 25.49	85°27.62 26.23	191°53.11 23.04	309°29.81 33.13	Adhara 255°5.33 -29°0.12
20	322° 37.87	142°5.77 24.27	100°28.37 26.77	206°55.33 23.00	324°32.43 33.19	Procyon 244°50.20 5°9.64
21 22	337° 40.34 352° 42.80	157°5.38 · · 23.06 172°4.99 21.85	115°29.11 · · 27.30 130°29.85 27.84	221°57.56 · · 22.97 236°59.79 22.94	339°35.05 · · 33.26 354°37.67 33.32	Pollux 243°16.57 27°57.80
23	7° 45.27	172 4.99 21.65 187°4.60 20.64	145° 30.60 28.37	252°2.02 22.90	9°40.29 33.39	Avior 234°14.65 -59°35.14
_				-		Suhail 222°46.06 -43°31.88
Mer.	pass. 22:29	ν-0.4' d-1.2' m-3.92	ν0.7' d0.5' m1.53	ν2.2' d-0.0' m-2.19	$\nu 2.6' \ d0.1' \ \text{m}0.67$	Miaplacidus 221°38.60 -69°49.02
						Alphard 217°47.31 -8°46.05 Regulus 207°33.99 11°50.54
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.75 61°36.59
0	22°47.73	202°4.21 N01°19.42	160°31.34 \$16°28.91	267°4.24 N21°22.87	24°42.91	Denebola 182°24.61 14°25.74
1	37° 50.20	217°3.82 18.21	175°32.08 29.44	282° 6.47 22.84	39°45.53 33.51	Gienah 175°43.28 -17°40.98
2	52° 52.66 67° 55.12	232°3.43 17.00 247°3.04 · · 15.78	190° 32.82 29.98 205° 33.56 · · · 30.51	297°8.70 22.80 312°10.93 · · 22.77	54°48.14 33.58 69°50.76 · · 33.64	Acrux 173°0.14 -63°14.40
4	82°57.59	262°2.65 14.57	220° 34.30 31.05	327°13.16 22.74	84°53.38 33.70	Gacrux 171°51.56 -57°15.34
5	98°0.05	277°2.25 13.35	235°35.04 31.58	342°15.39 22.70	99°56.00 33.77	Alioth 166°12.95 55°49.19
6	113°2.52	292°1.86 N01°12.14	250°35.78 <b>S</b> 16°32.12	357°17.62 N21°22.67	114°58.62 <b>S</b> 03°33.83	Spica 158°21.98 -11°17.66 Alkaid 152°51.98 49°11.13
7	$128^{\circ}4.98$	$307^{\circ}1.47$ 10.93	265° 36.52 32.65	12°19.85 22.64	130°1.24 33.89	Hadar 148°35.80 -60°29.83
8	143°7.44	322°1.08 9.71	280° 37.26 33.18	27°22.08 22.60	145°3.86 33.96	Menkent 147°57.29 -36°29.76
9	158°9.91	337°0.69 · · 8.50	295°38.00 · · 33.72	42°24.31 · · 22.57	160°6.48 · · 34.02	Arcturus 145°47.67 19°2.99
10 11	173° 12.37 188° 14.84	352°0.30 7.28 6°59.91 6.07	310° 38.74 34.25 325° 39.48 34.78	57°26.54 22.54 72°28.77 22.51	175°9.10 34.08 190°11.72 34.15	Rigil Kent. 139°40.11 -60°56.54
12	203° 17.30	21°59.52 N01°4.85	340°40.22 \$16°35.32	87°31.00 N21°22.47	205°14.33 S03°34.21	Kochab 137°20.84 74°3.02
13	218° 19.77	36°59.13 3.64	355°40.96 35.85	102°33.24 22.44	220°16.95 34.27	Zuben'ubi 136°55.65 -16°8.87 Alphecca 126°3.52 26°37.81
14	233°22.23	51°58.74 2.42	10°41.70 36.38	117°35.47 22.41	235°19.57 34.33	Alphecca 126°3.52 26°37.81 Antares 112°15.33 -26°29.35
15	248°24.69	66°58.35 · · 1.21	25°42.44 · · 36.92	132°37.70 · · 22.37	250°22.19 · · 34.40	Arria 107°9.33 -69°4.60
16	263°27.16	81°57.96 00°59.99	40°43.18 37.45	147°39.93 22.34	265°24.81 34.46	Sabik 102°2.26 -15°45.38
17	278° 29.62	96°57.57 00°58.78	55°43.91 37.98	162°42.17 22.31 177°44.40 N21°22.28	280°27.42 34.52 295°30.04 \$03°34.59	Shaula 96°9.72 -37°7.42
18 19	293°32.09 308°34.55	111°57.18 N00°57.56 126°56.79 56.35	70°44.65 \$16°38.51 85°45.39 39.04	177°44.40 N21°22.28 192°46.63 22.24	295°30.04 \$03°34.59 310°32.66 34.65	Rasalhague 95°58.13 12°32.62
20	323°37.01	141°56.40 55.13	100°46.12 39.57	207°48.87 22.21	325°35.28 34.71	Eltanin 90°42.10 51°29.36
21	338° 39.48	156°56.01 · · 53.92	115°46.86 · · 40.11	222°51.10 · · 22.18	340°37.90 · · 34.77	Kaus Aust. 83°31.80 -34°22.41 Vega 80°32.91 38°48.69
22	353°41.94	171°55.61 52.70	130° 47.60 40.64	237°53.34 22.15	355°40.51 34.84	Nunki 75°47.04 -26°15.91
23	8°44.41	186°55.22 51.48	145°48.33 41.17	252°55.57 22.12	10°43.13 34.90	Altair 61°59.33 8°56.34
Mer.p	pass. 22:25	ν-0.4' d-1.2' m-3.92	$\nu$ 0.7' $d$ 0.5' $m$ 1.53	$\nu$ 2.2' d-0.0' m-2.20	ν2.6' d0.1' m0.68	Peacock 53°4.60 -56°39.30
						Deneb 49°25.26 45°22.61
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.02 9°59.76
0	23° 46.87	201°54.83 N00°50.27	160°49.07 \$16°41.70	267°57.81 N21°22.08	25°45.75 \$03°34.96	Al Na'ir 27°31.82 -46°50.25 Fomalhaut 15°13.54 -29°29.11
1	38° 49.33	216°54.44 49.05	175°49.80 42.23	283°0.04 22.05	40°48.37 35.02	Scheat 13°44.33 28°13.57
2	53°51.80	231°54.05 47.84	190° 50.54 42.76	298° 2.28 22.02	55°50.98 35.09	Markab 13°29.02 15°20.82
3	68° 54.26	246°53.66 · · 46.62	205°51.27 · · 43.29	313°4.52 · · 21.99	70°53.60 · · 35.15	0 : 12 14 5114 14
4	83°56.73	261°53.27 45.40	220°52.01 43.82	328° 6.75 21.95	85°56.22 35.21	Oct 13 Mon         SHA         Mer.pass           Venus         180°24.99         10:31
5 6	98°59.19 114°1.66	276°52.88 44.19 291°52.49 N00°42.97	235°52.74 44.35 250°53.48 \$16°44.88	343°8.99 21.92 358°11.23 N21°21.89	100°58.83 35.27 116°1.45 \$03°35.33	Mars 138°24.86 13:18
7	129°4.12	306°52.10 41.75	265°54.21 45.41	13°13.46 21.86	131°4.07 35.40	Jupiter 244°22.27 06:14
8	144°6.58	321°51.71 40.54	280°54.94 45.94	28°15.70 21.83	146°6.69 35.46	Saturn 1°51.43 22:21
9	$159^{\circ}9.05$	336°51.32 · · 39.32	295°55.68 · · 46.46	43°17.94 · · 21.80	161°9.30 · · 35.52	Oct 14 Tue SHA Mer.pass
10	174° 11.51	351°50.93 38.10	310°56.41 46.99	58°20.18 21.76	176°11.92 35.58	Oct 14 Tue         SHA         Mer.pass           Venus         179°16.48         10:32
11	189° 13.98	6°50.53 36.88	325° 57.14 47.52	73°22.42 21.73	191°14.53 35.64	Mars 137°43.61 13:17
12 13	204° 16.44 219° 18.90	21°50.14 N00°35.67 36°49.75 34.45	340°57.87 \$16°48.05 355°58.61 48.58	88°24.66 N21°21.70 103°26.90 21.67	206°17.15 \$03°35.71 221°19.77 35.77	Jupiter 244°16.51 06:11
13 14	219 18.90 234°21.37	51°49.36 33.23	10°59.34 49.10	118°29.14 21.64	236°22.38 35.83	Saturn 1°55.17 22:17
15	249°23.83	66°48.97 · · 32.01	26°0.07 · · 49.63	133°31.38 · · 21.61	251°25.00 · · 35.89	Oct 15 Wed SHA Mer.pass
16	264°26.30	81°48.58 30.80	41°0.80 50.16	148°33.62 21.57	266°27.62 35.95	Venus 178°7.96 10:33
17	279°28.76	96°48.19 29.58	56°1.53 50.69	163°35.86 21.54	281°30.23 36.02	Mars 137°2.20 13:16
18	294°31.22	111°47.80 N00°28.36	71°2.26 \$16°51.21	178°38.10 N21°21.51	296°32.85	Jupiter 244°10.94 06:07
19	309°33.69	126°47.41 27.14	86°2.99 51.74	193°40.34 21.48	311°35.46 36.14 326°38.08 36.20	Saturn 1°58.88 22:13
20 21	324° 36.15 339° 38.62	141°47.02 25.92 156°46.62 · · 24.71	101°3.72 52.27 116°4.45 · · 52.79	208°42.58 21.45 223°44.82 · · 21.42	326°38.08 36.20 341°40.69 · · 36.26	Horizontal parallax
22	354° 41.08	171°46.23 23.49	131°5.18 53.32	238°47.06 21.39	356°43.31 36.32	Venus: 0.1
23	9°43.55	186°45.84 22.27	146°5.91 53.84	253°49.31 21.36	11°45.93 36.38	Mars: 0.1
Merr	pass. 22:21	ν-0.4' d-1.2' m-3.92	ν0.7' d0.5' m1.53	ν2.2' d-0.0' m-2.21	ν2.6' d0.1' m0.68	<del></del>
14161.		∠ U.¬ U-1.∠ III-J.7∠	ν υ.ι	ν Δ.Δ. U=U.U III=Δ.Δ1	ν Δ.Ο UU.1 IIIU.UU	

h	Su	n			Moon		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°25.54	S07°47.14	280° 18.05	4.5'	N27°51.31	-4.0'	58.7'
1 2	198°25.69 213°25.84	48.08 49.01	294°41.52 309°5.07	4.6' 4.7'	27° 47.26 27° 43.03	-4.2' -4.4'	58.6' 58.6'
3	213 25.04 228°25.99	• • 49.94	323° 28.72	4.7' 4.7'	27° 38.63	-4.4 -4.6'	58.6'
4	243°26.14	50.88	337°52.47	4.8'	27°34.06	-4.7'	58.6'
5	258°26.29	51.81	352° 16.32	4.9'	27°29.31	-4.9'	58.5'
6 7	273°26.44 288°26.59	\$07°52.74 53.68	6°40.26 21°4.30	5.0' 5.1'	N27°24.38 27°19.29	-5.1' -5.3'	58.5' 58.5'
8	303°26.74	53.08 54.61	21 4.30 35°28.45	5.1 5.2'	27 19.29 27°14.03	-5.3 -5.4'	58.4'
9	318°26.89	• • 55.54	49°52.69	5.4'	27°8.60	-5.6'	58.4'
10	333°27.04	56.47	64° 17.05	5.5'	27°3.01	-5.8'	58.4'
11	348°27.19 3°27.34	57.41 507°58.34	78°41.51 93°6.07	5.6' 5.7'	26° 57.25 N26° 51.33	-5.9' -6.1'	58.3' 58.3'
12 13	3 27.34 18°27.49	07°59.27	93 6.07 107°30.75	5. <i>1</i> 5.8'	26° 45.25	-6.1 -6.2'	58.3'
14	33°27.63	08° 0.20	121°55.53	5.9'	26°39.00	-6.4	58.2'
15	48°27.78	•• 1.13	136° 20.42	6.0'	26°32.60	-6.6'	58.2'
16	63°27.93	2.06	150°45.43	6.1'	26°26.04	-6.7'	58.2'
17 18	78°28.08 93°28.23	2.99 <b>S</b> 08°3.92	165° 10.55 179° 35.78	6.2' 6.3'	26° 19.33 N26° 12.47	-6.9' -7.0'	58.1' 58.1'
19	108°28.37	4.86	194°1.12	6.5	26°5.45	-7.2'	58.1
20	123°28.52	5.79	208° 26.58	6.6'	25°58.28	-7.3	58.1'
21	138°28.67	• • 6.72	222°52.16	6.7'	25°50.96	-7.5'	58.0'
22	153°28.81	7.65	237°17.85 251°43.66	6.8'	25° 43.50	-7.6'	58.0'
23	168°28.96	8.58	251-43.66	6.9'	25°35.89	-7.8'	58.0'
	SD = 16.0'	d = 0.9'		SI	D = 16.0'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.11	S08°9.50	266°9.58	7.0'	N25°28.14	-7.9'	57.9'
1	198°29.25	10.43	280°35.63	7.2'	25°20.24	-8.0'	57.9'
2	213°29.40	11.36	295°1.79	7.3'	25° 12.21	-8.2'	57.9'
3 4	228°29.54 243°29.69	· · 12.29 13.22	309°28.07 323°54.48	7.4' 7.5'	25°4.04 24°55.73	-8.3' -8.4'	57.8' 57.8'
5	258°29.83	14.15	338°21.00	7.6'	24° 47.28	-8.6'	57.8'
6	273°29.98	S08°15.08	352° 47.64	7.8'	N24°38.70	-8.7'	57.7'
7	288°30.12	16.01	7°14.40	7.9'	24°29.99	-8.8'	57.7'
8 9	303°30.27 318°30.41	16.93 •• 17.86	21°41.28 36°8.28	8.0' 8.1'	24°21.15 24°12.18	-9.0' -9.1'	57.7' 57.6'
10	333°30.55	18.79	50° 35.40	8.2'	24 12.16 24°3.09	-9.1 -9.2'	57.6'
11	348°30.70	19.72	65°2.65	8.4	23°53.87	-9.3	57.6'
12	3°30.84	S08°20.64	79°30.01	8.5'	N23° 44.52	-9.5'	57.6'
13 14	18°30.98 33°31.12	21.57 22.50	93°57.49 108°25.10	8.6' 8.7'	23°35.05 23°25.47	-9.6' -9.7'	57.5' 57.5'
15	48°31.27	• • 23.42	108 25.10 122°52.82	8.8'	23° 15.76	-9.1' -9.8'	57.5'
16	63°31.41	24.35	137° 20.66	9.0'	23°5.94	-9.9'	57.4'
17	78°31.55	25.28	151° 48.63	9.1'	22°56.00	-10.1'	57.4'
18 19	93°31.69 108°31.83	\$08°26.20 27.13	166° 16.71 180° 44.92	9.2' 9.3'	N22° 45.95 22° 35.79	-10.2' -10.3'	57.4' 57.3'
20	106 31.63 123°31.97	28.05	195° 13.24	9.3 9.4'	22° 25.51		57.3'
21	138°32.12	• • 28.98	209°41.68	9.6'	22°15.13	-10.5'	57.3'
22	153°32.26	29.91	224° 10.24	9.7'	$22^{\circ}4.64$	-10.6'	57.3'
23	168°32.40	30.83	238°38.91	9.8'	21°54.04	-10.7'	57.2'
	SD = 16.0'	d = 0.9'		SI	D = 15.8'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°32.54	S08°31.76	253°7.71	9.9'	N21°43.34	-10.8'	57.2'
1	198°32.68 213°32.82	32.68	267°36.62	10.0'	21°32.54	-10.9'	57.2'
2	213°32.82 228°32.96	33.60 •• 34.53	282°5.64 296°34.79	10.1' 10.3'	21°21.64 21°10.64	-11.0' -11.1'	57.1' 57.1'
4	243°33.09	35.45	311°4.04	10.3	20°59.54	-11.1	57.1
5	258°33.23	36.38	$325^{\circ}33.41$	10.5'	20°48.34	-11.3'	57.1'
6	273°33.37	S08°37.30	340°2.90	10.6'	N20° 37.05	-11.4'	57.0'
7 8	288°33.51 303°33.65	38.22 39.15	354°32.50 9°2.21	10.7' 10.8'	20°25.67 20°14.20	-11.5' -11.6'	57.0' 57.0'
9	303°33.65 318°33.79	39.15 •• 40.07	23° 32.03	10.8	20° 14.20 20° 2.63	-11.6 -11.7'	56.9
10	333°33.92	40.99	38°1.97	11.0'	19°50.98	-11.7	56.9'
11	348°34.06	41.91	52° 32.01	11.2'	19°39.24	-11.8'	56.9'
12	3°34.20	508°42.84	67°2.16	11.3'	N19°27.42	-11.9'	56.9'
13 14	18°34.33 33°34.47	43.76 44.68	81°32.43 96°2.79	11.4' 11.5'	19° 15.51 19° 3.51	-12.0' -12.1'	56.8' 56.8'
15	48°34.61	• 45.60	110°33.27	11.6'	18°51.44	-12.1	56.8'
16	63°34.74	46.52	125°3.85	11.7'	18° 39.29	-12.2'	56.7'
17	78°34.88	47.44	139°34.54	11.8'	18° 27.06	-12.3'	56.7'
18 19	93°35.02 108°35.15	\$08°48.37 49.29	154°5.33 168°36.23	11.9' 12.0'	N18° 14.75 18° 2.37	-12.4' -12.5'	56.7' 56.7'
20	108 35.15 123°35.29	50.21	183°7.23	12.1'	18 2.37 17°49.91	-12.5'	56.6'
21	138°35.42	•• 51.13	197°38.32	12.2'	17°37.39	-12.6'	56.6'
22	153°35.55	52.05	212°9.52	12.3'	17°24.79	-12.7'	56.6'
23	168°35.69	52.97	226° 40.82	12.4'	17°12.12	-12.7'	56.6'
	SD = 16.0'	d = 0.9'		SI	D = 15.6'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	59-37%	
13	13:42	13:49	11:46	05:32	18:02		
14	13:56	14:03	11:46	06:30	18:57		
15	14:10	14:17	11:46	07:23	19:47		

### October 16, 17, 18 UT (Thu., Fri., Sat.)

h	Aries	Ve	enus	M	ars	Jup	piter	Sat	urn		Stars	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	24°46.01	201°45.45	N00°21.05	161°6.64	S16°54.37	268°51.55	N21°21.32	26°48.54	S03°36.45			
1	39°48.47	216° 45.06	19.83	176°7.37	54.89	283°53.79	21.29	41°51.16	36.51	Alpheratz	357° 33.80	29°14.16
2	54°50.94	231°44.67	18.61	191°8.10	55.42	298°56.04	21.26	56°53.77	36.57	Ankaa	353°6.10	-42°9.90
3	69°53.40	246°44.28	17.40	206°8.83	• • 55.94	313°58.28	• • 21.23	71°56.39	• • 36.63	Schedar	349°29.80	56°40.89
4	84°55.87	261°43.89	16.18	221°9.56	56.47	329° 0.52	21.20	86°59.00	36.69	Diphda	348°46.34	-17°50.59
5	99°58.33	276°43.50	14.96	$236^{\circ}10.28$	56.99	344°2.77	21.17	102°1.62	36.75	Achernar	335°19.10 327°50.15	-57° 6.25 23° 35.19
6	115°0.79	291°43.10	N00°13.74	251°11.01	S16°57.52	359°5.01	N21°21.14	117°4.23	S03°36.81	Hamal Polaris	313° 16.31	23 35.19 89°22.26
7	$130^{\circ}3.26$	306°42.71	12.52	$266^{\circ}11.74$	58.04	14°7.26	21.11	132°6.85	36.87	Acamar	315°10.31	-40°11.86
8	$145^{\circ}5.72$	321°42.32	11.30	281°12.47	58.57	29° 9.50	21.08	147°9.46	36.93	Menkar	314°5.19	4°11.60
9	160°8.19	336°41.93	• • 10.08	296°13.19	• • 59.09	44°11.75	• • 21.05	162°12.08	• • 37.00	Mirfak	308° 26.92	49°57.16
10	175° 10.65	351°41.54	8.86	311°13.92	16°59.61	59°13.99	21.02	177°14.69	37.06	Aldebaran	290°38.66	16°33.75
11	190°13.11	6°41.15	7.64	326°14.65	17°0.14	74°16.24	20.99	192°17.30	37.12	Rigel	281°3.07	-8°10.11
12	205° 15.58	21°40.75	N00°6.42	341°15.37	S17°0.66	89°18.49	N21°20.96	207°19.92	S03°37.18	Capella	280°20.69	46°1.34
13	220° 18.04	36°40.36	5.20	356°16.10	1.18	104°20.73	20.92	222°22.53	37.24	Bellatrix	278°22.03	6°22.51
14 15	235°20.51 250°22.97	51°39.97	3.98	11°16.82	1.70	119°22.98 134°25.23	20.89 •• 20.86	237°25.15 252°27.76	37.30	Elnath	278°0.87	28°37.74
16	265° 25.43	66°39.58 81°39.19	· · 2.76 1.55	26°17.55 41°18.27	· · 2.23 2.75	134 25.23 149°27.48	· · 20.86 20.83	267°30.37	· · 37.36 37.42	Alnilam	275°36.93	$-1^{\circ}10.96$
17	280° 27.90	96°38.80	N00° 0.33	56° 19.00	3.27	164°29.73	20.83	282°32.99	37.42	Betelgeuse	270°51.26	7°24.83
18	295°30.36	111°38.40	S00° 0.89	71° 19.72	\$17°3.79	179°31.97	N21° 20.77	297°35.60	\$03°37.54	Canopus	263°51.94	-52°42.17
19	310°32.83	126°38.01	2.11	86°20.44	4.31	194°34.22	20.74	312°38.22	37.60	Sirius	258°25.60	-16°44.85
20	325° 35.29	141°37.62	3.33	101°21.17	4.84	209°36.47	20.71	327°40.83	37.66	Adhara	255°5.31	-29°0.12
21	340°37.75	156° 37.23	• • 4.55	116°21.89	5.36	224°38.72	. 20.68	342°43.44	• • 37.72	Procyon	244°50.17	5°9.64
22	355°40.22	171°36.84	5.77	131°22.61	5.88	239°40.97	20.65	357°46.06	37.78	Pollux	243°16.54	27°57.79
23	10°42.68	186°36.45	6.99	146°23.34	6.40	254°43.22	20.62	12°48.67	37.84	Avior	234°14.62	-59°35.14
N.4	00.17		1.0/ 2.00	-	F/ 1.FO					Suhail	222°46.03	-43°31.88
Wer.	pass. 22:17	$\nu$ -0.4′ d-1	1.2′ m-3.92	$\nu$ 0.7 d0	.5′ m1.52	$\nu$ 2.2' $d$ -0	).0′ m-2.21	$\nu$ 2.6′ d0	.1′ m0.68	Miaplacidus	221°38.56	-69°49.01
										Alphard	217°47.29 207°33.97	-8°46.05 11°50.53
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus Dubhe	207 33.97 193°40.72	61°36.58
0	25°45.15	201°36.05	S00°8.22	161°24.06	<b>S</b> 17°6.92	269°45.47	N21°20.59	27°51.28	S03°37.90	Denebola	193 40.72 182°24.60	14°25.73
1	$40^{\circ}47.61$	216°35.66	9.44	176°24.78	7.44	284°47.72	20.56	42°53.90	37.96	Gienah	175° 43.27	-17°40.98
2	55°50.08	231°35.27	10.66	191°25.50	7.96	299°49.97	20.53	57°56.51	38.02	Acrux	173°43.27	-63°14.39
3	$70^{\circ}52.54$	246°34.88	• • 11.88	206°26.23	• • 8.48	314°52.22	• • 20.50	72°59.12	• • 38.08	Gacrux	171°51.55	-57°15.33
4	85°55.00	261°34.48	13.10	221°26.95	9.00	329°54.48	20.47	88°1.73	38.14	Alioth	166° 12.94	55°49.17
5	100°57.47	276°34.09	14.32	236°27.67	9.52	344°56.73	20.44	103°4.35	38.20	Spica	158°21.97	-11°17.66
6	115°59.93	291°33.70	S00°15.54	251°28.39	S17°10.04	359°58.98	N21°20.41	118°6.96	S03°38.26	Alkaid	152°51.97	49°11.11
7	131°2.40	306°33.31	16.76	266°29.11	10.56	15° 1.23	20.38	133°9.57	38.32	Hadar	148°35.80	-60°29.82
8	146°4.86	321°32.92	17.98	281°29.83	11.07	30°3.49	20.36	148°12.18	38.38	Menkent	147° 57.29	-36°29.75
9	161°7.32	336°32.52	• • 19.20	296°30.55	• • 11.59	45°5.74	• • 20.33	163°14.80	• • 38.44	Arcturus	145°47.67	19°2.97
10	176°9.79	351°32.13	20.42	311°31.27	12.11	60°7.99	20.30	178°17.41	38.50	Rigil Kent.	139°40.12	-60°56.53
11 12	191° 12.25 206° 14.72	6°31.74 21°31.35	21.64 \$00°22.86	326°31.99 341°32.71	12.63 \$17°13.15	75°10.25 90°12.50	20.27 N21°20.24	193°20.02 208°22.63	38.56 \$03°38.62	Kochab	137°20.86	74°3.00
13	200 14.72 221° 17.18	36° 30.95	24.08	356° 33.43	13.66	105°14.75	20.21	200° 22.03 223° 25.24	38.68	Zuben'ubi	136° 55.65	-16°8.87
14	236° 19.64	51° 30.56	25.31	11°34.15	14.18	105 14.75 120°17.01	20.21	238°27.86	38.74	Alphecca	126°3.52	26°37.79
15	251°22.11	66°30.17	26.53	26°34.87	. 14.70	135°19.26	. 20.15	253°30.47	• • 38.80	Antares	112°15.34	-26°29.35
16	266° 24.57	81°29.77	27.75	41°35.58	15.22	150°21.52	20.12	268°33.08	38.86	Atria	107°9.36	-69°4.59
17	281°27.04	96°29.38	28.97	56°36.30	15.73	165°23.78	20.09	283°35.69	38.92	Sabik	102°2.27	-15°45.38
18	296°29.50	111°28.99	S00°30.19		\$17°16.25	180°26.03	N21°20.06	298°38.30	S03°38.98	Shaula	96°9.73	-37°7.42
19	311°31.96	126°28.60	31.41	86°37.74	16.77	195°28.29	20.03	313°40.91	39.04	Rasalhague	95°58.14 90°42.12	12°32.61 51°29.35
20	326°34.43	141°28.20	32.63	101°38.45	17.28	210°30.54	20.00	328°43.53	39.10	Eltanin Kaus Aust.		-34°22.41
21	341°36.89	156°27.81	• • 33.85	$116^{\circ}39.17$	• • 17.80	225°32.80	• • 19.98	343°46.14	• • 39.16	Vega	80°32.92	38°48.68
22	$356^{\circ}39.36$	171°27.42	35.08	131°39.89	18.31	240°35.06	19.95	358°48.75	39.22	Nunki		-26°15.91
23	11°41.82	186°27.02	36.30	146°40.60	18.83	255°37.32	19.92	13°51.36	39.27	Altair	61°59.34	8°56.33
Mer	pass. 22:13	v-0 4' d1	2′ m-3.92	ν0.7' d0	.5′ m1.52	v2 3' d-0	0.0' m-2.22	v2 6' d0	.1′ m0.69	Peacock		-56°39.30
- IVICI.	pass. 22.15	ν-0. <del>4</del> α1	111-5.92		.5 1111.52	ν2.5 u-0	7.0 111-2.22		.1 1110.09	Deneb	49°25.28	45°22.62
										Enif	33°38.02	9°59.76
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.83	
0	26° 44.28	201°26.63	S00°37.52		S17°19.34	270°39.57		28°53.97	S03°39.33	Fomalhaut	15° 13.54	-29°29.12
1	41°46.75	216°26.24	38.74	176° 42.04	19.86	285°41.83	19.86	43°56.58	39.39	Scheat	$13^{\circ}44.33$	$28^{\circ}13.58$
2	56° 49.21	231°25.84	39.96	191°42.75	20.37	300°44.09	19.83	58°59.19	39.45	Markab	13°29.03	15°20.83
3	71°51.68 86°54.14	246°25.45 261°25.06	· · 41.18	206° 43.47 221° 44.18	· · 20.89	315°46.35	· · 19.80	74°1.80 89°4.41	· · 39.51 39.57	Oct 16 Thu	SHA	Mor noce
4 5	86°54.14 101°56.60	261°25.06 276°24.66	42.41 43.63	221°44.18 236°44.90	21.40 21.92	330°48.61 345°50.87	19.77 19.75	104°7.02	39.57 39.63		3HA 176°59.44	Mer.pass 10:33
6	101°56.60 116°59.07	276 24.66 291°24.27	43.63 \$00°44.85		\$17°22.43		19.75 N21°19.72		39.63 \$03°39.69		176 59.44 136°20.63	13:15
7	132° 1.53	306° 23.88	46.07	266° 46.32	22.43	15°55.39	19.69	134°12.24	39.74	Jupiter	244°5.54	06:04
8	147°4.00	321°23.48	47.29	281°47.04	23.46	30°57.65	19.66	149°14.85	39.80	Saturn	2°2.53	22:09
9	162°6.46	336°23.09	• • 48.51	296°47.75	. 23.97	45°59.91	• • 19.63	164°17.46	• • 39.86			
10	177°8.92	351°22.69	49.74	311°48.47	24.48	61°2.17	19.60	179°20.07	39.92	Oct 17 Fri	SHA	Mer.pass
11	192° 11.39	6°22.30	50.96	326°49.18	25.00	76° 4.43	19.58	194°22.68	39.98		175°50.91	10:34
12	207° 13.85	21°21.91	\$00°52.18	341°49.89	S17°25.51	91°6.69		209°25.29	503°40.04		135°38.91	13:14
13	$222^{\circ}16.32$	$36^{\circ}21.51$	53.40	$356^{\circ}50.60$	26.02	106°8.96	19.52	224°27.90	40.10	Jupiter	244°0.32 2°6.14	06:00 22:05
14	$237^{\circ}18.78$	51°21.12	54.63	11°51.32	26.53	121°11.22	19.49	239°30.51	40.15	Saturn	∠ 0.14	22:05
15	252°21.24	66° 20.72	• • 55.85	26° 52.03	• • 27.04	136° 13.48	•• 19.46	254°33.12	• • 40.21	Oct 18 Sat	SHA	Mer.pass
16	267°23.71	81°20.33	57.07	41°52.74	27.56	151°15.74	19.44	269°35.73	40.27		$174^{\circ}42.35$	10:35
17	282°26.17	96°19.94	58.29	56°53.45	28.07	166°18.01	19.41	284°38.34	40.33	1	$134^{\circ}57.04$	13:13
18	297° 28.64	111°19.54	S00°59.51		S17°28.58	181°20.27		299°40.95	S03°40.39		243°55.29	05:56
19	312°31.10	126° 19.15	01°0.74	86°54.87	29.09	196°22.54	19.35	314°43.56	40.44	Saturn	2°9.69	22:01
20	327° 33.57	141°18.75	1.96	101°55.58	29.60	211°24.80	19.32	329°46.17	40.50	Horizon	ntal parallax	
21	342°36.03	156° 18.36	3.18	116°56.29	30.11	226°27.06	19.30	344°48.78	· · 40.56	11011201	Venus:	0.1
22 23	357° 38.49 12° 40.96	171°17.96	4.40 5.63	131°57.00	30.62 31.13	241°29.33 256°31.60	19.27 19.24	359°51.38 14°53.99	40.62 40.68		Mars:	0.1
		186°17.57		146°57.71								
Mer.	pass. 22:09	$ u$ -0.4 $^{\prime}$ d1	2′ m-3.92	$ u$ 0.7 $^{\prime}$ d0	.5′ m1.52	$\nu$ 2.3′ d-0	).0′ m-2.23	$\nu$ 2.6′ d0	.1′ m0.69			

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.82	S08°53.89	241°12.22	12.5'	$N16^{\circ}59.38$	-12.8'	56.5'
1	198°35.96	54.81	255°43.71	12.6'	16°46.57	-12.9'	56.5'
2	213°36.09 228°36.22	55.73 •• 56.65	270°15.30 284°46.99	12.7' 12.8'	16°33.70 16°20.77	-12.9' -13.0'	56.5' 56.4'
4	243°36.36	57.56	299°18.77	12.9'	16°7.77	-13.1'	56.4
5	258°36.49	58.48	313°50.64	13.0'	$15^{\circ}54.71$	-13.1'	56.4'
6	273°36.62	S08°59.40	328°22.61	13.1'	N15°41.59	-13.2'	56.4'
7 8	288°36.75 303°36.89	09°0.32 1.24	342°54.66 357°26.81	13.1' 13.2'	15°28.41 15°15.18	-13.2' -13.3'	56.3' 56.3'
9	318°37.02	. 2.15	11°59.04	13.2	15 15.16 15°1.88	-13.3'	56.3
10	333°37.15	3.07	26°31.36	13.4	14°48.53	-13.4	56.3'
11	348°37.28	3.99	41°3.77	13.5'	14°35.13	-13.5'	56.2'
12 13	3°37.41 18°37.54	S09°4.91 5.82	55°36.27 70°8.84	13.6' 13.7'	N14°21.68 14°8.17	-13.5' -13.6'	56.2' 56.2'
13 14	33°37.67	5.82 6.74	70 8.84 84°41.51	13.7'	14 8.17 13°54.61	-13.6'	56.2'
15	48°37.80	7.66	99°14.25	13.8'	13°41.01	-13.7'	56.1'
16	63°37.93	8.57	113°47.07	13.9'	$13^{\circ}27.35$	-13.7'	56.1'
17	78°38.06	9.49	128°19.98	14.0'	13°13.65	-13.7'	56.1'
18 19	93°38.19 108°38.32	\$09°10.40 11.32	142°52.96 157°26.02	14.1' 14.1'	N12°59.90	-13.8' -13.8'	56.1' 56.0'
20	106 38.32 123°38.45	12.24	171°59.15	14.1	12° 40.11	-13.6' -13.9'	56.0'
21	138°38.58	• • 13.15	186°32.36	14.3'	12°18.40	-13.9'	56.0'
22	153°38.71	14.07	201°5.65	14.4'	12°4.49	-14.0'	56.0'
23	168°38.83	14.98	215°39.01	14.4'	11°50.53	-14.0'	56.0'
	SD = 16.0'	d = 0.9'		SI	D = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°38.96	S09°15.89	230°12.43	14.5'	N11°36.53	-14.0'	55.9'
1	198°39.09	16.81	244°45.93	14.6'	11°22.50	-14.1'	55.9'
2	213°39.22 228°39.34	17.72	259°19.50 273°53.14	14.6'	11°8.43 10°54.33	-14.1'	55.9'
3 4	243°39.47	· · 18.64 19.55	273 53.14 288°26.84	14.7' 14.8'	10°54.33	-14.1' -14.2'	55.9' 55.8'
5	258°39.60	20.46	303°0.61	14.8'	10°26.01	-14.2'	55.8'
6	273°39.72	S09°21.38	317°34.44	14.9'	N10°11.81	-14.2'	55.8'
7	288°39.85	22.29	332°8.33	15.0'	09°57.57	-14.3'	55.8'
8 9	303°39.97 318°40.10	23.20 •• 24.11	346°42.29 1°16.31	15.0' 15.1'	09°43.31 09°29.01	-14.3' -14.3'	55.7' 55.7'
10	333°40.22	25.03	15°50.38	15.1'	09°29.01	-14.3	55.7'
11	348°40.35	25.94	30°24.52	15.2'	09°0.34	-14.4'	55.7'
12	3°40.47	S09°26.85	44°58.71	15.2'	N08°45.97	-14.4'	55.7'
13 14	18°40.60 33°40.72	27.76 28.67	59°32.96 74°7.27	15.3' 15.4'	08°31.57 08°17.14	-14.4' -14.4'	55.6' 55.6'
15	48°40.85	29.58	88°41.62	15.4	08°2.70	-14.5	55.6'
16	63°40.97	30.49	$103^{\circ}16.03$	15.5'	$07^{\circ}48.23$	-14.5'	55.6'
17	78°41.09	31.40	117°50.49	15.5'	07°33.74	-14.5'	55.6'
18 19	93°41.22 108°41.34	\$09°32.31 33.22	132°25.00 146°59.56	15.6' 15.6'	N07°19.23 07°4.71	-14.5' -14.5'	55.5' 55.5'
20	123°41.46	34.13	161°34.17		06°50.16		55.5'
21	138°41.58	• • 35.04	176°8.82	15.7'	06°35.60	-14.6'	55.5'
22	153°41.71	35.95	190°43.52	15.7'	06°21.02	-14.6'	55.4'
23	168°41.83	36.86	205°18.26	15.8'	06°6.43	-14.6'	55.4'
	SD = 16.0'	d = 0.9'		SI	D = 15.3'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°41.95	S09°37.77	219°53.05	15.8'	N05°51.82	-14.6'	55.4'
1 2	198°42.07 213°42.19	38.68 39.59	234°27.88 249°2.74	15.9' 15.9'	05°37.20 05°22.57	-14.6' -14.6'	55.4' 55.4'
3	213 42.19 228°42.31	. 40.49	249 2.74 263°37.65	15.9'	05 22.57 05°7.92	-14.0 -14.7'	55.3'
4	243°42.43	41.40	278°12.60	16.0'	04°53.27	-14.7'	55.3'
5	258°42.55	42.31	292°47.58	16.0'	04°38.61	-14.7'	55.3'
6 7	273°42.67 288°42.79	509°43.22 44.12	307°22.60 321°57.65	16.1' 16.1'	N04°23.93 04°9.26	-14.7' -14.7'	55.3' 55.3'
8	303°42.91	44.12 45.03	321 57.05 336°32.74	16.1	04 9.26 03°54.57	-14.7' -14.7'	55.3'
9	318°43.03	• • 45.94	351°7.85	16.2	03°39.88	-14.7'	55.2'
10	333°43.15	46.84	5°43.01	16.2'	03°25.18	-14.7'	55.2'
11	348°43.27 3°43.38	47.75 \$09°48.66	20°18.19 34°53.40	16.2' 16.2'	03°10.48 N02°55.78	-14.7' -14.7'	55.2'
12 13	3°43.38 18°43.50	49.56	49°28.63	16.2	02°41.07	-14.7' -14.7'	55.2' 55.2'
14	33°43.62	50.47	64°3.90	16.3	02°26.37	-14.7'	55.1
15	48°43.74	• • 51.37	78°39.19	16.3'	02°11.66	-14.7'	55.1'
16	63°43.85 78°43.97	52.28	93°14.50 107°49.84	16.3' 16.4'	01°56.95 01°42.25	-14.7'	55.1' 55.1'
17 18	78°43.97 93°44.09	53.18 \$09°54.09	107°49.84 122°25.20	16.4	01°42.25 N01°27.55	-14.7' -14.7'	55.1'
19	108°44.20	54.99	137°0.58	16.4	01°12.85	-14.7	55.1
20	123°44.32	55.89	151°35.98	16.4'	00°58.15	-14.7'	55.0'
21 22	138°44.43 153°44.55	· · 56.80 57.70	166°11.40 180°46.84	16.4' 16.5'	00°43.46 00°28.77	-14.7' -14.7'	55.0' 55.0'
23	153°44.55 168°44.66	57.70 58.60	180°46.84 195°22.29	16.5	00°28.77 00°14.10	-14.7' -14.7'	55.0'
	SD = 16.0'	d = 0.9'			D = 15.1'		
	<u> </u>	<u> </u>		J1			

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

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

	Sun			Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	27-11%	
16	14:23	14:30	11:46	08:11	20:33		
17	14:36	14:42	11:45	08:55	21:16		
18	14:48	14:54	11:45	09:36	21:57		

### October 19, 20, 21 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	27°43.42	201°17.17 <b>S</b> 01°6.85	161°58.42 \$17°31.64	271°33.86 N21°19.21	29°56.60 \$03°40.73	
1	42°45.89	216°16.78 8.07	176°59.13 32.15	286°36.13 19.19	44°59.21 40.79	Alpheratz 357°33.81 29°14.17 Ankaa 353°6.11 -42°9.91
2	57° 48.35	231°16.38 9.29	191°59.84 32.66	301°38.39 19.16	60°1.82 40.85	Schedar 349°29.81 56°40.91
3	72°50.81	246°15.99 · · 10.51	207°0.55 · · 33.17	316°40.66 · · 19.13	75°4.43 · · 40.91	Diphda 348°46.34 -17°50.59
4 5	87°53.28 102°55.74	261°15.59 11.74 276°15.20 12.96	222°1.26 33.68 237°1.97 34.19	331°42.93 19.10 346°45.19 19.08	90°7.03 40.96 105°9.64 41.02	Achernar 335°19.10 -57°6.26
6	102 55.74 117°58.21	291°14.80 S01°14.18	252°2.67 \$17°34.69	1°47.46 N21°19.05	120°12.25 S03°41.08	Hamal 327°50.15 23°35.20
7	133°0.67	306°14.41 15.40	267°3.38 35.20	16°49.73 19.02	135°14.86 41.14	Polaris 313°15.64 89°22.28
8	148°3.13	321°14.01 16.63	282°4.09 35.71	31°52.00 19.00	150° 17.47 41.19	Acamar 315°10.88 -40°11.87 Menkar 314°5.19 4°11.60
9	163°5.60	336°13.62 · · 17.85	297°4.79 · · 36.22	46°54.27 · · 18.97	165°20.07 · · 41.25	Menkar 314°5.19 4°11.60 Mirfak 308°26.91 49°57.17
10	178°8.06	351°13.22 19.07	312°5.50 36.73	61°56.53 18.94	180°22.68 41.31	Aldebaran 290°38.65 16°33.75
11	193°10.53	6°12.82 20.29 21°12.43 \$01°21.52	327°6.21 37.23	76°58.80 18.91 92°1.07 N21°18.89	195°25.29 41.37	Rigel 281°3.06 -8°10.11
12 13	208° 12.99 223° 15.45	21°12.43 S01°21.52 36°12.03 22.74	342°6.91 S17°37.74 357°7.62 38.25	92°1.07 N21°18.89 107°3.34 18.86	210°27.90 S03°41.42 225°30.50 41.48	Capella 280°20.67 46°1.34
14	238° 17.92	51°11.64 23.96	12°8.33 38.75	122°5.61 18.83	240°33.11 41.54	Bellatrix 278°22.01 6°22.50
15	253°20.38	66°11.24 · · 25.19	27°9.03 · · 39.26	137°7.88 · · 18.81	255°35.72 · · 41.59	Elnath 278° 0.86 28° 37.74
16	268°22.85	81°10.84 26.41	42°9.74 39.77	152°10.15 18.78	270°38.32 41.65	Alnilam 275°36.91 -1°10.97 Betelgeuse 270°51.25 7°24.82
17	283°25.31	96°10.45 27.63	57°10.44 40.27	167°12.43 18.75	285°40.93 41.71	Canopus 263°51.91 -52°42.18
18	298° 27.77	111°10.05 S01°28.85	72°11.14 S17°40.78	182°14.70 N21°18.73	300°43.54 S03°41.76	Sirius 258°25.58 -16°44.85
19 20	313°30.24 328°32.70	126°9.66 30.08 141°9.26 31.30	87°11.85 41.28 102°12.55 41.79	197°16.97 18.70 212°19.24 18.67	315° 46.14 41.82 330° 48.75 41.88	Adhara 255°5.29 -29°0.12
21	343°35.17	156°8.86 · · 32.52	117°13.26 · · 42.29	227°21.51 · · 18.65	345°51.36 · · 41.93	Procyon 244°50.16 5°9.64
22	358° 37.63	171°8.47 33.74	132°13.96 42.80	242°23.79 18.62	0°53.96 41.99	Pollux 243°16.52 27°57.79
23	13°40.09	186°8.07 34.97	147°14.66 43.30	257°26.06 18.59	15°56.57 42.05	Avior 234°14.59 -59°35.14 Suhail 222°46.01 -43°31.87
Merr	pass. 22:05	ν-0.4' d1.2' m-3.92	$\nu 0.7' \ d0.5' \ m1.51$	ν2.3' d-0.0' m-2.23	$\nu 2.6' \ d0.1' \ m0.70$	Suhail 222°46.01 -43°31.87 Miaplacidus 221°38.51 -69°49.01
14161.	-uss. 44.US	ν 0.π U1.Δ III-J.3Δ	νο.ι αυ.υ IIII.JI	ν 2.5 α-0.0 III-2.23	ν Δ.Ο UO.1 IIIO.10	Alphard 217°47.27 -8°46.05
	CIIA	CUA	CIIA	CHA	CHA	Regulus 207°33.96 11°50.52
Mon	<b>GHA</b> 28° 42.56	<b>GHA Dec</b> 201°7.67 <b>S</b> 01°36.19	<b>GHA Dec</b> 162°15.37 <b>S</b> 17°43.81	<b>GHA Dec</b> 272°28.33 N21°18.57	<b>GHA Dec</b> 30°59.18 <b>S</b> 03°42.10	Dubhe 193°40.70 61°36.56
0 1	43° 45.02	201°7.67 S01°36.19 216°7.28 37.41	162°15.37 \$17°43.81 177°16.07 44.31	287°30.61 18.54	46°1.78 42.16	Denebola 182°24.59 14°25.73
2	58° 47.49	231°6.88 38.63	192°16.77 44.81	302°32.88 18.52	61°4.39 42.22	Gienah 175° 43.26 -17° 40.97
3	73°49.95	246°6.48 · · 39.86	207°17.47 · · 45.32	317°35.15 · · 18.49	76°6.99 · · 42.27	Acrux 173°0.11 -63°14.38 Gacrux 171°51.54 -57°15.32
4	88°52.41	261°6.08 41.08	222°18.17 45.82	332°37.43 18.46	91°9.60 42.33	Alioth 166°12.94 55°49.15
5	103°54.88	276°5.69 42.30	237°18.88 46.32	347°39.70 18.44	106°12.20 42.39	Spica 158°21.97 -11°17.66
6	118° 57.34	291°5.29 S01°43.52	252°19.58 \$17°46.83 267°20.28 47.33	2°41.98 N21°18.41	121°14.81 \$03°42.44	Alkaid 152°51.98 49°11.09
7 8	133°59.81 149°2.27	306°4.89 44.75 321°4.49 45.97	267°20.28 47.33 282°20.98 47.83	17°44.26 18.38 32°46.53 18.36	136°17.41 42.50 151°20.02 42.55	Hadar 148°35.80 -60°29.81
9	164°4.73	336°4.10 · · 47.19	297°21.68 · · 48.34	47°48.81 · · 18.33	166°22.63 · · 42.61	Menkent 147°57.29 -36°29.75
10	179°7.20	351°3.70 48.42	312°22.38 48.84	62°51.08 18.31	181°25.23 42.67	Arcturus 145°47.67 19°2.96 Rigil Kent. 139°40.13 -60°56.52
11	194°9.66	6°3.30 49.64	327°23.08 49.34	77°53.36 18.28	196°27.84 42.72	Rigil Kent. 139°40.13 -60°56.52 Kochab 137°20.89 74°2.98
12	209° 12.13	21°2.90 <b>S</b> 01°50.86	342°23.78 <b>S</b> 17°49.84	92°55.64 N21°18.26	211°30.44 \$03°42.78	Zuben'ubi 136°55.65 -16°8.87
13	224° 14.59	36°2.51 52.08	357°24.48 50.34	107°57.92 18.23	226°33.04 42.83	Alphecca 126°3.53 26°37.79
14 15	239° 17.05 254° 19.52	51°2.11 53.31 66°1.71 • 54.53	12°25.18 50.84 27°25.87 · · 51.34	123°0.19 18.20 138°2.47 · · 18.18	241°35.65 42.89 256°38.25 • 42.95	Antares 112°15.35 -26°29.35
16	269°21.98	81°1.31 55.75	42°26.57 51.84	153°4.75 18.15	271°40.86 43.00	Atria 107°9.39 -69°4.58
17	284°24.45	96°0.91 56.97	57°27.27 52.34	168°7.03 18.13	286°43.46 43.06	Sabik 102°2.29 -15°45.38 Shaula 96°9.75 -37°7.42
18	299°26.91	111°0.51 <b>S</b> 01°58.20	72°27.97 <b>S</b> 17°52.84	183°9.31 N21°18.10	301°46.07 <b>S</b> 03°43.11	Shaula 96°9.75 -37°7.42 Rasalhague 95°58.16 12°32.61
19	314°29.37	126°0.11 01°59.42	87°28.67 53.34	198°11.59 18.08	316°48.67 43.17	Eltanin 90°42.15 51°29.34
20	329°31.84	140°59.72 02°0.64	102°29.36 53.84	213°13.87 18.05	331°51.27 43.22	Kaus Aust. 83°31.83 -34°22.41
21 22	344°34.30 359°36.77	155°59.32 · · 1.86 170°58.92 3.09	117°30.06 · · 54.34 132°30.76 54.84	228°16.15 · · 18.03 243°18.43 18.00	346°53.88 · · 43.28 1°56.48 43.33	Vega 80°32.95 38°48.68
23	14°39.23	185°58.52 4.31	147°31.45 55.34	258°20.71 17.98	16°59.09 43.39	Nunki 75°47.08 -26°15.91
						Altair 61°59.36 8°56.33
Mer.p	pass. 22:02	ν-0.4' d1.2' m-3.92	$\nu 0.7' \ d0.5' \ m1.51$	ν2.3' d-0.0' m-2.24	ν2.6' d0.1' m0.70	Peacock 53°4.65 -56°39.31 Deneb 49°25.31 45°22.62
						Enif 33°38.04 9°59.76
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.85 -46°50.27
0 1	29°41.70 44°44.16	200°58.12 S02°5.53 215°57.72 6.75	162°32.15 S17°55.84 177°32.85 56.34	273°22.99 N21°17.95 288°25.27 17.93	32°1.69	Fomalhaut 15°13.55 -29°29.13
2	59° 46.62	230°57.32 7.97	177 32.65 50.34 192°33.54 56.84	303°27.55 17.90	47°4.29 43.50 62°6.90 43.55	Scheat 13°44.34 28°13.58
3	74° 49.09	245°56.92 · · 9.20	207°34.24 · · 57.33	318°29.84 · · 17.88	77°9.50 · · 43.61	Markab 13°29.04 15°20.83
4	$89^{\circ}51.55$	260°56.52 10.42	222°34.93 57.83	333°32.12 17.85	92°12.10 43.66	Oct 19 Sun SHA Mer.pass
5	104°54.02	275°56.12 11.64	237°35.63 58.33	348°34.40 17.83	107°14.71 43.72	Venus 173° 33.75 10:35
6	119°56.48	290°55.72 \$02°12.86	252°36.32 \$17°58.83	3°36.69 N21°17.80	122°17.31 \$03°43.77	Mars 134°15.00 13:11
7 8	134°58.94 150°1.41	305°55.32 14.09 320°54.92 15.31	267°37.02 59.32 282°37.71 17°59.82	18°38.97 17.78 33°41.25 17.75	137° 19.91 43.83 152° 22.51 43.88	Jupiter 243°50.44 05:53 Saturn 2°13.18 21:56
9	165°3.87	335°54.52 · · 16.53	297°38.40 18°0.32	48°43.54 · · 17.73	167°25.12 · · 43.94	
10	180°6.34	350°54.12 17.75	312°39.10 0.81	63°45.82 17.70	182°27.72 43.99	Oct 20 Mon SHA Mer.pass
11	195°8.80	5°53.72 18.97	327°39.79 1.31	78°48.11 17.68	197°30.32 44.05	Venus 172°25.11 10:36 Mars 133°32.81 13:10
12	210°11.26	20°53.32 S02°20.20	342°40.48 \$18°1.81	93°50.39 N21°17.65	212°32.92 \$03°44.10	Jupiter 243°45.77 05:49
13	225°13.73	35°52.92 21.42	357°41.18 2.30	108°52.68 17.63	227°35.53 44.16	Saturn 2°16.62 21:52
14 15	240° 16.19 255° 18.66	50°52.52 22.64 65°52.12 · · 23.86	12°41.87 2.80 27°42.56 · · 3.29	123°54.96 17.61 138°57.25 · · 17.58	242°38.13 44.21 257°40.73 •• 44.27	
16	270°21.12	80°51.72 25.08	42°43.25 3.79	153°59.53 17.56	272°43.33 44.32	Oct 21 Tue SHA Mer.pass Venus 171°16.42 10:36
17	285°23.58	95°51.32 26.31	57°43.94 4.28	169°1.82 17.53	287°45.93 44.37	Mars 132°50.46 13:09
18	300°26.05	110°50.92 S02°27.53	72°44.64 <b>S</b> 18°4.78	184°4.11 N21°17.51	302°48.53 <b>S</b> 03°44.43	Jupiter 243°41.30 05:46
19	315°28.51	125°50.51 28.75	87°45.33 5.27	199°6.40 17.48	317°51.14 44.48	Saturn 2°19.99 21:48
20 21	330°30.98 345°33.44	140°50.11 29.97 155°49.71 · · 31.19	102°46.02 5.76 117°46.71 • 6.26	214°8.68 17.46 229°10.97 · 17.44	332°53.74 44.54 347°56.34 • 44.59	Horizontal parallax
22	0°35.90	170°49.31 32.42	132°47.40 6.75	244°13.26 17.41	2°58.94 44.64	Venus: 0.1
23	15°38.37	185°48.91 33.64	147°48.09 7.24	259°15.55 17.39	18°1.54 44.70	Mars: 0.1
	pass. 21:58	ν-0.4' d1.2' m-3.92	ν0.7' d0.5' m1.50	ν2.3' d-0.0' m-2.24	ν2.6' d0.1' m0.71	
14101.		ν σ.τ ατ.Σ III-σ.σ2		ν 2.0 G 0.0 ΠΓ-2.2+		

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	НР
0	183°44.78	S09°59.51	$209^{\circ}57.76$	16.5'	S00°0.58	14.7'	55.0'
1	198°44.89	10°0.41	224°33.25	16.5'	00°15.24	14.7'	54.9'
2	213°45.01 228°45.12	1.31 · · 2.21	239°8.74 253°44.25	16.5' 16.5'	00°29.89 00°44.54	14.6' 14.6'	54.9' 54.9'
4	243°45.24	3.11	268° 19.78	16.5	00° 44.54 00° 59.17	14.6'	54.9'
5	258°45.35	4.02	282°55.31	16.5'	01°13.79	14.6'	54.9'
6	273°45.46	<b>S</b> 10°4.92	297°30.85	16.5'	<b>S</b> 01°28.40	14.6'	54.9'
7	288°45.58	5.82	312°6.40	16.6'	01°43.00	14.6'	54.8'
8 9	303°45.69 318°45.80	6.72 •• 7.62	326°41.95 341°17.51	16.6' 16.6'	01°57.58 02°12.14	14.6' 14.6'	54.8' 54.8'
10	333°45.91	8.52	355°53.08	16.6'	02 12.14 02°26.70	14.5	54.8'
11	348°46.02	9.42	10°28.65	16.6'	02°41.23	14.5'	54.8'
12	3°46.14	S10°10.32	25°4.22	16.6'	S02°55.75	14.5'	54.8'
13	18°46.25	11.22	39°39.80	16.6'	03°10.25	14.5'	54.8'
14 15	33°46.36 48°46.47	12.12 •• 13.02	54° 15.37 68° 50.95	16.6' 16.6'	03°24.73 03°39.19	14.5' 14.4'	54.7' 54.7'
16	63°46.58	13.92	83°26.52	16.6'	03°53.62	14.4'	54.7'
17	78°46.69	14.82	98°2.10	16.6'	04°8.04	14.4'	54.7'
18	93°46.80	\$10° 15.71	112°37.66	16.6'	S04°22.44	14.4'	54.7'
19	108°46.91	16.61	127° 13.23	16.6'	04°36.81	14.3'	54.7'
20 21	123°47.02 138°47.13	17.51 •• 18.41	141°48.78 156°24.34	16.6' 16.5'	04°51.16 05°5.48	14.3' 14.3'	54.7' 54.6'
22	158 47.13 153°47.24	19.30	150 24.34 170°59.88	16.5	05 5.48 05°19.78	14.3'	54.6'
23	168°47.34	20.20	185°35.42	16.5'	05°34.05	14.2'	54.6'
	SD = 16.0'	d = 0.9'		SF	0 = 15.0'		
				- 52	10.0		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°47.45 198°47.56	\$10°21.10	200° 10.94 214° 46.46	16.5'	\$05°48.29 06°2.51	14.2' 14.2'	54.6'
1 2	198°47.56 213°47.67	21.99 22.89	214 46.46 229°21.96	16.5' 16.5'	06° 2.51	14.2'	54.6' 54.6'
3	228°47.77	. 23.79	243°57.46	16.5'	06°30.85	14.1'	54.6'
4	243°47.88	24.68	258°32.93	16.5'	$06^{\circ}44.98$	14.1'	54.5'
5	258°47.99	25.58	273°8.40	16.4'	06°59.08	14.1'	54.5'
6	273°48.09 288°48.20	\$10°26.47 27.37	287°43.85 302°19.28	16.4' 16.4'	507°13.14 07°27.17	14.0' 14.0'	54.5' 54.5'
7 8	303°48.31	28.26	302 19.28 316°54.70	16.4	07 27.17 07°41.17	14.0'	54.5'
9	318°48.41	29.16	331°30.10	16.4'	07°55.13	13.9'	54.5'
10	333°48.52	30.05	346°5.48	16.4'	$08^{\circ}9.06$	13.9'	54.5'
11	348°48.62	30.94	0°40.83	16.3'	08°22.95	13.9'	54.4'
12 13	3°48.73 18°48.83	\$10°31.84 32.73	15° 16.17 29° 51.49	16.3' 16.3'	\$08° 36.80 08° 50.62	13.8' 13.8'	54.4' 54.4'
14	33°48.94	33.62	44°26.78	16.3'	08 50.02 09°4.39	13.7	54.4
15	48°49.04	• • 34.52	59°2.05	16.2'	09°18.13	13.7'	54.4'
16	63°49.14	35.41	73°37.30	16.2'	09°31.83	13.7'	54.4'
17	78°49.25	36.30 \$10°37.19	88° 12.52	16.2'	09°45.48 \$09°59.10	13.6'	54.4'
18 19	93°49.35 108°49.45	38.08	102°47.71 117°22.88	16.2' 16.1'	10° 12.67	13.6' 13.5'	54.4' 54.4'
20	123°49.55	38.97	131°58.02		10°26.20		54.3'
21	138°49.66	• • 39.87	$146^{\circ}33.13$	16.1'	$10^{\circ}39.68$	13.4'	54.3'
22	153°49.76	40.76	161°8.21	16.0'	10°53.12	13.4'	54.3'
23	168°49.86	41.65	175°43.26	16.0'	11°6.51	13.3'	54.3'
	SD = 16.1'	d = 0.9'		SE	0 = 14.9'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.96	S10°42.54	190° 18.28	16.0'	S11°19.86	13.3'	54.3'
1	198°50.06	43.43	204°53.26	16.0'	11°33.16	13.2'	54.3'
2	213°50.16 228°50.26	44.32	219°28.22 234°3.13	15.9' 15.9'	11°46.41 11°59.61	13.2'	54.3'
3 4	228°50.26 243°50.36	· · 45.21 46.09	234° 3.13 248° 38.02	15.9° 15.8'	11°59.61 12°12.76	13.2' 13.1'	54.3' 54.3'
5	258°50.46	46.98	263°12.87	15.8'	12°25.86	13.1	54.2'
6	273°50.56	S10°47.87	277°47.68	15.8'	S12°38.90	13.0'	54.2'
7	288°50.66	48.76	292°22.46	15.7'	12°51.90	12.9'	54.2'
8 9	303°50.76 318°50.86	49.65 •• 50.54	306°57.19 321°31.89	15.7' 15.7'	13°4.84 13°17.73	12.9' 12.8'	54.2' 54.2'
10	318 50.86 333°50.96	51.42	321 31.89 336°6.55	15.7 15.6'	13 17.73 13°30.56	12.8'	54.2'
11	348°51.06	52.31	350°41.17	15.6'	13°43.34	12.7'	54.2'
12	3°51.15	S10°53.20	5° 15.75	15.5'	<b>S</b> 13°56.06	12.7'	54.2'
13	18°51.25	54.08	19°50.28	15.5'	14°8.72	12.6'	54.2'
14 15	33°51.35 48°51.45	54.97 •• 55.86	34°24.78 48°59.23	15.5' 15.4'	14°21.32 14°33.87	12.5' 12.5'	54.2' 54.1'
16	63°51.54	56.74	63°33.64	15.4'	14 33.67 14°46.35	12.5	54.1'
17	78°51.64	57.63	78°8.00	15.3'	14°58.77	12.4'	54.1'
18	93°51.74	S10°58.51	92°42.32	15.3'	\$15°11.13	12.3'	54.1'
19	108°51.83	10°59.40	107° 16.59	15.2'	15°23.43	12.2'	54.1'
20 21	123°51.93 138°52.02	11°0.28 · · 1.17	121°50.81 136°24.99	15.2' 15.1'	15° 35.67 15° 47.84	12.2' 12.1'	54.1' 54.1'
22	153°52.12	2.05	150° 59.12	15.1	15° 59.95	12.1	54.1
23	168°52.21	2.93	165°33.20	15.0'	16°11.98	12.0'	54.1'
	SD = 16.1'	d = 0.9'		SD	0 = 14.8'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	28-0
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	6-0%
19	14:59	15:05	11:45	10:17	22:37	
20	15:10	15:15	11:45	10:57	23:18	
21	15:20	15:25	11:45	11:38	-:-	

### October 22, 23, 24 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	30°40.83	200°48.51 S02°34.5		274°17.84 N21°17.36	33°4.14		
1	45° 43.30	215°48.10 36.		289°20.13 17.34	48°6.74 44.81	Alpheratz 357°33.81 Ankaa 353°6.11	
2	60°45.76	230° 47.70 37.5		304°22.42 17.32	63°9.34 44.86	Ankaa 353°6.11 Schedar 349°29.81	
3	75° 48.22	245°47.30 · · 38.		319°24.71 · · 17.29	78°11.94 · · 44.91	Diphda 348°46.35	
4	90°50.69	260°46.90 39.		334°27.00 17.27	93°14.54 44.97	Achernar 335°19.10	
5 6	105° 53.15 120° 55.62	275°46.49 40.9 290°46.09 \$02°42.		349°29.29 17.25 4°31.58 N21°17.22	108° 17.15 45.02 123° 19.75 \$03° 45.07	Hamal 327°50.14	
7	135° 58.08	305°45.69 43.		19°33.87 17.20	138°22.35 45.13	Polaris 313°14.82	
8	151°0.55	320°45.29 44.		34°36.16 17.18	153°24.95 45.18	Acamar 315°10.87	
9	166°3.01	335°44.88 · · 45.	35 297°54.97 ·· 12.16	49°38.45 · · 17.15	168°27.55 · · 45.23	Menkar 314°5.18 Mirfak 308°26.89	
10	181°5.47	350°44.48 47.0		64°40.75 17.13	183°30.15 45.29	Aldebaran 290°38.63	
11	196°7.94	5°44.08 48.3		79°43.04 17.11	198°32.75 45.34	Rigel 281°3.04	
12	211°10.40 226°12.87	20°43.67 S02°49.8 35°43.27 50.		94°45.33 N21°17.08 109°47.63 17.06	213°35.34	Capella 280°20.65	
13 14	241° 15.33	35°43.27 50.° 50°42.87 51.9		109°47.63 17.06 124°49.92 17.04	228°37.94 45.45 243°40.54 45.50	Bellatrix 278°21.99	
15	256° 17.79	65°42.46 · · 53.		139°52.21 · · 17.01	258° 43.14 · · 45.55	Elnath 278° 0.84	
16	271°20.26	80°42.06 54.4		154°54.51 16.99	273°45.74 45.61	Alnilam 275°36.89	
17	286°22.72	95°41.65 55.		169°56.80 16.97	288°48.34 45.66	Betelgeuse 270°51.23 Canopus 263°51.89	
18	301°25.19	110°41.25 S02°56.		184°59.10 N21°16.94	303°50.94 <b>S</b> 03°45.71	Sirius 258°25.56	
19	316°27.65	125° 40.84 58.		200°1.39 16.92	318° 53.54 45.76	Adhara 255° 5.27	
20 21	331°30.11 346°32.58	140°40.44 02°59.3 155°40.04 03°0.3		215°3.69 16.90 230°5.99 •• 16.88	333°56.14 45.82 348°58.74 · · 45.87	Procyon 244°50.14	5°9.63
22	1°35.04	170°39.63 1.		245°8.28 16.85	4°1.33 45.92	Pollux 243°16.50	
23	16°37.51	185°39.23 2.9		260°10.58 16.83	19°3.93 45.97	Avior 234°14.55	
		-		ν2.3' d-0.0' m-2.25		Suhail 222°45.98	
ivier.p	pass. 21:54	ν-0.4' d1.2' m-3.9	2	ν2.3 <i>a</i> -0.0 m-2.25	ν2.6′ d0.1′ m0.71	Miaplacidus 221°38.46 Alphard 217°47.26	
						Regulus 207°33.94	
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°40.68	
0	31°39.97	200°38.82 \$03°4.		275°12.88 N21°16.81	34°6.53 S03°46.03	Denebola 182°24.58	
1 2	46° 42.44 61° 44.90	215°38.42 5.3 230°38.01 6.0		290°15.17 16.79 305°17.47 16.76	49°9.13 46.08 64°11.73 46.13	Gienah 175°43.25	
3	76° 47.36	245°37.60 · · 7.5		320°19.77 · · 16.74	79°14.33 · · 46.18	Acrux 173°0.09	
4	91°49.83	260° 37.20 9.0		335°22.07 16.72	94°16.92 46.24	Gacrux 171°51.53	
5	$106^{\circ}52.29$	275°36.79 10.:	26 238°8.65 21.93	350°24.37 16.70	109°19.52 46.29	Alioth 166°12.93 Spica 158°21.97	
6	121°54.76	290°36.39 <b>S</b> 03°11.	_	5°26.66 N21°16.67	124°22.12 <b>S</b> 03°46.34	Alkaid 152°51.98	
7	136° 57.22	305°35.98 12.		20°28.96 16.65	139°24.72 46.39	Hadar 148°35.80	
8 9	151°59.68 167°2.15	320°35.57 13.		35°31.26 16.63	154°27.31 46.45	Menkent 147°57.29	
10	167 2.15 182°4.61	335°35.17 · · 15.3 350°34.76 16.3		50°33.56 · · 16.61 65°35.86 · · 16.59	169°29.91 · · 46.50 184°32.51 46.55	Arcturus 145°47.67	
11	197°7.08	5°34.36 17.		80°38.16 16.56	199°35.10 46.60	Rigil Kent. 139°40.13	
12	212°9.54	20°33.95 S03°18.		95°40.47 N21°16.54	214°37.70 \$03°46.65	Kochab 137°20.91 Zuben'ubi 136°55.66	
13	227°12.00	35°33.54 20.	02 358°14.10 25.81	110°42.77 16.52	229°40.30 46.70	Zuben'ubi 136°55.66 Alphecca 126°3.54	
14	242°14.47	50°33.13 21.		125°45.07 16.50	244° 42.90 46.76	Antares 112° 15.36	
15	257° 16.93	65°32.73 · · 22.		140°47.37 · · 16.48	259°45.49 · · 46.81	Atria 107°9.42	
16 17	272°19.40 287°21.86	80°32.32 23.0 95°31.91 24.0		155°49.67 16.45 170°51.98 16.43	274°48.09 46.86 289°50.68 46.91	Sabik 102°2.30	
18	302°24.33	95 31.91 24.5 110°31.50 \$03°26.5		185°54.28 N21°16.41	304°53.28 S03°46.96	Shaula 96°9.77	
19	317°26.79	125°31.10 27.		200°56.58 16.39	319°55.88 47.01	Rasalhague 95°58.17	
20	332°29.25	140°30.69 28.		215°58.89 16.37	334°58.47 47.07	Eltanin 90°42.17 Kaus Aust. 83°31.85	51°29.34 -34°22.41
21	$347^{\circ}31.72$	155°30.28 · · 29.		231°1.19 · · 16.35	350°1.07 · · 47.12	Vega 80°32.96	
22	2°34.18	170°29.87 30.9		246°3.49 16.33	5°3.66 47.17	1	-26°15.91
23	17°36.65	185°29.46 32.:	21 148°20.88 30.63	261°5.80 16.30	20°6.26 47.22	Altair 61°59.38	8°56.33
Mer.p	oass. 21:50	$\nu$ -0.4' $d1.2'$ m-3.9	2 $\nu 0.7' \ d0.5' \ m1.50$	$\nu$ 2.3′ <i>d</i> -0.0′ m-2.26	$ u 2.6' \ d0.1' \ m0.72$		-56°39.31
						Deneb 49°25.33	
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.05	
0	32°39.11	200°29.06 \$03°33.		276°8.10 N21°16.28	35°8.86 \$03°47.27	Al Na'ir 27°31.87 Fomalhaut 15°13.57	-46°50.27 -29°29.14
1	47° 41.57	215°28.65 34.	55 178°22.23 31.59	291°10.41 16.26	50°11.45 47.32	Scheat 13°44.35	
2	62°44.04	230°28.24 35.3		306°12.71 16.24	65°14.05 47.37	Markab 13°29.05	
3 4	77° 46.50 92° 48.97	245°27.83 · · 37.0 260°27.42 38.3		321°15.02 · · 16.22 336°17.33 16.20	80°16.64 · · 47.42 95°19.24 47.47	Oct 22 Wed SHA	Mer.pass
4 5	92 48.97 107°51.43	275° 27.01 39.		350 17.33 10.20 351°19.63 16.18	95 19.24 47.47 110°21.83 47.52	Venus 170°7.67	
6	122°53.89	290°26.60 S03°40.		6°21.94 N21°16.16	125°24.43 S03°47.58	Mars 132°7.94	
7	137° 56.36	305°26.19 41.		21°24.25 16.14	140°27.02 47.63	Jupiter 243°37.01	. 05:42
8	152° 58.82	320°25.78 43.		36°26.56 16.11	155°29.62 47.68	Saturn 2°23.31	21:44
9	168°1.29	335°25.37 · · 44.3		51°28.86 · · 16.09	170°32.21 · · 47.73	Oct 23 Thu SHA	Mer.pass
10	183°3.75	350°24.96 45.		66°31.17 16.07	185°34.80 47.78	Venus 168° 58.85	•
11 12	198°6.22 213°8.68	5°24.55 46.3 20°24.14 \$03°48.		81°33.48 16.05 96°35.79 N21°16.03	200°37.40 47.83 215°39.99 \$03°47.88	Mars 131°25.27	
13	213 0.00 228°11.14	35°23.73 49.		111°38.10 16.01	230°42.59 47.93	Jupiter 243°32.90	
14	243° 13.61	50°23.32 50.		126°40.41 15.99	245°45.18 47.98	Saturn 2°26.56	21:40
15	$258^{\circ}16.07$	65°22.91 · · 51.	59 28°31.66 ·· 38.30	141°42.72 · · 15.97	260°47.77 · · 48.03	Oct 24 Fri SHA	Mer.pass
16	273° 18.54	80°22.50 52.		156°45.03 15.95	275°50.37 48.08	Venus 167°49.95	10:38
17	288°21.00	95°22.09 54.		171°47.34 15.93	290°52.96 48.13	Mars 130°42.44	
18 19	303°23.46 318°25.93	110°21.67 <b>S</b> 03°55.3 125°21.26 <b>5</b> 6.3		186°49.65 N21°15.91 201°51.96 15.89	305°55.55	Jupiter 243°28.99	
20	318° 25.93 333° 28.39	125°21.26 56.5 140°20.85 57.		201°51.96 15.89 216°54.27 15.87	320°58.15 48.23 336°0.74 48.28	Saturn 2°29.75	21:36
21	348° 30.86	155°20.44 03°58.9		231°56.59 · · 15.85	351°3.33 · · 48.33	Horizontal parallax	1
22	3°33.32	170°20.03 04°0.	_	246°58.90 15.83	6°5.93 48.38	Venus	
23	18°35.79	185°19.61 1.	43 148°37.03 42.11	262°1.21 15.81	21°8.52 48.43	Mars	: 0.1
Mer.	pass. 21:46	ν-0.4' d1.2' m-3.9	$\frac{1}{2} \frac{1}{\nu_{0.7'} d_{0.5'} m_{1.49}}$	ν2.3' d-0.0' m-2.27	ν2.6' d0.1' m0.73		
				·			

	011-010 =	T0.0030 Sec		-011 -	- +09.1010		
h	Su	n			Moon		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°52.31	S11°3.82	180°7.23	15.0'	S16°23.96	11.9'	54.1'
1	198°52.40 213°52.49	4.70	194°41.21 209°15.15	14.9' 14.9'	16°35.86 16°47.70	11.8' 11.8'	54.1' 54.1'
2 3	213 52.49 228°52.59	5.58 •• 6.47	209 15.15 223°49.03	14.9 14.8'	16 47.70 16°59.47	11.8	54.1 54.0'
4	243°52.68	7.35	238°22.86	14.8'	17° 11.17	11.6'	54.0'
5	258°52.77	8.23	252° 56.63	14.7'	17°22.79	11.6'	54.0'
6	273°52.87	S11°9.11	267°30.36	14.7'	<b>S</b> 17°34.35	11.5'	54.0'
7	288°52.96	9.99	282°4.03	14.6'	17°45.83	11.4'	54.0'
8 9	303°53.05 318°53.14	10.87 •• 11.75	296°37.65 311°11.21	14.6' 14.5'	17°57.24 18°8.57	11.3' 11.3'	54.0' 54.0'
10	333°53.23	12.64	325°44.72	14.5'	18° 19.83	11.2'	54.0'
11	348°53.32	13.52	$340^{\circ}18.17$	14.4'	$18^{\circ}31.01$	11.1'	54.0'
12	3°53.42	S11°14.40	354°51.57	14.3'	S18°42.11	11.0'	54.0'
13 14	18°53.51 33°53.60	15.27 16.15	9°24.91 23°58.19	14.3' 14.2'	18°53.14 19°4.09	10.9' 10.9'	54.0' 54.0'
15	48°53.69	17.03	25 56.19 38°31.42	14.2'	19 4.09 19°14.96	10.9	54.0'
16	63°53.78	17.91	53°4.59	14.1'	19°25.75	10.7	54.0'
17	78°53.87	18.79	67°37.70	14.1'	$19^{\circ}36.45$	10.6'	54.0'
18	93°53.95	S11°19.67	82°10.76	14.0'	\$19°47.08	10.5'	54.0'
19	108°54.04 123°54.13	20.55	96°43.75 111°16.69	13.9' 13.9'	19°57.62 20°8.08	10.5'	54.0'
20 21	123°54.13 138°54.22	21.42 •• 22.30	111° 16.69 125° 49.57	13.9	20° 8.08 20° 18.45	10.4' 10.3'	53.9' 53.9'
22	153°54.31	23.18	140°22.38	13.8'	20° 28.74	10.2	53.9'
23	168°54.39	24.05	154°55.14	13.7'	20°38.94	10.1'	53.9'
	SD = 16.1'	d = 0.9'		SF	0 = 14.7'		
					<u> </u>		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0 1	183°54.48 198°54.57	\$11°24.93 25.81	169°27.84 184°0.48	13.6' 13.6'	\$20°49.06 20°59.08	10.0' 9.9'	53.9' 53.9'
2	213°54.66	26.68	198°33.05	13.5'	20° 59.08 21° 9.02	9.8'	53.9
3	228°54.74	27.56	213°5.57	13.5'	21° 18.87	9.8'	53.9'
4	243°54.83	28.43	227°38.02	13.4'	$21^{\circ}28.62$	9.7'	53.9'
5	258°54.91	29.31	242°10.41	13.3'	21°38.29	9.6'	53.9'
6 7	273°55.00 288°55.08	S11°30.18 31.06	256° 42.74 271° 15.01	13.3' 13.2'	\$21°47.86 21°57.34	9.5' 9.4'	53.9' 53.9'
8	303°55.17	31.93	285° 47.22	13.1'	21 57.34 22°6.73	9.4	53.9'
9	318°55.25	• • 32.81	300° 19.36	13.1'	22°16.02	9.2'	53.9'
10	333°55.34	33.68	314°51.44	13.0'	$22^{\circ}25.22$	9.1'	53.9'
11	348°55.42	34.55	329°23.46	13.0'	22°34.31	9.0'	53.9'
12 13	3°55.51 18°55.59	\$11°35.42 36.30	343°55.42 358°27.32	12.9' 12.8'	\$22°43.32 22°52.22	8.9' 8.8'	53.9' 53.9'
14	33°55.67	37.17	12°59.15	12.8'	23°1.02	8.7'	53.9
15	48°55.76	• • 38.04	27°30.92	12.7'	23°9.73	8.6'	53.9'
16	63°55.84	38.91	42°2.62	12.6'	23° 18.33	8.5'	53.9'
17 18	78°55.92 93°56.00	39.78 \$11°40.65	56°34.27 71°5.85	12.6' 12.5'	23°26.83 \$23°35.23	8.4' 8.3'	53.9' 53.9'
19	108°56.08	41 52	85°37.37		23°43.53	6.3 8.2'	53.9'
20	123°56.16	42.40	100°8.83	12.4'	23°51.72	8.1'	53.9'
21	138°56.25	• • 43.27	114°40.23	12.3'	$23^{\circ}59.81$	8.0'	53.9'
22	153°56.33	44.13	129°11.56	12.3'	24°7.79	7.9'	53.9'
23	168°56.41	45.00	143°42.83	12.2'	24° 15.67	7.8'	53.9'
	SD = 16.1'	d = 0.9'		SE	0 = 14.7'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°56.49	S11°45.87	158° 14.04	12.1'	S24°23.44	7.7'	53.9'
1	198°56.57	46.74	172°45.19	12.1'	24°31.10	7.6'	53.9'
2	213°56.65	47.61	187°16.28	12.0'	24° 38.65	7.4'	53.9'
3 4	228°56.73 243°56.80	•• 48.48 49.35	201°47.30 216°18.27	12.0' 11.9'	24°46.10 24°53.43	7.3' 7.2'	53.9' 53.9'
5	258° 56.88	50.21	230°49.17	11.8'	24 55.45 25°0.65	7.1	53.9
6	273°56.96	S11°51.08	245°20.02	11.8'	\$25°7.76	7.0'	53.9'
7	288°57.04	51.95	259° 50.80	11.7'	25° 14.76	6.9'	53.9'
8 9	303°57.12 318°57.19	52.81 •• 53.68	274°21.53 288°52.19	11.7' 11.6'	25°21.64 25°28.41	6.8' 6.7'	53.9' 53.9'
9 10	318°57.19 333°57.27	54.55	303°22.80	11.5	25° 28.41 25° 35.07	6.5'	53.9' 53.9'
11	348°57.35	55.41	317°53.35	11.5'	25°41.61	6.4	53.9'
12	3°57.42	S11°56.28	332°23.84	11.4'	S25°48.03	6.3'	53.9'
13	18°57.50	57.14	346°54.27	11.4'	25°54.34	6.2'	53.9'
14 15	33°57.58 48°57.65	58.01 •• 58.87	1°24.65 15°54.96	11.3' 11.3'	26°0.53 26°6.60	6.1' 6.0'	53.9' 53.9'
16	63°57.73	11°59.74	30°25.23	11.3	26° 12.55	5.8'	53.9'
17	78°57.80	12°0.60	44° 55.44	11.2'	26° 18.38	5.7'	53.9'
18	93°57.88	S12°1.46	59°25.59	11.1'	S26°24.09	5.6'	53.9'
19	108°57.95	2.33	73°55.69	11.0'	26°29.68	5.5'	53.9'
20 21	123°58.02 138°58.10	3.19 •• 4.05	88°25.73 102°55.72	11.0' 10.9'	26°35.15 26°40.50	5.3' 5.2'	53.9' 53.9'
22	150 50.10 153°58.17	4.91	102 55.72 117°25.66	10.9	26°45.72	5.2 5.1'	53.9'
23	168°58.24	5.77	131°55.55	10.8'	26° 50.82	5.0'	53.9'
	SD = 16.1'	d = 0.9'	-	SE	0 = 14.7'		
				JL			

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age 1-3
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-6%
22	15:29	15:34	11:44	12:21	00:00	
23	15:38	15:42	11:44	13:06	00:43	
24	15:46	15:50	11:44	13:54	01:30	

### October 25, 26, 27 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Sta	ars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	S	HA Dec
0	33°38.25	200°19.20 <b>S</b> 04°2.64	163°37.70 \$18°42.59	277°3.52 N21°15.79	36°11.11 <b>S</b> 03°48.48		
1	48°40.71	215°18.79 3.86	178°38.37 43.06	292°5.84 15.77	51°13.71 48.53		°33.81 29°14.18 3°6.12 -42°9.93
2	63°43.18	230° 18.38 5.08	193°39.04 43.54	307°8.15 15.75	66°16.30 48.58		°29.81 56°40.93
3	78° 45.64	245°17.96 · · 6.29	208°39.71 · · 44.01	322°10.47 · · 15.73	81°18.89 · · 48.63		°46.34 -17°50.61
4	93°48.11	260°17.55 7.51 275°17.14 8.72	223°40.38 44.48 238°41.05 44.96	337°12.78 15.71	96°21.48 48.68		°19.10 -57°6.29
5 6	108° 50.57 123° 53.03	275°17.14 8.72 290°16.72 \$04°9.94	238°41.05 44.96 253°41.72 \$18°45.43	352°15.10 15.69 7°17.41 N21°15.67	111°24.07 48.73 126°26.67 \$03°48.77		°50.13 23°35.20
7	138°55.50	305°16.31 11.15	268°42.38 45.90	22°19.73 15.65	141°29.26 48.82		°13.94 89°22.31
8	153° 57.96	320°15.90 12.37	283°43.05 46.38	37°22.04 15.63	156°31.85 48.87		°10.86 -40°11.90
9	169°0.43	335°15.48 · · 13.58	298°43.72 · · 46.85	52°24.36 · · 15.61	171°34.44 · · 48.92		4°5.16 4°11.60 °26.87 49°57.18
10	184°2.89	350° 15.07 14.80	313°44.38 47.32	67°26.67 15.59	186° 37.03 48.97		°38.61 16°33.75
11	199°5.36	5°14.65 16.01	328°45.05 47.80	82°28.99 15.57	201°39.62 49.02		1°3.02 -8°10.13
12	214°7.82 229°10.28	20°14.24	343°45.72 \$18°48.27 358°46.38 48.74	97°31.31 N21°15.56 112°33.63 15.54	216° 42.22 S03° 49.07 231° 44.81 49.12		°20.62 46°1.35
13 14	229 10.28 244°12.75	35°13.82 18.44 50°13.41 19.66	358°46.38 48.74 13°47.05 49.21	112°33.63 15.54 127°35.94 15.52	231°44.81 49.12 246°47.40 49.17		°21.97 6°22.50
15	259° 15.21	65°12.99 · · 20.87	28°47.72 · · 49.68	142°38.26 · · 15.50	261°49.99 · · 49.22		8°0.81 28°37.74
16	274° 17.68	80°12.58 22.09	43°48.38 50.15	157°40.58 15.48	276°52.58 49.26		°36.87 -1°10.98
17	$289^{\circ}20.14$	95°12.16 23.30	58°49.05 50.62	172°42.90 15.46	291°55.17 49.31	_	°51.20 7°24.81 °51.85 -52°42.20
18	304°22.60	110°11.75 \$04°24.51	73°49.71 \$18°51.09	187°45.22 N21°15.44	306°57.76 <b>S</b> 03°49.36		°25.54 -16°44.87
19	319°25.07	125°11.33 25.73	88°50.38 51.56	202°47.54 15.42	322°0.35 49.41	1	5°5.24 -29°0.14
20 21	334°27.53 349°30.00	140°10.92 26.94 155°10.50 · · 28.16	103°51.04 52.03 118°51.70 •• 52.50	217°49.86 15.40 232°52.18 •• 15.38	337°2.94 49.46 352°5.53 • 49.51		°50.11 5°9.62
22	4°32.46	170°10.08 29.37	133°52.37 52.97	247°54.50 15.37	7°8.12 49.56		° 16.47 27° 57.78
23	19°34.93	185°9.67 30.58	148°53.03 53.44	262°56.82 15.35	22°10.71 49.60		°14.51 -59°35.14
				$\nu 2.3' \ d$ -0.0' m-2.27			°45.95 -43°31.88
ivier.p	pass. 21:42	ν-0.4' d1.2' m-3.92	$\nu 0.7' \ d0.5' \ m1.49$	ν2.3° α-0.0° m-2.21	ν2.6' d0.0' m0.73		°38.40 -69°49.00 °47.23 -8°46.06
							°33.92 11°50.51
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	_	°40.65 61°36.53
0	34°37.39	200°9.25 S04°31.80	163°53.69 \$18°53.91	277°59.14 N21°15.33	37°13.30 S03°49.65	Denebola 182	°24.56 14°25.71
1 2	49°39.85	215°8.83 33.01 230°8.42 34.22	178°54.36 54.38 193°55.02 54.85	293°1.46 15.31 308°3.78 15.29	52°15.89 49.70 67°18.48 49.75	Gienah 175°	°43.23 -17°40.98
3	64° 42.32 79° 44.78	245°8.00 · · 35.43	193°55.02 54.85 208°55.68 · · 55.32	308°3.78 15.29 323°6.11 · · 15.27	67°18.48 49.75 82°21.07 • 49.80		3°0.06 -63°14.36
4	94° 47.25	260°7.58 36.65	223°56.34 55.78	338°8.43 15.26	97°23.66 49.84		°51.50 -57°15.30
5	109°49.71	275°7.16 37.86	238°57.01 56.25	353°10.75 15.24	112°26.25 49.89		°12.92 55°49.11 °21.96 -11°17.66
6	124°52.17	290°6.75 <b>S</b> 04°39.07	253°57.67 \$18°56.72	8°13.07 N21°15.22	127°28.84 <b>S</b> 03°49.94		°51.97 49°11.06
7	139°54.64	305°6.33 40.28	268°58.33 57.19	23°15.40 15.20	142°31.43 49.99		°35.78 -60°29.78
8	154° 57.10	320°5.91 41.50	283°58.99 57.65	38°17.72 15.18	157°34.01 50.04		°57.28 -36°29.73
9	169°59.57	335°5.49 · · 42.71	298°59.65 · · 58.12	53°20.05 · · 15.16	172°36.60 · · 50.08 187°39.19 50.13		°47.67 19°2.95
10 11	185°2.03 200°4.50	350°5.07 43.92 5°4.65 45.13	314° 0.31 58.59 329° 0.97 59.05	68°22.37 15.15 83°24.70 15.13	187°39.19 50.13 202°41.78 50.18		°40.12 -60°56.49
12	215°6.96	20°4.23 S04°46.34	344°1.63 \$18°59.52	98°27.02 N21°15.11	217°44.37 \$03°50.23	1	°20.93 74°2.95
13	230°9.42	35°3.81 47.56	359°2.29 18°59.98	113°29.35 15.09	232°46.96 50.27		°55.65 -16°8.87 6°3.54 26°37.77
14	$245^{\circ}11.89$	50°3.40 48.77	14°2.95 0.45	128°31.67 15.08	247°49.54 50.32		°15.36 -26°29.34
15	260° 14.35	65°2.98 · · 49.98	29°3.61 · · 0.91	143°34.00 · · 15.06	262°52.13 · · 50.37	1	7°9.43 -69°4.56
16	275° 16.82	80°2.56 51.19	44°4.27 1.38	158°36.33 15.04	277°54.72 50.42		2°2.30 -15°45.38
17 18	290° 19.28 305° 21.74	95°2.14 52.40 110°1.72 \$04°53.61	59°4.93 1.84 74°5.58 \$19°2.31	173°38.65 15.02 188°40.98 N21°15.00	292°57.31 50.46 307°59.90 \$03°50.51		6°9.77 -37°7.40
19	305 21.74 320°24.21	125°1.30 54.82	89°6.24 2.77	203°43.31 14.99	323°2.48 50.56	Rasalhague 95	°58.18 12°32.60
20	335°26.67	140°0.87 56.03	104° 6.90 3.23	218°45.64 14.97	338°5.07 50.60		°42.19 51°29.33
21	350°29.14	155°0.45 · · 57.24	119°7.56 · · 3.70	233°47.96 · · 14.95	353°7.66 · · 50.65		°31.86 -34°22.40 °32.98 38°48.67
22	5°31.60	170°0.03 58.45	134° 8.21 4.16	248°50.29 14.94	8° 10.25 50.70	_	°47.10 -26°15.91
23	20°34.07	184°59.61 59.66	149° 8.87 4.62	263°52.62 14.92	23° 12.83 50.74		°59.39 8°56.33
Mer.	pass. 21:38	ν-0.4' d1.2' m-3.91	ν0.7' d0.5' m1.48	ν2.3' d-0.0' m-2.28	ν2.6' d0.0' m0.74	Peacock 53	3°4.70 -56°39.31
							°25.34 45°22.63
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		°38.06 9°59.76
0	35°36.53	199°59.19 \$05°0.87	164°9.53 \$19°5.09	278°54.95 N21°14.90	38°15.42 \$03°50.79		°31.89 -46°50.28
1	50°38.99	214°58.77 2.08	179°10.18 5.55	293°57.28 14.88	53°18.01 50.84		°13.57 -29°29.14 °44.36 28°13.60
2	$65^{\circ}41.46$	229°58.35 3.29	194°10.84 6.01	308°59.61 14.87	68°20.59 50.88	1	°29.05 15°20.83
3	80° 43.92	244°57.92 · · 4.50	209°11.50 · · 6.47	324°1.94 · · 14.85	83°23.18 · · 50.93		
4	95° 46.39	259°57.50 5.71	224°12.15 6.93	339°4.27 14.83	98°25.76 50.98		<b>OHA</b> Mer.pass ° 40.95 10:39
5 6	110° 48.85 125° 51.31	274°57.08 6.92 289°56.66 \$05°8.13	239°12.81 7.39 254°13.46 \$19°7.86	354°6.60 14.82 9°8.93 N21°14.80	113°28.35 51.02 128°30.94 \$03°51.07		°40.95 10:39 °59.45 13:05
7	140°53.78	304°56.23 9.34	269°14.12 8.32	24°11.27 14.78	143°33.52 51.12		°25.28 05:31
8	155° 56.24	319°55.81 10.55	284°14.77 8.78	39°13.60 14.77	158°36.11 51.16		°32.86 21:32
9	170°58.71	334°55.39 · · 11.75	299°15.42 · · 9.24	54°15.93 · · 14.75	173°38.69 · · 51.21		
10	186°1.17	349°54.96 12.96	314°16.08 9.70	69°18.26 14.73	188°41.28 51.26		<b>OHA</b> Mer.pass °31.86 10:40
11	201°3.64	4°54.54 14.17	329°16.73 10.16	84°20.60 14.72	203°43.87 51.30		°16.30 13:04
12 13	216°6.10 231°8.56	19°54.12 <b>S</b> 05°15.38 34°53.69 16.59	344°17.38 S19°10.62 359°18.04 11.08	99°22.93 N21°14.70 114°25.26 14.68	218°46.45 \$03°51.35 233°49.04 51.39		°21.75 05:27
13 14	231 8.50 246°11.03	49°53.27 17.79	14°18.69 11.53	114 25.26 14.68 129°27.60 14.67	248°51.62 51.44		°35.91 21:27
15	261° 13.49	64°52.84 · · 19.00	29°19.34 · · 11.99	144°29.93 · · 14.65	263°54.21 · · 51.49	Oct 27 Mon S	HA Mer.pass
16	$276^{\circ}15.96$	79°52.42 20.21	44°19.99 12.45	159°32.27 14.63	278°56.79 51.53		°22.66 10:40
17	291° 18.42	94°51.99 21.41	59°20.65 12.91	174°34.60 14.62	293°59.38 51.58		°33.00 13:03
18	306°20.88	109°51.57 S05°22.62	74°21.30 S19°13.37	189°36.94 N21°14.60	309°1.96 S03°51.62		°18.42 05:23
19	321°23.35 336°25.81	124°51.14 23.83 139°50.72 25.04	89°21.95 13.82 104°22.60 14.28	204°39.27 14.59	324°4.54 51.67	Saturn 2°	°38.89 21:23
20 21	351°25.81	139°50.72 25.04 154°50.29 •• 26.24	104°22.60 14.28 119°23.25 · · 14.74	219°41.61 14.57 234°43.95 •• 14.55	339°7.13 51.71 354°9.71 · · 51.76	Horizontal p	arallax
22	6°30.74	169°49.87 27.45	134°23.90 15.20	249°46.28 14.54	9°12.30 51.80		Venus: 0.1
23	21°33.21	184°49.44 28.65	149°24.55 15.65	264°48.62 14.52	24°14.88 51.85		Mars: 0.1
Mer	pass. 21:34	ν-0.4' d1.2' m-3.91	ν0.7' d0.5' m1.48	ν2.3' d-0.0' m-2.29	ν2.6' d0.0' m0.74		

h	Su			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.32	S12°6.64	$146^{\circ}25.38$	10.8'	\$26°55.79	4.8'	53.9'
1	198°58.39	7.50	160°55.17	10.7'	27°0.64	4.7'	53.9'
2	213°58.46 228°58.53	8.36 •• 9.22	175°24.90 189°54.59	10.7' 10.6'	27°5.37 27°9.96	4.6' 4.5'	53.9' 54.0'
4	243°58.60	10.08	204°24.23	10.6'	27°14.43	4.3'	54.0'
5	258°58.68	10.94	$218^{\circ}53.82$	10.5'	$27^{\circ}18.78$	4.2'	54.0'
6	273°58.75	\$12°11.80	233° 23.36	10.5'	\$27°22.99	4.1'	54.0'
7 8	288°58.82 303°58.89	12.66 13.52	247°52.86 262°22.32	10.5' 10.4'	27°27.08 27°31.03	4.0' 3.8'	54.0' 54.0'
9	318°58.96	• • 14.37	276°51.72	10.4'	27°34.86	3.7'	54.0'
10	333°59.03	15.23	291°21.09	10.3'	27°38.56	3.6'	54.0'
11 12	348°59.10 3°59.17	16.09 \$12°16.95	305°50.41 320°19.70	10.3' 10.2'	27°42.13 527°45.56	3.4' 3.3'	54.0' 54.0'
13	18°59.23	17.80	320 19.70 334°48.94	10.2	27°48.87	3.2'	54.0'
14	33°59.30	18.66	349° 18.14	10.2'	27°52.04	3.0'	54.0'
15	48°59.37	• • 19.52	3°47.30	10.1'	27°55.07	2.9'	54.0'
16 17	63°59.44 78°59.51	20.37 21.23	18° 16.43 32° 45.52	10.1' 10.1'	27°57.98 28°0.75	2.8' 2.6'	54.0' 54.1'
18	93°59.57	\$12°22.09	47° 14.57	10.1	\$28°3.39	2.5'	54.1'
19	108°59.64	22.94	61°43.59	10.0'	$28^{\circ}5.89$	2.4'	54.1'
20	123°59.71	23.80	76° 12.58	10.0'	28°8.26	2.2'	54.1'
21 22	138°59.77 153°59.84	· · 24.65 25.50	90°41.53 105°10.45	9.9' 9.9'	28°10.49 28°12.59	2.1' 2.0'	54.1' 54.1'
23	168°59.90	26.36	119° 39.34	9.9'	28°14.55	1.8'	54.1
	SD = 16.1'	d = 0.9'		SD	0 = 14.7'		
					± 1.1		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	183°59.97 199°0.04	\$12°27.21 28.06	134°8.21 148°37.04	9.8' 9.8'	\$28°16.37 28°18.06	1.7' 1.6'	54.1' 54.1'
2	214°0.10	28.92	163°5.85	9.8'	28°19.61	1.4'	54.1'
3	229°0.16	• • 29.77	177°34.63	9.8'	28°21.02	1.3'	54.1'
4	244°0.23	30.62	192°3.38	9.7'	28°22.30	1.1'	54.2'
5 6	259°0.29 274°0.36	31.47 \$12°32.33	206°32.11 221°0.82	9.7' 9.7'	28°23.44 \$28°24.43	1.0' 0.9'	54.2' 54.2'
7	289° 0.42	33.18	235° 29.51	9.7'	28°25.29	0.7	54.2'
8	304°0.48	34.03	249°58.18	9.6'	$28^{\circ}26.01$	0.6'	54.2'
9	319°0.54	• • 34.88	264°26.82	9.6'	28°26.60	0.4'	54.2'
10 11	334°0.61 349°0.67	35.73 36.58	278°55.45 293°24.07	9.6' 9.6'	28°27.04 28°27.34	0.3' 0.2'	54.2' 54.2'
12	4°0.73	S12°37.43	307°52.66	9.6'	S28°27.50	0.0'	54.3'
13	19°0.79	38.28	322°21.25	9.6'	28°27.53	-0.1'	54.3'
14 15	34°0.85 49°0.91	39.13 · · 39.97	336°49.81 351°18.37	9.6' 9.5'	28°27.41 28°27.15	-0.3' -0.4'	54.3' 54.3'
16	64°0.97	40.82	5°46.92	9.5'	28°26.75	-0.4 -0.5'	54.3'
17	79°1.03	41.67	20° 15.45	9.5'	28°26.21	-0.7'	54.3'
18	94°1.09	S12° 42.52	34°43.98	9.5'	\$28°25.53	-0.8'	54.3'
19 20	109°1.15 124°1.21	43.36 44.21	49°12.50 63°41.01	9.5' 9.5'	28°24.71 28°23.75	-1.0' -1.1'	54.4' 54.4'
21	139°1.27	• • 45.06	78° 9.52	9.5'	28°22.65	-1.1	54.4
22	154°1.33	45.90	92°38.02	9.5'	28°21.41	-1.4'	54.4'
23	169°1.39	46.75	107°6.52	9.5'	28°20.02	-1.5'	54.4'
	SD = 16.1'	d = 0.9'		SD	0 = 14.8'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	184°1.44	S12° 47.59	121°35.02	9.5'	\$28°18.50	-1.7'	54.4
1	199°1.50	48.44	136°3.52	9.5'	$28^{\circ}16.83$	-1.8'	54.5'
2	214°1.56 229°1.61	49.28 •• 50.13	150°32.01 165°0.51	9.5' 9.5'	28°15.02 28°13.07	-1.9' -2.1'	54.5' 54.5'
3 4	229°1.61 244°1.67	50.13 50.97	165°0.51 179°29.02	9.5° 9.5'	28°13.07 28°10.98	-2.1' -2.2'	54.5' 54.5'
5	259°1.73	51.82	193°57.52	9.5'	28°8.75	-2.4'	54.5'
6	274°1.78	\$12°52.66	208°26.03	9.5'	\$28°6.38	-2.5'	54.5'
7 8	289°1.84 304°1.89	53.50 54.34	222°54.55 237°23.08	9.5' 9.5'	28° 3.87 28° 1.21	-2.7' -2.8'	54.6' 54.6'
9	319°1.95	55.19	251° 51.61	9.5'	20 1.21 27°58.42	-2.6 -2.9'	54.6'
10	334°2.00	56.03	266°20.15	9.6'	27°55.48	-3.1'	54.6'
11	349°2.06	56.87	280°48.70	9.6'	27°52.41	-3.2'	54.6'
12 13	4°2.11 19°2.17	\$12°57.71 58.55	295°17.27 309°45.84	9.6' 9.6'	\$27°49.19 27°45.84	-3.4' -3.5'	54.6' 54.7'
14	34°2.22	12°59.39	324°14.43	9.6'	27°42.34	-3.6'	54.7'
15	49°2.27	13°0.23	338°43.04	9.6'	27°38.71	-3.8'	54.7'
16	64°2.32 79°2.38	1.07	353°11.65 7°40.29	9.6'	27°34.93	-3.9'	54.7'
17 18	79°2.38 94°2.43	1.91 \$13°2.75	7°40.29 22°8.94	9.7' 9.7'	27°31.01 \$27°26.96	-4.1' -4.2'	54.7' 54.8'
19	109°2.48	3.59	36°37.61	9.7'	27°22.77	-4.3	54.8'
20	124°2.53	4.43	51°6.30	9.7'	27°18.43	-4.5'	54.8'
21 22	139°2.58 154°2.63	· · 5.27 6.10	65°35.01 80°3.75	9.7' 9.8'	27°13.96 27°9.36	-4.6' -4.7'	54.8' 54.9'
23	169°2.68	6.10	94°32.50	9.8'	27° 4.61	-4.7' -4.9'	54.9'
	SD = 16.1'	d = 0.8'			0 = 14.8'	-	
					11.0		

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

Lat.		Moonris	е		Moonset	:
Ldl.	Sat	Sun	Mon	Sat	Sun	Mon
N 72°						
<b>N</b> 70°						
68°						
66°						
64°						
62°	14:36		15:50	14:49	10.00	17:12
60°	13:07	14:15	14:48	16:18	16:58	18:14
N 58°	12:31	13:34	14:14	16:54	17:39	18:47
56°	12:05	13:06	13:49	17:20	18:07	19:12
54°	11:45	12:44	13:28	17:41	18:28	19:32
52°	11:28	12:26	13:12	17:58	18:46	19:49
50° 45°	11:13 10:43	12:11 11:40	12:57 12:28	18:13 18:43	19:02 19:33	20:03 20:32
<b>N</b> 40° 35°	10:20	11:16	12:05	19:06	19:57	20:54
35°	10:01 09:45	10:56 10:39	11:46 11:29	19:26 19:42	20:16 20:33	21:13 21:29
20°	09:45	10:39	11:29	20:10	20:33	21:29
N 10°	08:54	09:46	10:38	20:10	21:26	22:19
0°	08:32	09:23	10:16	20:57	21:49	22:41
<b>S</b> 10°	08:10	09:01	09:53	21:19	22:11	23:02
20°	07:47	08:36	09:30	21:43	22:36	23:25
30°	07:20	80:80	09:02	22:11	23:04	23:52
35°	07:04	07:51	08:45	22:28	23:20	
40°	06:45	07:32	08:26	22:47	23:40	
45°	06:23	07:08	08:03	23:11		00:03
<b>S</b> 50°	05:55	06:37	07:33	23:41		00:34
52°	05:41	06:22	07:18	23:56		00:49
54°	05:25	06:05	07:01		00:14	01:06
56°	05:06	05:43	06:40		00:35	01:27
58°	04:42	05:16	06:13		01:02	01:53
<b>S</b> 60°	04:12	04:38	05:37	00:20	01:41	02:30

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-25%
25	15:53	15:57	11:44	14:44	02:19	
26	16:00	16:03	11:44	15:36	03:10	
27	16:06	16:08	11:44	16:28	04:02	

### October 28, 29, 30 UT (Tue., Wed., Thu.)

Section   Sect	h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
1	Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
1 97/3813 24/48/8 3 167 79/28/8 1 160 90 269/33 1 144 95/20/3 1 94 5 5 5 5 6 5 6 7 6 7 6 7 6 7 6 7 6 7 6 7								
1	1	51°38.13			294°53.30 14.49			I
Section   Column								
The color of the								I
Section   Sect							1 .	-57°6.31
7 11/15/29 301/400 30 301 30 997/2974 1029 297/733 14/0 14/15/35 52.21							Hamal 327°50.12 2	23°35.21
1								39°22.33
9   171-9788   334*6-17   4070   296*11.0   2000   59*12.01   14.37   174*071   52.20   Method   350*13.49   Met								I
187 1870-1871 1874-1874-1874-1874-1874-1874-1874-1874-								
13   22   17   34   35   54   35   52   33   32   32   32   32   32	10	187°0.31	349°44.74 41.91	314°31.69 20.65	70°14.35 14.35	189° 43.30 52.34		
13								
14   15   16   17   17   18   18   18   18   18   18								46°1.35
200   12.0   1.0   1.4   1.9   1.4   1.0   1.5								6°22.49
16 2771510 9142.0 4913 4473550 2337 100°28.1 1420 2978.879 2.0 1 17 2071715 91 0742.0 4913 150°35 373 21 238 21 238 21 75°5.0 5 11.5 20°5.0 14.5 20°5.							Elnath 278° 0.78 2	28° 37.75
17 202°17:50   100°41:30   50.33   59°30:21   2382   175°30.75   1425   29°13.77   24°13.70   25°13.71   25°13								-1°10.98
188 907°90.00 109°41.30 S09°51.53 74°30.86 S19°24.27 190°33.09 N21°14.23 300°3.95 S03°3.27   190 320°2.40 109°41.00 S09°51.53 74°30.86 S19°24.27 190°3.00 N21°14.23 300°3.95 S03°3.27   20 337°24.96 109°40.41 53.94 104°38.14 52.17 220°3.77 8 1.42 2 325°6.85 52.74   20 337°24.96 139°3.07 50.04 133°3.84 20.07 220°3.78 1.42 2 325°6.85 52.74   20 337°24.96 139°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.07 50.04 134°3.08 120°3.0								7°24.81
237 327 349 139 6844	18	307°20.02		74°36.86 <b>S</b> 19°24.27	190°33.09 N21°14.23			I
23 27°29.25 189°39.67 5.34 189°38.67 5.36 189°38.67 5.36 189°38.67 5.36 189°39.67 5.34 189°38.68 189°38.67 5.35 189°38.68 189°38.67 5.35 189°38.68 189°38.67 5.35 189°38.68 189°38.69 189°								
22 F7288 19979977 50.44 1197808 2097404 1117 1014.29 52.88 April 229 729 80 1997997 50.44 1297808 2007 2097404 1117 1014.29 52.88 April 2297459 2097404 1117 1014.29 52.88 April 2297459 2097405 2								5°9.62
Mer.pass. 21:30   Pol. of 12   Pol. of 12   Pol. of 13   Pol. of 14   Pol. of 15								27°57.77
Wed   GHA   GHA   Ouc   GHA   Duc   GHA							Avior 234°14.47 -5	59°35.15
New   CHA	23	22 32.35					Suhail 222°45.92 -4	13°31.88
CHA	Mer.p	pass. 21:30	u-0.4 $'$ $d$ 1.2 $'$ m-3.91	$ u 0.6' \ d 0.5' \ m 1.48$	$\nu 2.3' \ d$ -0.0' m-2.29	$\nu 2.6' \ d0.0' \ m0.75$		59°49.00
Charle   C								
1 5 23° 37° 348 11 199° 38.71	Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		
2 67°39.727 24°38.28 05°59.95 19°4°4.36 27.42 29°59.95 11 15°5°2.07 27 240°5.05 10°51.05 11 15°5°2.07 27 240°5.05 10°5.14 11 15°5°2.07 240°5.05 10°5.14 11 15°5°2.07 11 15°2.07								
2 67°3974 6 220 244°374 0 - 238 209°4265 - 238 22 328°420 1.14.0	1						1	
8 82-42.20 244-37.41 2.35 209-42.65 - 28.32 325-54.20 - 14.10 85-71.8 - 53.09   4 97-44-67 295-36.96 3.35 224-43.29 2.27 340-55.55 14.00 100-29.7.6 5.314   5 112'47.13 5.55 - 47.7 229'43.93 2.22 355'5.90 14.07 113'32.34 53.18   5 12'47-49.59 269'36.11 506'5.51 2.29'43.93 2.22 355'5.90 14.07 113'32.34 53.18   5 12'47-49.59 269'36.11 506'5.51 2.29'4.47 57 12.06 1 10'32.34 53.18   5 15'6. 127'49.59 269'36.11 506'5.51 2.29'4.47 57 12.06 1 10'32.34 53.18   5 15'6. 127'49.59 2.25 32.35 2.24'4.48 58 30.35   10'17'56.50 319'38.25 8.35 224'4.48 58 30.35   11'17'51.49 3.29 13.00 15'6.00 3.35 3.24   11'17'51.49 3.29 13.00 15'6.20 115'5.40 6.0 15'3.24   11'17'51.49 3.29 13.00 15'6.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.20 115'5.40 6.0 15'5.40 6.0 15'5.40 11.00 110'48.24   11'20'19'19' 4"33.94 11.05 334'48.4 519'32.35 101'15.34 N21'13.98 220'50.40 503'53.48   11'20'19'19' 4"33.94 11.05 339'40.00 33.27 116'17.09 13.99 205'47.8 53.40   11'20'21'17' 6"32.29 13.09 30'40.00 33.27 116'17.09 13.99 205'47.8 53.40   11'20'21'17' 6"32.29 13.09 20'50.40 503'53.48   11'20'21'17' 6"32.29 13.09 20'50.40 503'53.48   11'20'21'17' 6"32.29 13.09 20'50.40 503'53.48   11'20'21'17' 6"32.29 13.09 20'50.40 503'53.48   11'20'21'17' 6"32.29 13.09 20'50.40 503'53.48   11'20'21'17' 6"32.29 13.09 30'40.00 33.27 116'17.09 13.99 20'50.40 503'53.48   11'20'21'17' 6"32.29 13.09 30'40.00 33.27 116'17.09 13.99 20'52'48.50 33.00 30'50.40   11'20'21'17' 6"32.29 13.10 11'53.40 11'53.40 11'54'17' 6"3.39 2.20'50.40 503'53.48   11'20'21'17' 6"32.29 11.00 11'53.40 11'54' 11								
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Transport   Tran							Alioth 166°12.90 5	55°49.09
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8 157"54.52 316"35.25 8.35 284"35.86 30.56 41"5.94 14.03 160"40.08 53.31   187"594.59 334"44.81955 299"46.50 31.01 568'8.29 11.02 175"4.26 653.35   187"594.59 334"44.81 1955 299"46.50 31.01 568'8.29 11.02 175"4.26 653.35   187"594.33 40 11.95 316"47.14 31.45 71"10.04 14.01 190"45.24 53.44   187"594.33 40 11.95 320"47.78 31.90 880"1.299 13.99 200"59.00 503"53.48   187"594.33 40 11.95 320"47.78 31.90 880"1.299 13.99 200"59.00 503"53.48   187"594.33 40 11.95 346"48.42 519"32.35 101"15.34 N21"13.98 220"59.00 503"53.48   187"594.33 40 19"32.64 15.54 14"49.70 33.24 131"20.04 13.95 250"55.55 53.57   187"594.24 79"31.77 1.79 44"59.08 33.68 146"22.39 13.94 266"58.31 35.61   187"594.24 79"51.77 1.79 44"59.08 34.13 161"24.74 13.92 261"0.71 53.65   188"508"10.16 100"93.09 506"20.34 74"52.25 519"35.02 191"29.45 N21"13.90 311"5.87 503"53.74   189 323"21.03 124"30.64 21.53 33.85 34.65 200"18.00 13.88 236"68.5 53.78   189 323"21.03 124"30.64 21.53 33.35 35.91 212"341.5 13.87 341"11.02 53.83   189 328"21.03 124"30.64 21.53 13"5.61 1 14"32.2   189 323"21.48 184"28.71 26.32 119"54.41 73.63 5 236"65.1 13.84 211"16.18 53.91   189 323"21.48 184"28.71 26.32 134"51.84 13.60 7.72 23" 24.60 0" m0.75   189 323"21.48 184"28.71 26.32 134"51.84 13.60 7.72 24.50 1.85 53.87   189 323"31.48 184"28.71 26.32 134"51.44 7.72 4 26"61.21 13.83 26"18.5 53.98   180 38"34.95 1.55 54 506"33.69 23.99 30.1 326"65.03 13.13 15.10 11"16.18 53.91   189 324"21.25 25.12 134"51.84 13.60 7.72 24"51.85 5.99 5.90 5.90 5.90 5.90 5.90 5.90 5.9								19°11.04
172"5699   334"34.81   9.55   299"66.50   3.101   56"8.29   14.02   175"26.26   53.35   53.40   11.01   190"45.24   53.40   53.40   11.02   175"0.64   14.01   190"45.24   53.40   53.40   61.11   190"45.24   62"3.24   63.40   63"5.34   63"3.34   63"3.37   14.35   329"4.78   31.90   86"12.99   13.99   205"47.82   53.40   53"5.40   63"5.48   13"2.04   13.95   220"5.55   53.57   64"3.20   14.35   359"4.90   60   32.79   116"17.99   13.96   235"5.29   53.55   53.57   53"5.15   263"11.77   64"32.20   16.74   29"50.34   33.64   14"93.07   33.24   131"2.00   41.35   329"4.24   79"3.17   17.94   44"50.98   34.13   161"24.74   13.92   221"5.15   35.65   64"61   17.94   40"50.98   34.13   161"24.74   13.92   221"5.15   35.65   64"61   17.94   40"50.98   34.13   161"24.74   13.92   221"5.15   35.65   64"61   17.94   40"50.98   34"5.10   15"5.60   44"50.98   34.13   161"24.74   13.92   221"5.15   35.65   53.57   53"5.18   12"2.35   15"3.25								I
10 187*59.4 349*34.38 10.75 314*47.14 31.45 71*10.64 14.01 190*45.24 53.40 11 20*34.38 1 10.75 329*47.8 31.99 86*12.99 13.99 20*54*7.8 2 53.40 12.21.8 13.99 20*54.8 2 53.40 12.21.8 13.99 20*54.8 2 53.40 12.21.8 13.99 20*54.8 2 53.40 12.21.8 13.99 20*54.8 2 53.40 12.21.8 13.99 20*54.8 2 53.40 12.21.8 13.23.9 12.21.8 13.23.9 13.90								
11 203°192 4°3394 11.95 329°47.78 31.90 86°12.99 13.99 205°47.82 53.44 Kochab 137°20.94 7.4°2.1 12°12.34 81 20°35.5 506°13.15 344°48.42 81°93.25 10°13.5 344°48.42 81°93.25 10°13.5 344°48.42 81°93.25 10°13.5 346°48.42 13°2.04 11.36°55.64 136°55.64 136°55.63 13°13.04 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.64 136°55.65 136°15 15°263°11.77 64°32.20 116.74 29°50.34 1336 61 16°24.74 13.92 281°07.1 53.65 11°293°16.70 94°31.33 19.14 59°51.62 34.57 176°27.09 13.91 296°32.9 53.70 18.386 10°12.93 11°587 508°32.9 53.70 18.386 10°12.93 11°1.94 59°51.62 34.57 176°27.09 13.91 296°32.9 53.70 18.386 10°22.30 12°30.00 2 22.73 104°55.35 35.91 22°34.15 13.87 341°10.2 53.83 12°332°2.16 3 124°30.40 139°30.00 2 22.73 104°55.35 35.91 22°34.15 13.87 341°10.2 53.83 12°332°2.16 3 124°30.40 139°30.00 2 22.73 104°55.35 35.91 22°34.15 13.87 341°10.2 53.83 12°32°3.14 81 184°28.71 26.32 149°55.44 37.24 266°41.21 13.83 26°18.76 53.95 140°40.22 15°29.3 140°40.22 15°40.22 15°40.22 15°40.22 15°40.22 15°40.22 15°40.22 15°40.22 15°40.22 15°40.22	10	$187^{\circ}59.45$	349°34.38 10.75	314°47.14 31.45	71°10.64 14.01	190° 45.24 53.40		
12 218*4.38 19*3.51 SU6*11.15 34*4*8.44 \$19*3.2.35 101*13.48 \$12*13.99 \$2.0*5 54.95 \$75.55 \$3.57 \$ 14 248*9.31 49*32.64 15.54 1*49*70*3.3.24 131*20.04 13.95 250*55.55 53.57 \$ Alpherotal 15*26*9*1.17 64*32.20 1.67*4 29*50.34 *33.64 131*20.04 13.95 250*55.55 53.57 \$ Alpherotal 16*22.39 13.94 49*32.20 1.67*4 29*50.34 *33.64 131*20.04 13.95 250*55.55 53.57 \$ Antares 112*15.36 26*93.15*4.15*4 13.92 281*0.71 53.65 \$4.95*4.20 1.67*4.29*1.30 13.94 20*6*32.99 53.70 \$ 18 308*19.16 109*30.90 506*20.34 *7.45*5.20 519*35.02 191*29.45 N21*33.90 311*5.87 530*5.75 \$ 19 323*21.63 124*30.46 21.53 89*52.89 35.46 20*31.80 13.88 325.84 55.78 \$ 20 338*24.09 139*30.02 22.73 10*6*35.53 35.91 221*34.15 13.87 341*11.05 53.83 \$ 22 8*29.02 169*29.15 25.12 134*54.81 36.79 251*38.86 13.84 11*16.18 53.91 \$ Mer.pass. 21:26 \$								74°2.93
14 248°9.31 49°32.64 15.54 14°49.70 33.24 131°2.04 13.95 250°55.55 55.57 15 268°58.13 53.61 16 228°1.177 64°32.20 1.67 29°50.34 33 36.4 146°22.39 13.94 266°58.13 53.61 Artrae 112°1.56 2-62°2.31 16°2.76 16.70 49°31.37 17.94 44°50.98 34.13 161°4.74 13.92 281°0.71 53.65 26°2.21 17°9.74 110°3.01 100°3.09 506°2.034 74°52.25 510°35.02 191°2.94.5 N21°13.90 311°5.87 503°53.74 19 323°21.63 124°30.46 21.53 88°52.89 35.46 206°3.18.0 13.88 326°6.45 53.78 Eltanin 96°9.78 13°2.21 343°54.84 13.67 92.21°34.15 13.87 341°11.02 53.83 18.21°3.21°2.21°3.23°2.65 154°2.55.99 2.39.31 119°54.17 13.65 2.26°3.65 13.84 111°1.61 18.59.91 18.21°3.21°3.21°3.21°3.21°3.21°3.21°3.21°3								-16°8.87
15   263°11.77   66°32.20   · · 16.74   29°8.03   · · · 33.68   146°22.39   · · · 13.94   266°8.13   · · · 53.61   Africa   107°34   .60°42   .60°13   .61°24   .61°25   .61								26° 37.75
16   276°14.24   79°31.77   17.94   44°50.98   34.13   161°24.74   13.92   281°0.71   53.65   53.67   17.92°1.07   17.93°1.07   17.94   17.92°1.07   13.91   296°3.29   53.70   18.8308°19.16   100°30.90   506°20.34   74°52.25   519°50.02   191°9.945   121°3.39   311°5.87   503°33.74   53.70   53.80   53.70   53.80								26°29.34
18   308   919   16   109   39.90   506° 20.34   74° 52.25   519° 53.02   139° 39.05   139° 39.09   506° 20.34   74° 52.25   519° 53.02   139° 39.09   518° 53.73   138° 387° 24.09   139° 30.02   22.73   104° 53.53   35.91   221° 34.15   13.87   341° 11.02   53.83   128° 327° 24.00   139° 30.02   22.73   104° 53.53   35.91   221° 34.15   13.87   341° 11.02   53.83   148° 148° 25.59   158° 25.12   134° 54.81   36.79   251° 38.60   13.84   11° 16.18   53.91   148° 52.29   128° 23.23° 31.48   148° 28.71   22.51   24.95° 54.41   73.24   266° 41.21   13.83   26° 18.76   53.95   148° 18.28   128° 22.50   149° 55.44   37.24   266° 41.21   13.83   26° 18.76   53.95   148° 18.28								-69°4.55
18 308°19.16 109°30,90 506°20.34 74°52.25 S19°35.02 191°29.45 N21°13.90 311°5.87 S03°53.74 Rasalhague 97 9.76 5.77 N21°3.73 N21°3.72 N21°3.75 N21°3								
19 323°21.63 124°30.46 21.53 89°52.89 35.46 206°31.80 13.88 326°8.45 53.78 341°11.02 53.83 21 353°26.56 154°29.99 · · · · · · · · · · · · · · · · · ·								
20 338°24.09 139°30.02 22.73 104°53.53 35.91 221°34.15 13.87 341°11.02 53.88 356°13.60 53.87 229 338°24.09 139°30.02 22.93 311°954.17 36.35 236°36.51 13.86 356°13.60 53.87 240°32.29 169°29.15 25.12 134°54.81 36.79 251°38.86 13.84 11°16.18 53.91 Munki 75°47.11 -26°15.54 37.24 266°41.21 13.83 26°18.76 53.95 Munki 75°47.11 -26°15.54 38.74 21°2.34 266°41.21 13.83 26°18.76 53.95 Munki 75°47.11 -26°15.54 26°18.76 34.95 Munki 75°47.11 -26°15.54 38.75 Munki 75°47.11 -26°15.54 Munki 75°47.11 -26	19	323°21.63	124°30.46 21.53	89°52.89 35.46	206°31.80 13.88	326°8.45 53.78		
21 353°26.56 154°29.59 · 23.93 119°54.17 · 36.35 236°36.51 · 13.86 356°13.60 · 53.87   22 8°29.02 166°29.15 25.12 134°55.44 37.24 266°41.21 13.83 26°18.76 53.95   Mer.pass. 21:26	20	338°24.09	139°30.02 22.73	104°53.53 35.91		341°11.02 53.83		
22 8°29.02 169°29.15 25.12 134°54.81 36.79 251°38.85 13.84 11°16.18 53.91  Mer.pass. 21:26							_	38°48.66
Mer.pass. 21:26   ν-0.4' d1.2' m-3.91   ν-0.6' d0.4' m1.47   ν-2.3' d-0.0' m-2.30   ν-2.6' d0.0' m0.75								26° 15.91
Thu GHA GHA Dec Enif 33°38.07 29°55.1  Thu GHA GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Dec GHA Signary Sig			184°28.71 26.32		266°41.21 13.83			8°56.33
Thu GHA GHA Dec GHA DE	Mer.p	pass. 21:26	u-0.4 $'$ $d$ 1.2 $'$ m-3.91	$ u 0.6' \; d0.4' \; \mathrm{m}1.47$	$\nu 2.3' \ d\text{-}0.0' \ \text{m-}2.30$	$\nu 2.6' \ d0.0' \ m0.75$		
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10 188*58.59 349*23.88 39.47 315*2.43 42.09 72*7.13 13.69 191*47.10 54.41 12 204*0.55 4°23.44 40.66 330°3.07 42.53 87°9.48 13.68 206°49.68 54.46 12 219°3.52 19°23.00 506°41.86 345°3.70 519°42.97 102°11.84 N21°13.67 221°52.26 503°54.50 13 234°5.98 34°22.56 43.05 0°4.34 43.41 117°14.20 13.66 236°54.83 54.54 14 249°8.45 49°22.12 44.24 15°4.97 43.85 132°16.56 13.64 251°57.41 54.58 15 264°10.91 64°21.68 45.44 30°5.60 44.29 147°18.92 13.63 266°59.98 54.62 16 279°13.37 79°21.23 46.63 45°6.23 44.73 162°21.28 13.62 282°2.56 54.66 17 294°15.84 94°20.79 47.82 60°6.87 45.17 177°23.64 13.61 297°5.13 54.70 18 309°18.30 109°20.35 506°49.01 75°7.50 519°45.60 192°26.00 N21°13.60 312°7.71 503°54.74 19 324°20.77 124°19.91 50.21 90°8.13 46.04 207°28.36 13.58 327°10.28 54.79 20 339°23.23 139°19.46 51.40 105°8.76 46.48 222°30.72 13.57 342°12.86 54.83 135°10.02 47.35 252°35.45 13.55 12°18.01 54.91 Venus 0.1 102°3.90 102°40.15 13.64 1							Oct 20 Word City	
11 204*1.05 4*23.44 40.06 330*3.07 42.53 87*9.48 13.68 206*49.08 54.46 12:10*3.52 19*0.3.00 \$06*41.86 345*3.70 \$19*0.42.97 102*11.84 \$N21*0.13.66 236*54.83 54.54 14 249*8.45 49*0.2.12 44.24 15*0.49*4.85 132*16.56 13.64 251*57.41 54.58 15 264*10.91 64*21.68 · · · 45.44 30*5.60 · · · 44.29 147*18.92 · · · 13.63 266*59.98 · · 54.62 16 279*13.37 70*21.23 46.63 45*6.23 44.73 162*21.28 13.62 282*2.56 54.66 17 294*15.84 94*20.79 47.82 60*6.87 45.17 177*23.64 13.61 297*51.3 54.70 18 309*18.30 109*20.35 \$06*49.01 75*7.50 \$19*45.60 192*26.00 \$N21*13.60 312*7.71 \$03*54.74 150*22.13 13:01*26*22.23 13:01*26*22.23 13:01*26*22.23 13:01*26*22.23 13:01*26*22.2								10:42
12 219 3.52 19 23.00 506 41.86 345 3.70 519 42.97 102 11.84 N21 13.67 221 52.26 503 54.50 13 234 5.98 34 22.56 43.05 0° 4.34 43.41 117 14.20 13.66 236 54.83 54.54 14 249 8.45 49 22.12 44.24 15 4.97 43.85 132 16.56 13.64 251 57.41 54.58 15 264 10.91 64 21.68 · · 45.44 30 ° 5.60 · · 44.29 147 18.92 · · 13.63 266 ° 59.98 · · 54.62 16 279 ° 13.37 79 ° 21.23 46.63 45 ° 6.23 44.73 162 ° 21.28 13.62 282 ° 2.56 54.66 17 294 ° 15.84 94 ° 20.79 47.82 60 ° 6.87 45.17 177 ° 23.64 13.61 297 ° 5.13 54.70 18 309 ° 18.30 109 ° 20.35 506 ° 49.01 75 ° 7.50 519 ° 45.60 192 ° 26.00 N21 ° 13.60 312 ° 7.71 503 ° 54.74 19 324 ° 20.77 124 ° 19.91 50.21 90 ° 8.13 46.04 207 ° 28.36 13.58 327 ° 10.28 54.79 20 339 ° 23.23 139 ° 19.46 51.40 105 ° 8.76 46.48 222 ° 30.72 13.57 342 ° 12.86 54.83 21 354 ° 25.70 154 ° 19.02 · · 52.59 120 ° 9.39 · · 46.92 237 ° 33.08 · · 13.56 357 ° 15.43 · · 54.87 120 ° 12.35 05:1								13:01
13 234*9.98 34*22.50 43.05 0*4.34 43.41 117*14.20 13.60 230*54.83 54.54   14 249*8.45 49*22.12 44.24 15*4.97 43.85 132*16.56 13.64 251*57.41 54.58   15 264*10.91 64*21.68 · · 45.44 30*5.60 · · 44.29 147*18.92 · · 13.63 266*59.98 · · 54.62   16 279*13.37 79*21.23 46.63 45*6.23 44.73 162*21.28 13.62 282*2.56 54.66   17 294*15.84 94*20.79 47.82 60*6.87 45.17 177*23.64 13.61 297*5.13 54.70   18 309*18.30 109*20.35 \$06*49.01 75*7.50 \$19*45.60 192*26.00 N21*13.60 312*7.71 \$03*54.74   19 324*20.77 124*19.91 50.21 90*8.13 46.04 207*28.36 13.58 327*10.28 54.79   20 339*23.23 139*19.46 51.40 105*8.76 46.48 222*30.72 13.57 342*12.86 54.83   21 354*25.70 154*19.02 · · 52.59 120*9.39 · · 46.92 237*33.08 · · 13.56 357*15.43 · · 54.87   22 9*28.16 169*18.58 53.78 135*10.02 47.35 252*35.45 13.55 12*18.01 54.91   23 24*30.62 184*18.13 54.97 150*10.65 47.79 267*37.81 13.54 27*20.58 54.95    Saturn 2*44.63 21::  Oct 30 Thu SHA Mer.pa  Venus 160*54.32 10:2  Saturn 2*44.63 21::  Sa								05:16
15						_		21:15
16 279°13.37 79°21.23 46.63 45°6.23 44.73 162°21.28 13.62 282°2.56 54.66 17 294°15.84 94°20.79 47.82 60°6.87 45.17 177°23.64 13.61 297°5.13 54.70 18 309°18.30 109°20.35 506°49.01 75°7.50 519°45.60 192°26.00 N21°13.60 312°7.71 503°54.74 19 324°20.77 124°19.91 50.21 90°8.13 46.04 207°28.36 13.58 327°10.28 54.79 20 339°23.23 139°19.46 51.40 105°8.76 46.48 222°30.72 13.57 342°12.86 54.83 21 354°25.70 154°19.02 · 52.59 120°9.39 · 46.92 237°33.08 · 13.56 357°15.43 · 54.87 22 9°28.16 169°18.58 53.78 135°10.02 47.35 252°35.45 13.55 12°18.01 54.91 Venus: 0.1 23 24°30.62 184°18.13 54.97 150°10.65 47.79 267°37.81 13.54 27°20.58 54.95							Oct 30 Thu SUA A	Mer pass
17 294°15.84 94°20.79 47.82 60°6.87 45.17 177°23.64 13.61 297°5.13 54.70 18 309°18.30 109°20.35 506°49.01 75°7.50 S19°45.60 192°26.00 N21°13.60 312°7.71 S03°54.74 19 324°20.77 124°19.91 50.21 90°8.13 46.04 207°28.36 13.58 327°10.28 54.79 20 339°23.23 139°19.46 51.40 105°8.76 46.48 222°30.72 13.57 342°12.86 54.83 21 354°25.70 154°19.02 · 52.59 120°9.39 · 46.92 237°33.08 · 13.56 357°15.43 · 54.87 22 9°28.16 169°18.58 53.78 135°10.02 47.35 252°35.45 13.55 12°18.01 54.91 23 24°30.62 184°18.13 54.97 150°10.65 47.79 267°37.81 13.54 27°20.58 54.95  Mars 126°22.13 13:03 13:04 1						_		10:42
18 309°18.30 109°20.35 S06°49.01 75°7.50 S19°45.60 192°26.00 N21°13.60 312°7.71 S03°54.74 19 324°20.77 124°19.91 50.21 90°8.13 46.04 207°28.36 13.58 327°10.28 54.79 20 339°23.23 139°19.46 51.40 105°8.76 46.48 222°30.72 13.57 342°12.86 54.83 21 354°25.70 154°19.02 · 52.59 120°9.39 · 46.92 237°33.08 · 13.56 357°15.43 · 54.87 22 9°28.16 169°18.58 53.78 135°10.02 47.35 252°35.45 13.55 12°18.01 54.91 23 24°30.62 184°18.13 54.97 150°10.65 47.79 267°37.81 13.54 27°20.58 54.95  Mars: 0.1								13:00
19 324°20.77 124°19.91 50.21 90°8.13 46.04 207°28.36 13.58 327°10.28 54.79 20 339°23.23 139°19.46 51.40 105°8.76 46.48 222°30.72 13.57 342°12.86 54.83 21 354°25.70 154°19.02 52.59 120°9.39 46.92 237°33.08 13.56 357°15.43 54.87 22 9°28.16 169°18.58 53.78 135°10.02 47.35 252°35.45 13.55 12°18.01 54.91 23 24°30.62 184°18.13 54.97 150°10.65 47.79 267°37.81 13.54 27°20.58 54.95    Saturn 2°47.39 21::34.39	18	309°18.30	109°20.35 <b>S</b> 06°49.01	75°7.50 <b>S</b> 19°45.60	192°26.00 N21°13.60	312°7.71 <b>S</b> 03°54.74		05:12
21       354°25.70       154°19.02       · · 52.59       120°9.39       · · 46.92       237°33.08       · · 13.56       357°15.43       · · 54.87       Horizontal parallax         22       9°28.16       169°18.58       53.78       135°10.02       47.35       252°35.45       13.55       12°18.01       54.91       Venus:       0.1         23       24°30.62       184°18.13       54.97       150°10.65       47.79       267°37.81       13.54       27°20.58       54.95       Mars:       0.1							1	21:11
22 9°28.16 169°18.58 53.78 135°10.02 47.35 252°35.45 13.55 12°18.01 54.91 Venus: 0.1 23 24°30.62 184°18.13 54.97 150°10.65 47.79 267°37.81 13.54 27°20.58 54.95 Mars: 0.1							Horizontal parallay	
23 24°30.62 184°18.13 54.97 150°10.65 47.79 267°37.81 13.54 27°20.58 54.95 Mars: 0.1							1	0.1
25 27 50.02 10 10.15 51.51 20 10.05 11.15 20 10.05								
wier.pass. 21:22								
	Wer.p	oass. 21:22	ν-0.4′ d1.2′ m-3.91	νυ.ο΄ dU.4΄ m1.4/	ν2.4′ <i>d</i> -0.0′ m-2.31	ν2.0′ dU.U′ mU./6		

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°2.73	S13°7.78	109° 1.28	9.8'	\$26°59.72	-5.0'	54.9'
1	199°2.78	8.61	123°30.08	9.8'	26°54.70	-5.2'	54.9'
2	214°2.83	9.45	137°58.90	9.8'	26°49.54	-5.3'	54.9'
3 4	229°2.88 244°2.93	· · 10.29	152°27.75 166°56.62	9.9' 9.9'	26°44.25 26°38.82	-5.4' -5.6'	55.0' 55.0'
5	259° 2.98	11.12	181°25.53	9.9	26°33.25	-5.7'	55.0'
6	274°3.03	S13°12.79	195°54.45	10.0'	S26°27.55	-5.8'	55.0'
7	289°3.08	13.63	210°23.41	10.0'	$26^{\circ}21.71$	-6.0'	55.1'
8	304°3.12	14.46	224°52.40	10.0'	26°15.73	-6.1'	55.1'
9	319°3.17 334°3.22	• • 15.29	239°21.41 253°50.46	10.0'	26° 9.62 26° 3.38	-6.2' -6.4'	55.1'
10 11	349°3.26	16.13 16.96	268°19.54	10.1' 10.1'	20 3.30 25°57.01	-6.5'	55.1' 55.2'
12	4°3.31	\$13°17.79	282°48.64	10.1	\$25°50.50	-6.6'	55.2'
13	19°3.36	18.62	297°17.78	10.2'	25°43.85	-6.8'	55.2'
14	34°3.40	19.46	311°46.96	10.2'	25°37.08	-6.9'	55.2'
15	49°3.45	• • 20.29	326°16.16 340°45.40	10.2'	25°30.17	-7.0'	55.3'
16 17	64°3.49 79°3.54	21.12 21.95	340°45.40 355°14.67	10.3' 10.3'	25°23.14 25°15.97	-7.2' -7.3'	55.3' 55.3'
18	94°3.58	\$13°22.78	9°43.98	10.3	\$25°8.67	-7.4'	55.4'
19	109°3.63	23.61	24°13.32	10.4	25°1.24	-7.6'	55.4'
20	124°3.67	24.44	38°42.70	10.4'	24°53.68	-7.7'	55.4'
21	139°3.71	• • 25.27	53°12.12	10.4'	24°45.99	-7.8'	55.4'
22	154°3.76 169°3.80	26.10	67°41.57 82°11.05	10.5'	24°38.18	-7.9'	55.5'
23		26.92	82 11.05	10.5'	24°30.23	-8.1'	55.5'
	SD = 16.1'	d = 0.8'		SI	O = 15.0'		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°3.84	S13°27.75	96°40.58	10.6'	\$24°22.16	-8.2	55.5'
1	199°3.88	28.58	$111^{\circ}10.14$	10.6'	$24^{\circ}13.96$	-8.3'	55.5'
2	214°3.92	29.41	125°39.73	10.6'	24°5.64	-8.5'	55.6'
3	229°3.97	• • 30.24	140°9.37	10.7'	23°57.19	-8.6'	55.6'
4 5	244°4.01 259°4.05	31.06 31.89	154°39.04 169°8.75	10.7' 10.7'	23°48.61 23°39.91	-8.7' -8.8'	55.6' 55.7'
6	274°4.09	\$13°32.71	183°38.50	10.7	\$23°31.09	-8.9'	55.7'
7	289°4.13	33.54	198°8.29	10.8'	23°22.14	-9.1'	55.7'
8	304°4.17	34.36	212°38.12	10.9'	$23^{\circ}13.07$	-9.2'	55.8'
9	319°4.21	• • 35.19	227°7.98	10.9'	23°3.88	-9.3'	55.8'
10	334°4.25 349°4.28	36.01 36.84	241°37.89 256°7.83	10.9' 11.0'	22°54.57 22°45.13	-9.4' -9.6'	55.8'
11 12	349 4.28 4°4.32	30.84 \$13°37.66	250 7.83 270°37.81	11.0'	522°35.58	-9.6 -9.7'	55.9' 55.9'
13	19°4.36	38.48	285°7.83	11.1'	22°25.90	-9.8'	55.9'
14	34°4.40	39.31	299°37.89	11.1'	$22^{\circ}16.11$	-9.9'	55.9'
15	49°4.44	• • 40.13	314°7.98	11.1'	22°6.20	-10.0'	56.0'
16	64°4.47 79°4.51	40.95	328°38.12 343°8.29	11.2'	21°56.17	-10.1'	56.0'
17 18	79°4.51 94°4.55	41.77 \$13°42.59	343°8.29 357°38.51	11.2' 11.3'	21°46.02 \$21°35.76	-10.3' -10.4'	56.0' 56.1'
19	109° 4.58	43.42	12° 8.76	11.3'	21°25.38	-10.4	56.1
20	124°4.62	44.24	26°39.05		21°14.89		56.1'
21	139°4.65	• • 45.06	41°9.37	11.4'	21°4.28	-10.7'	56.2'
22	154°4.69	45.88	55°39.74	11.4'	20°53.56	-10.8'	56.2'
23	169°4.72	46.70	70°10.14	11.4'	20°42.72	-10.9'	56.2'
	SD = 16.1'	d = 0.8'		SI	O = 15.1'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°4.76	S13°47.51	84°40.58	11.5'	S20°31.78	-11.1'	56.3'
1	199°4.79	48.33	99°11.06	11.5'	20°20.72	-11.2'	56.3'
2	214°4.83 229°4.86	49.15	113°41.57	11.6'	20°9.55	-11.3'	56.4'
3 4	229°4.86 244°4.89	· · 49.97 50.79	128°12.12 142°42.71	11.6' 11.6'	19°58.27 19°46.88	-11.4' -11.5'	56.4' 56.4'
5	259°4.93	51.60	142 42.71 157°13.33	11.7	19 40.00 19°35.39	-11.5 -11.6'	56.5'
6	274°4.96	\$13°52.42	171°43.99	11.7'	S19°23.78	-11.7'	56.5'
7	289°4.99	53.24	186°14.68	11.7'	19°12.07	-11.8'	56.5'
8	304°5.02	54.05	200°45.41	11.8'	19° 0.25	-11.9'	56.6'
9 10	319°5.05 334°5.09	• • 54.87 55.68	215°16.17 229°46.97	11.8' 11.8'	18°48.33 18°36.30	-12.0' -12.1'	56.6' 56.6'
11	349°5.12	55.08 56.50	229 46.97 244°17.79	11.8	18 30.30 18°24.17	-12.1 -12.2'	56.7'
12	4°5.15	\$13°57.31	258°48.65	11.9'	\$18°11.93	-12.3	56.7'
13	19°5.18	58.13	273°19.55	11.9'	17°59.60	-12.4'	56.7'
14	34°5.21	58.94	287°50.47	12.0'	17°47.16	-12.5'	56.8'
15 16	49°5.24 64°5.27	13°59.75 14°0.57	302°21.43 316°52.41	12.0'	17°34.62 17°21.98	-12.6'	56.8'
16 17	64°5.27 79°5.29	14°0.57 1.38	316°52.41 331°23.43	12.0' 12.0'	17°21.98 17°9.24	-12.7' -12.8'	56.9' 56.9'
18	94°5.32	S14°2.19	345°54.48	12.1'	\$16°56.40	-12.9'	56.9'
19	109°5.35	3.00	0°25.55	12.1'	$16^{\circ}43.47$	-13.0'	57.0'
20	124°5.38	3.81	14°56.65	12.1'	16°30.43	-13.1'	57.0'
21	139°5.41	• 4.63	29°27.78	12.2'	16°17.31	-13.2'	57.1'
22 23	154°5.43 169°5.46	5.44 6.25	43°58.94 58°30.12	12.2' 12.2'	16°4.08 15°50.77	-13.3' -13.4'	57.1' 57.1'
23			JO JU.12			-13.4	31.1
	SD = 16.1'	d = 0.8'		SI	D = 15.3'		

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

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

		Sun		Moon		
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age
- 4,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	34-53%
28	16:11	16:13	11:44	17:20	04:54	
29	16:15	16:17	11:44	18:10	05:45	
30	16:19	16:21	11:44	18:58	06:34	

### October 31, 01, 02 UT (Fri., Sat., Sun.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	39°33.09	199°17.69 \$06°56.16	165°11.28 \$19°48.22	282°40.17 N21°13.53	42°23.16	
1	54°35.55	214° 17.25 57.35	180°11.91 48.66	297°42.53 13.52	57°25.73 55.03	Alpheratz 357°33.82 29°14.20
2	69°38.02	229°16.80 58.54	195°12.54 49.10	312°44.90 13.50	72°28.31 55.07	Ankaa 353°6.12 -42°9.95
3	84°40.48	244°16.36 06°59.73	210°13.17 · · 49.53	327°47.26 · · 13.49	87°30.88 · · 55.11	Schedar 349°29.82 56°40.96
4	99°42.94	259°15.91 07°0.92	225°13.80 49.97	342°49.62 13.48	102°33.45 55.15	Diphda 348°46.34 -17°50.62 Achernar 335°19.10 -57°6.32
5	$114^{\circ}45.41$	274° 15.47 2.11	240°14.43 50.40	357°51.99 13.47	117°36.03 55.19	Hamal 327°50.12 23°35.22
6	129°47.87	289°15.02 <b>S</b> 07°3.30	255°15.06 S19°50.83	12°54.35 N21°13.46	132°38.60 \$03°55.23	Polaris 313°12.83 89°22.35
7	144°50.34	304°14.58 4.49	270°15.69 51.27	27°56.72 13.45	147°41.17 55.27	Acamar 315°10.84 -40°11.93
8	159° 52.80	319°14.13 5.68	285°16.32 51.70	42°59.08 13.44	162°43.75 55.31	Menkar 314°5.14 4°11.60
9	174° 55.26	334°13.68 · · 6.87	300°16.94 · · 52.14 315°17.57 52.57	58°1.45 · · 13.43	177°46.32 · · 55.35 192°48.89 55.39	Mirfak 308°26.83 49°57.21
10 11	189°57.73 205°0.19	349°13.24 8.06 4°12.79 9.25	315°17.57 52.57 330°18.20 53.00	73°3.81 13.42 88°6.18 13.40	192°48.89 55.39 207°51.47 55.43	Aldebaran 290°38.57 16°33.75
12	220°2.66	19°12.34 S07°10.43	345°18.83 \$19°53.43	103°8.55 N21°13.39	222°54.04 S03°55.47	Rigel 281°2.98 -8°10.14
13	235°5.12	34°11.89 11.62	0°19.45 53.87	118°10.91 13.38	237°56.61 55.51	Capella 280°20.56 46°1.36
14	250°7.58	49°11.45 12.81	15°20.08 54.30	133°13.28 13.37	252°59.18 55.55	Bellatrix 278°21.93 6°22.49
15	$265^{\circ}10.05$	64°11.00 · · 14.00	30°20.71 · · 54.73	148°15.65 · · 13.36	268°1.76 · · 55.59	Elnath 278° 0.76 28° 37.75 Alnilam 275° 36.83 -1° 10.98
16	$280^{\circ}12.51$	79°10.55 15.18	45°21.33 55.16	163°18.02 13.35	283°4.33 55.63	Betelgeuse 270°51.16 7°24.81
17	$295^{\circ}14.98$	94°10.10 16.37	60°21.96 55.59	178°20.39 13.34	298°6.90 55.67	Canopus 263°51.80 -52°42.22
18	310° 17.44	109°9.65 <b>S</b> 07°17.56	75°22.58 \$19°56.02	193°22.75 N21°13.33	313°9.47 S03°55.71	Sirius 258°25.49 -16°44.88
19	325°19.91	124°9.20 18.74	90°23.21 56.45	208°25.12 13.32	328° 12.04 55.75	Adhara 255°5.19 -29°0.15
20	340°22.37	139°8.75 19.93	105°23.83 56.89	223°27.49 13.31	343°14.62 55.79	Procyon 244°50.06 5°9.61
21 22	355°24.83 10°27.30	154°8.31 · · 21.11 169°7.86 22.30	120°24.46 · · 57.32 135°25.08 57.74	238°29.86 ·· 13.30 253°32.23 13.29	358°17.19 · · 55.83 13°19.76 55.87	Pollux 243°16.41 27°57.77
23	25° 29.76	184°7.40 23.48	150°25.71 58.17	268°34.60 13.28	28°22.33 55.91	Avior 234°14.43 -59°35.15
		-	· · · <del></del>		_	Suhail 222°45.90 -43°31.88
Mer.	pass. 21:18	$\nu$ -0.4' $d1.2'$ m-3.91	$ u 0.6' \ d0.4' \ m1.46$	$\nu$ 2.4′ <i>d</i> -0.0′ m-2.31	$\nu 2.6' \ d0.0' \ m0.76$	Miaplacidus 221°38.31 -69°49.00
						Alphard 217°47.18 -8°46.08
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.87 11°50.49 Dubhe 193°40.57 61°36.50
0	$40^{\circ}32.23$	199°6.95 <b>S</b> 07°24.67	165°26.33 <b>S</b> 19°58.60	283°36.97 N21°13.27	43°24.90 <b>S</b> 03°55.95	Denebola 182°24.52 14°25.69
1	55° 34.69	214°6.50 25.85	180°26.95 59.03	298°39.35 13.26	58°27.47 55.99	Gienah 175°43.20 -17°40.98
2	70°37.15	229°6.05 27.04	195°27.58 59.46	313°41.72 13.25	73°30.04 56.03	Acrux 173°0.01 -63°14.34
3 4	85°39.62 100°42.08	244°5.60 · · 28.22 259°5.15 29.40	210°28.20 19°59.89 225°28.82 20°0.32	328°44.09 · · 13.24 343°46.46 13.23	88°32.61 · · 56.06 103°35.18 56.10	Gacrux 171°51.46 -57°15.28
5	115° 44.55	274°4.70 30.59	240°29.45 0.74	358°48.83 13.22	118° 37.75 56.14	Alioth 166°12.88 55°49.08
6	130°47.01	289°4.25 S07°31.77	255°30.07 \$20°1.17	13°51.21 N21°13.21	133°40.32 S03°56.18	Spica 158°21.93 -11°17.67
7	$145^{\circ}49.47$	304°3.79 32.95	270°30.69 1.60	28°53.58 13.20	148° 42.89 56.22	Alkaid 152°51.95 49°11.02 Hadar 148°35.76 -60°29.76
8	$160^{\circ}51.94$	319°3.34 34.14	285°31.31 2.03	43°55.95 13.19	163°45.46 56.26	Menkent 147°57.26 -36°29.73
9	175°54.40	334°2.89 · · 35.32	300°31.93 · · 2.45	58°58.33 · · 13.18	178°48.03 · · 56.30	Arcturus 145°47.65 19°2.92
10	190°56.87	349°2.43 36.50	315°32.55 2.88	74°0.70 13.17	193°50.60 56.34	Rigil Kent. 139°40.10 -60°56.47
11	205° 59.33	4°1.98 37.68	330°33.18 3.30	89°3.08 13.16 104°5.45 N21°13.15	208°53.17 56.37	Kochab 137°20.95 74°2.91
12 13	221°1.79 236°4.26	19°1.53 S07°38.86 34°1.07 40.04	345°33.80 \$20°3.73 0°34.42 4.16	104°5.45 N21°13.15 119°7.83 13.14	223°55.74 \$03°56.41 238°58.31 56.45	Zuben'ubi 136°55.64 -16°8.87
14	251°6.72	49°0.62 41.23	15°35.04 4.58	134°10.20 13.13	254°0.88 56.49	Alphecca 126°3.54 26°37.74
15	266°9.19	64°0.16 · · 42.41	30°35.66 · · 5.01	149°12.58 · · 13.13	269°3.45 · · 56.53	Antares 112°15.37 -26°29.34 Atria 107°9.46 -69°4.54
16	$281^{\circ}11.65$	78°59.71 43.59	45°36.28 5.43	164°14.96 13.12	284°6.02 56.57	Atria 107°9.46 -69°4.54 Sabik 102°2.31 -15°45.38
17	$296^{\circ}14.11$	93°59.25 44.77	60°36.89 5.85	179°17.33 13.11	299°8.59 56.60	Shaula 96°9.79 -37°7.40
18	311°16.58	108°58.80 S07°45.95	75°37.51 \$20°6.28	194°19.71 N21°13.10	314°11.16 S03°56.64	Rasalhague 95°58.19 12°32.59
19	326° 19.04	123°58.34 47.13	90°38.13 6.70	209°22.09 13.09	329°13.73 56.68	Eltanin 90°42.23 51°29.31
20 21	341°21.51 356°23.97	138°57.88 48.31 153°57.43 • 49.48	105°38.75 7.12 120°39.37 · · 7.55	224°24.47 13.08 239°26.84 · · 13.07	344°16.29 56.72 359°18.86 •• 56.75	Kaus Aust. 83°31.88 -34°22.40
22	11°26.43	168° 56.97 50.66	135°39.99 7.97	254°29.22 13.06	14°21.43 56.79	Vega 80°33.01 38°48.65
23	26°28.90	183°56.51 51.84	150°40.60 8.39	269°31.60 13.05	29°24.00 56.83	Nunki 75°47.12 -26°15.91
_						Altair 61°59.41 8°56.33
Wer.	pass. 21:14	ν-0.5' d1.2' m-3.91	$\nu$ 0.6' d0.4' m1.46	ν2.4' d-0.0' m-2.32	ν2.6' d0.0' m0.77	Peacock 53°4.74 -56°39.31 Deneb 49°25.38 45°22.63
						Enif 33°38.08 9°59.76
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°31.91 -46°50.29
0	41°31.36	198°56.05 \$07°53.02	165°41.22 \$20°8.81	284°33.98 N21°13.05	44°26.57 \$03°56.87	Fomalhaut 15°13.59 -29°29.15
1	56° 33.83	213°55.60 54.20	180°41.84 9.24	299°36.36 13.04	59°29.13 56.91	Scheat 13°44.37 28°13.61
2	71°36.29	228°55.14 55.38	195°42.46 9.66	314°38.74 13.03	74°31.70 56.94	Markab 13°29.06 15°20.84
3 4	86° 38.76 101° 41.22	243°54.68 · · 56.55 258°54.22 57.73	210°43.07 ·· 10.08 225°43.69     10.50	329°41.12 · · 13.02 344°43.50 13.01	89°34.27 · · 56.98 104°36.84 57.02	Oct 31 Fri SHA Mer.pass
4 5	101°41.22 116°43.68	258°54.22 57.73 273°53.76 07°58.91	240°44.30 10.92	359°45.88 13.00	119° 39.40 57.05	Venus 159°44.60 10:43
6	131°46.15	288°53.30 S08°0.08	255°44.92 S20°11.34	14°48.26 N21°13.00	134°41.97 S03°57.09	Mars 125° 38.20 12:59
7	146°48.61	303°52.84 1.26	270°45.54 11.76	29°50.65 12.99	149° 44.54 57.13	Jupiter 243°7.08 05:09
8	161°51.08	318°52.38 2.43	285°46.15 12.18	44°53.03 12.98	164°47.10 57.17	Saturn 2°50.07 21:07
9	176°53.54	333°51.92 · · 3.61	300°46.77 · · 12.60	59°55.41 · · 12.97	179°49.67 · · 57.20	Nov 01 Sat SHA Mer.pass
10	191°56.00	348°51.46 4.79	315°47.38 13.02	74°57.79 12.96	194°52.24 57.24	Venus 158°34.73 10:44
11 12	206° 58.47 222° 0.93	3°51.00 5.96 18°50.54 \$08°7.13	330°47.99 13.44 345°48.61 \$20°13.86	90°0.18 12.95 105°2.56 N21°12.95	209°54.80 57.28 224°57.37 \$03°57.31	Mars 124°54.11 12:58
13	222 0.93 237°3.40	33°50.08 8.31	0°49.22 14.27	105 2.50 NZ1 12.95 120°4.94 12.94	239°59.93 57.35	Jupiter 243°4.75 05:05
14	252°5.86	48°49.62 9.48	15°49.84 14.69	135°7.33 12.93	255°2.50 57.39	Saturn 2° 52.68 21:03
15	267°8.32	63°49.16 · · 10.66	30°50.45 · · 15.11	150°9.71 · · 12.92	270°5.07 · · 57.42	Nov 02 Sun SHA Mer.pass
16	$282^{\circ}10.79$	78°48.69 11.83	45°51.06 15.53	165°12.10 12.92	285°7.63 57.46	Venus 157°24.69 10:45
17	297° 13.25	93°48.23 13.00	60°51.68 15.94	180°14.48 12.91	300°10.20 57.50	Mars 124°9.86 12:57
18	312° 15.72	108°47.77	75°52.29 \$20°16.36	195°16.87 N21°12.90	315°12.76 \$03°57.53	Jupiter 243°2.62 05:01
19 20	327° 18.18 342° 20.64	123°47.30 15.35 138°46.84 16.52	90°52.90 16.78 105°53.51 17.19	210°19.25 12.89 225°21.64 12.89	330° 15.33 57.57 345° 17.89 57.61	Saturn 2°55.20 20:59
21	342 20.04 357°23.11	153°46.38 · · 17.69	105 53.51 17.19 120°54.12 · · 17.61	240°24.03 · · 12.88	0°20.46 · · 57.64	Horizontal parallax
22	12°25.57	168° 45.91 18.86	135°54.73 18.03	255°26.41 12.87	15°23.02 57.68	Venus: 0.1
23	27°28.04	183°45.45 20.04	150°55.35 18.44	270°28.80 12.86	30°25.59 57.71	Mars: 0.1
Mer	pass. 21:10	ν-0.5' d1.2' m-3.91	ν0.6' d0.4' m1.45	ν2.4' d-0.0' m-2.33	ν2.6' d0.0' m0.77	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.49	\$14°7.06	$73^{\circ}1.33$	12.2'	S15°37.36	-13.5'	57.2'
1	199°5.51	7.87	87°32.56	12.3'	15°23.85	-13.6'	57.2'
2	214°5.54 229°5.57	8.67 •• 9.48	102°3.81 116°35.09	12.3' 12.3'	15°10.26 14°56.58	-13.7' -13.8'	57.2' 57.3'
4	244°5.59	10.29	131° 6.39	12.3'	14° 42.80	-13.0' -13.9'	57.3'
5	259° 5.62	11.10	145°37.72	12.3'	14°28.94	-14.0'	57.4'
6	274°5.64	S14°11.91	160°9.06	12.4'	S14°14.99	-14.0'	57.4'
7	289°5.66	12.71	174°40.42	12.4'	14° 0.95	-14.1'	57.4'
8 9	304°5.69 319°5.71	13.52 •• 14.33	189°11.80 203°43.20	12.4' 12.4'	13°46.82 13°32.61	-14.2' -14.3'	57.5' 57.5'
10	334°5.73	15.13	218°14.62	12.4	13°18.32	-14.4'	57.6'
11	349°5.76	15.94	232°46.05	12.4'	13°3.94	-14.5'	57.6'
12	4°5.78	S14°16.74	247°17.50	12.5'	S12°49.48	-14.5'	57.6'
13 14	19°5.80 34°5.82	17.55 18.35	261°48.96 276°20.44	12.5' 12.5'	12°34.94 12°20.32	-14.6' -14.7'	57.7' 57.7'
14 15	34 5.82 49°5.85	18.35	276 20.44 290°51.93	12.5'	12 20.32 12°5.62	-14.7 -14.8'	57.7 57.8'
16	64°5.87	19.96	305°23.43	12.5'	11°50.84	-14.9'	57.8'
17	79°5.89	20.76	319°54.94	12.5'	$11^{\circ}35.98$	-14.9'	57.8'
18	94°5.91	S14°21.56	334°26.46	12.5'	S11°21.05	-15.0'	57.9'
19 20	109°5.93 124°5.95	22.37 23.17	348°57.99 3°29.53	12.5' 12.5'	11°6.04 10°50.95	-15.1' -15.2'	57.9' 58.0'
21	139°5.97	• • 23.97	3 29.53 18°1.07	12.5'	10°35.79	-15.2'	58.0'
22	154°5.99	24.77	32°32.62	12.6'	10°20.56	-15.3'	58.0'
23	$169^{\circ}6.01$	25.57	47°4.18	12.6'	$10^{\circ}5.26$	-15.4'	58.1'
	SD = 16.1'	d = 0.8'		SI	D = 15.6'		
C-+	СПУ	Daa	CH*		Das	اد	μn
Sat 0	<b>GHA</b> 184°6.02	Dec \$14°26.37	<b>GHA</b> 61°35.73	u 12.6'	<b>Dec</b> \$09°49.89	d -15.4'	HP 58.1'
1	199°6.04	27.17	76°7.29	12.6'	09°34.45	-15.5'	58.2'
2	214°6.06	27.97	90°38.85	12.6'	09°18.94	-15.6'	58.2'
3	229°6.08	• • 28.77	105°10.42	12.6'	09°3.36	-15.6'	58.3'
4 5	244°6.09 259°6.11	29.57 30.36	119°41.98 134°13.53	12.6' 12.6'	08°47.72 08°32.01	-15.7' -15.8'	58.3' 58.3'
6	274°6.13	\$14°31.16	148°45.09	12.6'	508°16.24	-15.8'	58.4'
7	289°6.14	31.96	163°16.64	12.5'	08° 0.41	-15.9'	58.4'
8	304°6.16	32.76	177°48.18	12.5'	07°44.51	-16.0'	58.5'
9	319°6.17	• • 33.55	192°19.72	12.5'	07°28.56	-16.0'	58.5'
10 11	334°6.19 349°6.20	34.35 35.14	206°51.25 221°22.78	12.5' 12.5'	07°12.54 06°56.47	-16.1' -16.1'	58.5' 58.6'
12	4°6.22	\$14°35.94	235°54.29	12.5'	S06°40.34	-16.2	58.6'
13	19°6.23	36.73	250°25.79	12.5'	$06^{\circ}24.15$	-16.2'	58.7'
14	34°6.25	37.53	264°57.27	12.5'	06°7.91	-16.3'	58.7'
15 16	49°6.26 64°6.27	· · 38.32 39.12	279°28.75 294°0.21	12.5' 12.4'	05°51.62 05°35.27	-16.3' -16.4'	58.7' 58.8'
17	79°6.29	39.12	308°31.65	12.4'	05 35.27 05°18.88	-16.4'	58.8'
18	94°6.30	S14°40.70	323° 3.07	12.4'	S05°2.43	-16.5	58.9'
19	109°6.31	41.49	337°34.48	12.4'	04°45.94	-16.5'	58.9'
20	124°6.32	42.29	352°5.86		04°29.40		58.9'
21 22	139°6.33 154°6.34	· · 43.08 43.87	6°37.23 21°8.57	12.3' 12.3'	04°12.81 03°56.18	-16.6' -16.7'	59.0' 59.0'
23	169°6.35	44.66	35°39.89	12.3'	03°39.51	-16.7	59.1'
	SD = 16.1'	d = 0.8'		SI	D = 15.9'		
Sun	GHA	Dec	GHA	ν	Dec	d 16.0'	HP
0 1	184° 6.36 199° 6.37	\$14°45.45 46.24	50°11.18 64°42.44	12.3' 12.2'	\$03°22.79 03°6.03	-16.8' -16.8'	59.1' 59.1'
2	214°6.38	47.03	79°13.68	12.2'	02°49.24	-16.8	59.2
3	229°6.39	• • 47.82	93°44.89	12.2'	$02^{\circ}32.41$	-16.9'	59.2'
4	244°6.40	48.61	108°16.07	12.1'	02°15.54	-16.9'	59.3'
5 6	259°6.41 274°6.42	49.39 \$14°50.18	122°47.21 137°18.33	12.1' 12.1'	01°58.64 \$01°41.70	-16.9' -17.0'	59.3' 59.3'
7	289° 6.43	50.16	151°49.41	12.1	01°24.74	-17.0'	59.4'
8	304°6.43	51.76	166°20.45	12.0'	$01^{\circ}7.74$	-17.0'	59.4'
9	319°6.44	• • 52.54	180°51.45	12.0'	00°50.71	-17.1'	59.5'
10 11	334°6.45 349°6.46	53.33 54.11	195°22.42 209°53.35	11.9' 11.9'	00°33.66 \$00°16.58	-17.1' -17.1'	59.5' 59.5'
12	349 6.46 4 6.46	54.11 \$14°54.90	209°53.35 224°24.23	11.9	N00° 0.53	-17.1' 17.1'	59.5
13	19°6.47	55.68	238°55.08	11.8'	00° 17.65	17.1	59.6'
14	34°6.47	56.47	253°25.88	11.8'	00°34.80	17.2'	59.6'
15	49°6.48	• • 57.25	267°56.63	11.7'	00°51.97	17.2'	59.7'
16 17	64°6.48 79°6.49	58.04 58.82	282°27.34 296°57.99	11.7' 11.6'	01°9.15 01°26.35	17.2' 17.2'	59.7' 59.8'
18	94°6.49	58.82 \$14°59.60	311°28.60	11.6'	01 20.35 N01°43.57	17.2'	59.8'
19	109°6.49	15°0.38	325°59.16	11.5'	02°0.80	17.2'	59.8'
20	124°6.50	1.17	340°29.67	11.5'	02°18.04	17.3'	59.9'
21	139°6.50 154°6.50	• • 1.95	355°0.12 9°30.52	11.4'	02°35.29 02°52.55	17.3'	59.9'
22 23	154°6.50 169°6.51	2.73 3.51	9°30.52 24°0.86	11.3' 11.3'	02°52.55 03°9.82	17.3' 17.3'	59.9' 60.0'
	SD = 16.1'	d = 0.8'			D = 16.1'		

	Twilight				Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	06:07	07:30	00.50	14:27	15:55	17:18	
			08:58				
N 70°	06:03	07:17	08:32	14:54	16:09	17:23	
68°	05:59	07:06	08:12	15:14	16:19	17:27	
66°	05:56	06:57	07:56	15:30	16:28	17:30	
64°	05:53	06:50	07:43	15:43	16:36	17:33	
62°	05:50	06:43	07:32	15:54	16:43	17:36	
60°	05:48	06:37	07:23	16:04	16:49	17:38	
N 58°	05:46	06:32	07:15	16:12	16:54	17:40	
56°	05:44	06:28	07:07	16:19	16:59	17:43	
54°	05:42	06:23	07:01	16:25	17:03	17:45	
52°	05:40	06:20	06:55	16:31	17:07	17:47	
50°	05:38	06:16	06:50	16:37	17:10	17:49	
45°	05:33	06:08	06:39	16:48	17:19	17:53	
<b>N</b> 40°	05:29	06:01	06:29	16:57	17:26	17:58	
35°	05:25	05:55	06:21	17:06	17:32	18:02	
30°	05:21	05:49	06:14	17:13	17:38	18:06	
20°	05:13	05:39	06:02	17:25	17:48	18:14	
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	
<b>S</b> 10°	04:42	05:08	05:30	17:58	18:19	18:45	
20°	04:28	04:55	05:18	18:09	18:32	18:59	
30°	04:10	04:40	05:05	18:22	18:48	19:18	
35°	03:58	04:31	04:58	18:30	18:57	19:30	
40°	03:44	04:20	04:49	18:39	19:08	19:44	
45°	03:27	04:06	04:39	18:49	19:22	20:02	
<b>S</b> 50°	03:04	03:50	04:26	19:02	19:39	20:25	
52°	02:52	03:42	04:20	19:08	19:47	20:37	
54°	02:39	03:33	04:14	19:15	19:56	20:50	
56°	02:23	03:23	04:07	19:22	20:06	21:06	
58°	02:04	03:11	03:59	19:30	20:18	21:26	
<b>S</b> 60°	01:39	02:57	03:49	19:39	20:32	21:53	

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-83%	
31	16:22	16:23	11:44	19:46	07:22		
01	16:24	16:25	11:44	20:33	08:09		
02	16:25	16:26	11:44	21:21	08:56		

#### November 03, 04, 05 UT (Mon., Tue., Wed.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA
0	42°30.50	198°44.98	165°55.96 \$20°18.86	285°31.19 N21°12.86	45°28.15 \$03°57.75	Alpheratz 357°33.83
1	57° 32.96	213°44.52 22.38	180°56.57 19.27	300°33.58 12.85	60°30.72 57.79	Ankaa 353°6.13
2	72°35.43	228°44.05 23.55	195°57.18 19.68	315°35.97 12.84	75°33.28 57.82	Schedar 349°29.83
3 4	87°37.89 102°40.36	243°43.59 · · 24.72 258°43.12 25.89	210°57.79 · · 20.10 225°58.40 20.51	330°38.36 · · 12.84 345°40.74 12.83	90°35.84 · · 57.86 105°38.41 57.89	Diphda 348°46.35
5	102 40.30 117° 42.82	258° 43.12 25.89 273° 42.65 27.06	240°59.01 20.93	0°43.13 12.82	105°38.41 57.89 120°40.97 57.93	Achernar 335°19.10
6	132°45.28	288°42.19 S08°28.23	255°59.62 S20°21.34	15°45.52 N21°12.82	135°43.53 S03°57.96	Hamal 327°50.12
7	$147^{\circ}47.75$	303°41.72 29.40	271°0.23 21.75	30°47.91 12.81	150°46.10 58.00	Polaris 313°12.48 Acamar 315°10.83
8	162°50.21	318°41.25 30.56	286°0.83 22.16	45°50.30 12.80	165°48.66 58.04	Menkar 314°5.14
9 10	177°52.68 192°55.14	333°40.78 · · 31.73 348°40.32 32.90	301°1.44 · · 22.58 316°2.05 22.99	60°52.70 · · 12.80 75°55.09 12.79	180°51.22 · · 58.07 195°53.79 58.11	Mirfak 308°26.82
11	207° 57.60	3°39.85 34.07	331°2.66 23.40	90°57.48 12.78	210° 56.35 58.14	Aldebaran 290°38.56
12	223°0.07	18°39.38	346°3.27 <b>S</b> 20°23.81	105°59.87 N21°12.78	225°58.91 \$03°58.18	Rigel 281°2.97 Capella 280°20.54
13	238°2.53	33°38.91 36.40	1°3.87 24.22	121°2.26 12.77	241°1.48 58.21	Capella 280°20.54 Bellatrix 278°21.92
14	253°5.00	48°38.44 37.57	16° 4.48 24.63	136°4.66 12.76	256°4.04 58.25	Elnath 278° 0.75
15 16	268°7.46 283°9.92	63°37.97 · · 38.73 78°37.50 39.90	31°5.09 · · 25.04 46°5.69 25.45	151°7.05 · · 12.76 166°9.44 12.75	271°6.60 · · 58.28 286°9.16 58.32	Alnilam 275°36.81
17	298° 12.39	93°37.03 41.07	61°6.30 25.86	181°11.84 12.74	301°11.73 58.35	Betelgeuse 270°51.14
18	313°14.85	108°36.56 <b>S</b> 08°42.23	76°6.91 <b>S</b> 20°26.27	196°14.23 N21°12.74	316°14.29 \$03°58.39	Canopus 263°51.77 Sirius 258°25.47
19	328° 17.32	123°36.09 43.40	91°7.51 26.68	211°16.62 12.73	331°16.85 58.42	Adhara 255°5.17
20	343°19.78	138°35.62 44.56	106° 8.12 27.09	226°19.02 12.73	346°19.41 58.46	Procyon 244°50.04
21 22	358°22.25 13°24.71	153°35.15 · · 45.72 168°34.67 46.89	121°8.72 · · 27.50 136°9.33 27.91	241°21.41 · · 12.72 256°23.81 12.71	1°21.97 · · 58.49 16°24.53 58.52	Pollux 243°16.39
23	28°27.17	183°34.20 48.05	151°9.93 28.32	271°26.21 12.71	31°27.09 58.56	Avior 234°14.40
Morr	pass. 21:06	ν-0.5' d1.2' m-3.91	ν0.6' d0.4' m1.45	ν2.4' d-0.0' m-2.34	ν2.6' d0.0' m0.78	Suhail 222°45.87 Miaplacidus 221°38.26
- IVICI.L	Jass. 21.00	ν-0.5 d1.2 III-3.91		ν2.4 α-0.0 III-2.54		Alphard 217° 47.16
-	CIIA	CUA D	CUA D	CIIA	CUA D	Regulus 207°33.85
Tue 0	<b>GHA</b> 43° 29.64	<b>GHA Dec</b> 198°33.73 \$08°49.22	<b>GHA Dec</b> 166°10.54 \$20°28.72	<b>GHA Dec</b> 286°28.60 N21°12.70	<b>GHA Dec</b> 46°29.66 \$03°58.59	Dubhe 193°40.54
1	58° 32.10	213°33.26 50.38	181°11.14 29.13	301°31.00 12.70	61°32.22 58.63	Denebola 182°24.51
2	73°34.57	228°32.78 51.54	196°11.74 29.54	316°33.40 12.69	76°34.78 58.66	Gienah 175°43.19 Acrux 172°59.99
3	88° 37.03	243°32.31 · · 52.70	211°12.35 · · 29.94	331°35.79 · · 12.69	91°37.34 · · 58.70	Gacrux 171°51.44
4	103°39.49	258°31.84 53.87	226°12.95 30.35	346°38.19 12.68	106°39.90 58.73	Alioth 166°12.87
5 6	118°41.96 133°44.42	273°31.36 55.03 288°30.89 \$08°56.19	241°13.55 30.76 256°14.16 \$20°31.16	1°40.59 12.68 16°42.99 N21°12.67	121° 42.46 58.76 136° 45.02 \$03° 58.80	Spica 158°21.93
7	148°46.89	303°30.41 57.35	271°14.76 31.57	31°45.39 12.66	151°47.58 58.83	Alkaid 152°51.95
8	163°49.35	318°29.94 58.51	286°15.36 31.97	46°47.78 12.66	166°50.14 58.87	Hadar 148°35.75 Menkent 147°57.26
9	178°51.81	333°29.46 08°59.67	301°15.96 · · 32.38	61°50.18 · · 12.65	181°52.70 · · 58.90	Arcturus 145° 47.65
10	193°54.28	348°28.98 09°0.83	316°16.56 32.78	76°52.58 12.65	196° 55.26 58.93	Rigil Kent. 139°40.10
11 12	208° 56.74 223° 59.21	3°28.51 1.99 18°28.03 \$09°3.15	331°17.17 33.19 346°17.77 \$20°33.59	91°54.98 12.64 106°57.38 N21°12.64	211° 57.82 58.97 227° 0.38 \$03° 59.00	Kochab 137°20.96
13	239°1.67	33°27.55 4.31	1°18.37 33.99	121°59.79 12.63	242°2.94 59.03	Zuben'ubi 136°55.64 Alphecca 126°3.55
14	254°4.13	48°27.08 5.47	16°18.97 34.40	$137^{\circ}2.19$ 12.63	257°5.49 59.07	Alphecca 126°3.55 Antares 112°15.37
15	269°6.60	63°26.60 · · 6.63	31°19.57 · · 34.80	152°4.59 · · 12.62	272°8.05 · · 59.10	Atria 107°9.49
16 17	284°9.06 299°11.53	78°26.12 7.78 93°25.64 8.94	46°20.17 35.20 61°20.77 35.61	167°6.99 12.62 182°9.39 12.61	287°10.61 59.13 302°13.17 59.17	Sabik 102°2.32
18	314° 13.99	108°25.16 S09°10.10	76°21.37 S20°36.01	197°11.80 N21°12.61	317°15.73 S03°59.20	Shaula 96°9.80
19	329° 16.45	123°24.69 11.26	91°21.97 36.41	212°14.20 12.61	332°18.29 59.23	Rasalhague 95°58.20 Eltanin 90°42.25
20	344° 18.92	138°24.21 12.41	106°22.57 36.81	227°16.60 12.60	347°20.85 59.27	Kaus Aust. 83°31.89
21	359°21.38	153°23.73 · · 13.57	121°23.17 · · 37.21	242°19.01 · · 12.60	2°23.40 · · 59.30	Vega 80°33.03
22 23	14°23.85 29°26.31	168° 23.25 14.72 183° 22.77 15.88	136°23.76 37.61 151°24.36 38.01	257°21.41 12.59 272°23.81 12.59	17°25.96 59.33 32°28.52 59.37	Nunki 75°47.13
		-				Altair 61°59.42
Mer.p	bass. 21:03	ν-0.5' d1.2' m-3.91	ν0.6′ d0.4′ m1.44	ν2.4' d-0.0' m-2.34	ν2.6' d0.0' m0.78	Peacock 53°4.77 Deneb 49°25.41
						Enif 33°38.09
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27° 31.93
0 1	44°28.78 59°31.24	198°22.28	166°24.96	287°26.22 N21°12.58 302°28.62 12.58	47°31.08	Fomalhaut 15°13.60
2	74° 33.70	213 21.80 18.19 228°21.32 19.34	196°26.15 39.21	317°31.03 12.58	77°36.19 59.46	Scheat 13°44.39
3	89°36.17	243°20.84 · · 20.50	211°26.75 · · 39.61	332°33.43 · · 12.57	92°38.75 · · 59.50	Markab 13°29.07
4	104°38.63	258°20.36 21.65	226°27.35 40.01	347°35.84 12.57	107°41.31 59.53	Nov 03 Mon SHA
5	119°41.10	273°19.88 22.81	241°27.95 40.41	2°38.25 12.56	122°43.86 59.56	Venus 156°14.48 Mars 123°25.46
6 7	134° 43.56 149° 46.02	288°19.39 \$09°23.96 303°18.91 25.11	256°28.54 \$20°40.81 271°29.14 41.21	17°40.65 N21°12.56 32°43.06 12.56	137°46.42 S03°59.59 152°48.98 59.62	Mars 123°25.46 Jupiter 243°0.69
8	164° 48.49	318°18.43 26.26	286°29.73 41.61	47°45.47 12.55	167°51.53 59.66	Saturn 2°57.65
9	179°50.95	333°17.94 · · 27.42	301°30.33 ·· 42.00	62°47.88 · · 12.55	182°54.09 · · 59.69	Nov. 04 Tue CHA
10	194°53.42	348°17.46 28.57	316°30.92 42.40	77°50.29 12.54	197° 56.65 59.72	Nov 04 Tue SHA Venus 155°4.09
11	209°55.88	3°16.97 29.72	331°31.52 42.80	92°52.69 12.54	212°59.20 59.75	Mars 122°40.90
12 13	224°58.34 240°0.81	18°16.49 \$09°30.87 33°16.00 32.02	346°32.11 \$20°43.19 1°32.71 43.59	107°55.10 N21°12.54 122°57.51 12.53	228°1.76 S03°59.79 243°4.31 59.82	Jupiter 242°58.96
14	255°3.27	48°15.52 33.17	16°33.30 43.99	137°59.92 12.53	258°6.87 59.85	Saturn 3°0.02
15	270°5.74	63°15.03 · · 34.32	31°33.90 · · 44.38	153°2.33 · · 12.53	273°9.42 · · 59.88	Nov 05 Wed SHA
16	285°8.20	78°14.54 35.47	46°34.49 44.78	168° 4.74 12.52	288°11.98 59.91	Venus 153°53.51
17	300°10.67	93°14.06 36.62 108°13.57 \$09°37.77	61°35.08 45.17	183°7.15 12.52	303°14.53 03°59.94 318°17.09 \$03°59.97	Mars 121°56.18
18 19	315° 13.13 330° 15.59	108°13.57 <b>S</b> 09°37.77 123°13.08 38.91	76°35.68 \$20°45.57 91°36.27 45.96	198°9.56 N21°12.52 213°11.98 12.51	318°17.09 S03°59.97 333°19.64 0.01	Jupiter 242° 57.44 Saturn 3° 2.30
20	345° 18.06	138°12.59 40.06	106°36.86 46.35	228°14.39 12.51	348° 22.20 0.04	
21	0°20.52	153°12.11 · · 41.21	121°37.45 · · 46.75	243°16.80 · · 12.51	3°24.75 · · 0.07	Horizontal parallax
22	15°22.99	168°11.62 42.36	136°38.05 47.14	258°19.21 12.51	18°27.31 0.10	Venus: Mars:
23	30°25.45	183°11.13 43.50	151°38.64 47.53	273°21.63 12.50	33°29.86 0.13	Iviais.
Mer.p	pass. 20:59	ν-0.5′ d1.2′ m-3.91	$\nu 0.6' \ d0.4' \ m1.44$	ν2.4' d-0.0' m-2.35	ν2.6' d0.0' m0.79	

Dec 29°14.20 -42°9.97 56°40.97 -17°50.63  $\text{-}57^{\circ}6.34$  $23^{\circ}35.22$  $89^{\circ}22.36$ -40°11.94 4°11.59 49°57.22 16°33.75 -8°10.15 46°1.37  $6^{\circ}22.49$ 28°37.75 -1°10.99 7°24.80 -52°42.23 -16°44.89 -29°0.16 5°9.61 27°57.77 -59°35.15 -43°31.89 -69°49.00 -8°46.08 11°50.48 61°36.49  $14^{\circ}25.68$ -17°40.98 -63°14.33 -57°15.27 55°49.06 -11°17.67 49°11.00 -60°29.75 -36°29.72 19°2.91 -60°56.46  $74^{\circ}2.89$  $-16^{\circ}8.87$ 26°37.73 -26°29.34 -69°4.53  $-15^{\circ}45.38$  $\text{-}37^{\circ}7.40$  $12^{\circ}32.58$ 51°29.30 -34°22.40 38°48.65 -26°15.91 8°56.32 -56°39.31  $45^{\circ}22.62$ 9°59.76 -46°50.30 -29°29.16 28°13.61 15°20.84 Mer.pass 10:45 12:56 04:57

> Mer.pass 10:46 12:55 04:53 20:50 Mer.pass 10:47 12:54 04:49 20:46

> > 0.1 0.1

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	184°6.51	S15°4.29	38°31.14	11.2'	N03°27.08	17.3'	60.0'
1	199°6.51	5.07	53°1.36	11.2'	03°44.36	17.3'	60.0'
2	214°6.51	5.85	67°31.52	11.1'	04°1.63	17.3'	60.1'
3	229°6.51	• • 6.63	82°1.63	11.0'	04° 18.90	17.3	60.1'
4 5	244°6.51 259°6.51	7.41 8.18	96°31.66 111°1.63	11.0' 10.9'	04°36.17 04°53.44	17.3' 17.3'	60.1' 60.2'
6	259 0.51 274°6.51	8.18 \$15°8.96	111 1.03 125°31.54	10.9	N05° 10.70	17.3	60.2'
7	289°6.51	9.74	140°1.38	10.8	05° 27.95	17.2	60.2
8	304°6.51	10.51	154°31.15	10.7'	05°45.19	17.2'	60.3'
9	319°6.51	• • 11.29	169°0.85	10.6'	06°2.42	17.2'	60.3'
10	$334^{\circ}6.51$	12.07	183°30.48	10.6'	$06^{\circ}19.64$	17.2'	60.3'
11	349°6.51	12.84	198°0.03	10.5'	06°36.84	17.2'	60.4'
12	4°6.51	S15°13.62	212°29.51	10.4	N06°54.02	17.2	60.4
13	19°6.50 34°6.50	14.39 15.17	226°58.92 241°28.24	10.3' 10.2'	07°11.18 07°28.32	17.1' 17.1'	60.4' 60.5'
14 15	49°6.50	15.17	241 28.24 255°57.49	10.2'	07 28.32 07°45.44	17.1' 17.1'	60.5'
16	64°6.49	16.71	270° 26.66	10.2	08°2.53	17.1	60.5
17	79°6.49	17.49	284°55.75	10.0'	08° 19.60	17.0'	60.6'
18	94°6.48	S15° 18.26	299°24.76	9.9'	N08° 36.63	17.0'	60.6'
19	109°6.48	19.03	313°53.68	9.8'	08°53.63	17.0'	60.6'
20	124°6.47	19.80	328°22.52	9.8'	09°10.60	16.9'	60.6'
21	139°6.47	• • 20.57	342°51.27	9.7'	09°27.54	16.9'	60.7'
22	154°6.46	21.34	357°19.93	9.6'	09°44.43	16.9'	60.7'
23	169°6.46	22.11	11°48.51	9.5'	10°1.29	16.8'	60.7'
	SD = 16.1'	d = 0.8'		SI	0 = 16.4'		
Tue	GHA	Dec	GHA	ν	Dec	d	НР
0	184° 6.45	\$15° 22.88	26° 16.99	9.4'	N10° 18.10	16.8'	60.7'
1	199°6.44	23.65	40°45.39	9.3'	10° 34.87	16.7'	60.8'
2	214°6.44	24.42	55° 13.69	9.2'	$10^{\circ}51.59$	16.7'	60.8'
3	229°6.43	• • 25.19	69°41.90	9.1'	11°8.26	16.6'	60.8'
4	244°6.42	25.96	84° 10.01	9.0'	11°24.88	16.6'	60.8'
5	259°6.41	26.72	98°38.03	8.9'	11°41.45	16.5'	60.9'
6	274°6.41	S15°27.49	113°5.96	8.8'	N11°57.96 12°14.42	16.5'	60.9'
7 8	289°6.40 304°6.39	28.26 29.02	127°33.78 142°1.50	8.7' 8.6'	12° 14.42 12° 30.81	16.4' 16.3'	60.9' 60.9'
9	319°6.38	29.79	156° 29.13	8.5'	12° 47.14	16.3	61.0'
10	334°6.37	30.56	170° 56.65	8.4	13°3.41	16.2'	61.0'
11	349°6.36	31.32	185° 24.07	8.3'	13° 19.61	16.1	61.0'
12	4°6.35	S15°32.08	199°51.39	8.2'	N13°35.74	16.1'	61.0'
13	19°6.34	32.85	$214^{\circ}18.61$	8.1'	13°51.80	16.0'	61.0'
14	34°6.32	33.61	228° 45.72	8.0'	14°7.78	15.9'	61.1'
15	49°6.31	• • 34.38	243° 12.72	7.9'	14°23.69	15.8'	61.1'
16	64°6.30	35.14	257°39.62	7.8'	14° 39.52	15.7'	61.1'
17 18	79°6.29 94°6.28	35.90 \$15°36.66	272°6.41 286°33.09	7.7' 7.6'	14°55.27 N15°10.94	15.7' 15.6'	61.1' 61.1'
19	109°6.26	37.42	300°59.66	7.6 7.5'	15° 26.52	15.5'	61.1
20	124°6.25	38.18	315° 26.13	7.4	15° 42.01	15.4	61.2'
21	139°6.23	38.94	329°52.48	7.2'	15° 57.41	15.3'	61.2'
22	154°6.22	39.70	344° 18.72	7.1'	16° 12.72	15.2'	61.2'
23	169°6.21	40.46	358°44.85	7.0'	16°27.93	15.1'	61.2'
	SD = 16.1'	d = 0.8'		SI	0 = 16.6'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	184°6.19	S15°41.22	13° 10.87	6.9'	N16° 43.04	15.0'	61.2'
1	199°6.18	41.98	27°36.77	6.8'	$16^{\circ}58.06$	14.9'	61.2'
2	214°6.16	42.74	42°2.56	6.7'	17° 12.97	14.8'	61.2'
3	229°6.14	• • 43.50	56°28.24	6.6'	17° 27.78	14.7'	61.3'
4	244°6.13	44.25	70°53.81	6.4'	17° 42.47	14.6'	61.3'
5 6	259°6.11 274°6.09	45.01 \$15°45.77	85° 19.26 99° 44.59	6.3' 6.2'	17°57.06 N18°11.54	14.5' 14.4'	61.3' 61.3'
7	274°6.09 289°6.08	46.52	99°44.59 114°9.81	6.2	18° 25.90	14.4	61.3
8	304°6.06	40.52 47.28	114 9.01 128°34.91	6.0'	18° 40.14	14.1	61.3
9	319°6.04	• 48.03	142° 59.90	5.9'	18° 54.27	14.0'	61.3
10	334°6.02	48.79	157°24.78	5.8'	19°8.27	13.9'	61.3'
11	349°6.00	49.54	171°49.54	5.6'	$19^{\circ}22.15$	13.8'	61.3'
12	4°5.98	S15°50.30	186°14.18	5.5'	N19°35.90	13.6'	61.3'
13	19°5.96	51.05	200°38.71	5.4'	19°49.52	13.5'	61.3'
14	34°5.94	51.80	215°3.12 229°27.42	5.3'	20°3.00	13.4'	61.4'
15 16	49°5.92 64°5.90	· · 52.55 53.31	229°27.42 243°51.60	5.2' 5.1'	20° 16.36 20° 29.58	13.2' 13.1'	61.4' 61.4'
16 17	79°5.88	53.31 54.06	243°51.60 258°15.67	5.1	20° 29.58 20° 42.66	13.1	61.4
18	94°5.86	\$15°54.81	272° 39.62	4.8'	N20° 55.59	12.9	61.4
19	109°5.84	55.56	287°3.47	4.7'	21°8.39	12.6'	61.4
20	124°5.82	56.31	301°27.19	4.6'	21°21.04	12.5'	61.4
21	139°5.79	•• 57.06	315°50.81	4.5'	21°33.53	12.3'	61.4'
22	154°5.77	57.81	330°14.31	4.4'	21°45.88	12.2'	61.4'
23	169°5.75	58.56	344°37.70	4.3'	21°58.08	12.0'	61.4'
	SD = 16.1'	d = 0.8'		SI	O = 16.7'		

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

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

	Sun			Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	91-99%	
03	16:26	16:26	11:44	22:11	09:45		
04	16:26	16:25	11:44	23:05	10:38		
05	16:25	16:24	11:44	-:-	11:34		

### November 06, 07, 08 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	45°27.91	198°10.64 <b>S</b> 09°44.65	166°39.23 <b>S</b> 20°47.93	288°24.04 N21°12.50	48°32.42 <b>S</b> 04°0.16	Alpheratz 357°33.83 29°14.21
1	60°30.38	213° 10.15 45.80	181°39.82 48.32	303°26.45 12.50	63°34.97 0.19	Ankaa 353°6.14 -42°9.98
2	75°32.84	228°9.66 46.94	196°40.41 48.71	318°28.87 12.49	78° 37.52 0.22	Schedar 349°29.83 56°40.99
3	90°35.31	243°9.17 · · 48.09	211°41.00 · · 49.10	333°31.28 · · 12.49	93°40.08 · · 0.26	Diphda 348°46.35 -17°50.63
4 5	105° 37.77 120° 40.24	258°8.68 49.23 273°8.19 50.38	226°41.59 49.50 241°42.18 49.89	348°33.70 12.49 3°36.11 12.49	108° 42.63 0.29 123° 45.18 0.32	Achernar 335°19.11 -57°6.35
6	135° 42.70	288°7.70 S09°51.52	256°42.77 \$20°50.28	18°38.53 N21°12.48	138° 47.74 S04° 0.35	Hamal 327°50.11 23°35.22
7	150° 45.16	303°7.20 52.67	271°43.36 50.67	33°40.94 12.48	153°50.29 0.38	Polaris 313°11.82 89°22.38
8	165°47.63	318°6.71 53.81	286°43.95 51.06	48°43.36 12.48	168°52.84 0.41	Acamar 315°10.83 -40°11.96   Menkar 314°5.13 4°11.59
9	180°50.09	333°6.22 · · 54.95	301°44.54 · · 51.45	63°45.78 · · 12.48	183°55.40 · · 0.44	Mirfak 308°26.80 49°57.23
10	195°52.56	348°5.73 56.09	316°45.13 51.84	78°48.19 12.48	198° 57.95 0.47	Aldebaran 290°38.54 16°33.75
11 12	210° 55.02 225° 57.48	3°5.23 57.24 18°4.74 \$09°58.38	331°45.72 52.23 346°46.30 \$20°52.62	93°50.61 12.47 108°53.03 N21°12.47	214°0.50 0.50 229°3.05 \$04°0.53	Rigel 281°2.95 -8°10.16
13	240°59.95	33°4.25 09°59.52	1°46.89 53.01	123°55.44 12.47	244°5.61 0.56	Capella 280°20.51 46°1.37
14	256°2.41	48°3.75 10°0.66	16°47.48 53.39	138°57.86 12.47	259°8.16 0.59	Bellatrix 278°21.90 6°22.48
15	271°4.88	63°3.26 · · 1.80	31°48.07 · · 53.78	154°0.28 · · 12.47	274°10.71 · · 0.62	Elnath 278° 0.72 28° 37.75   Alnilam 275° 36.80 -1° 11.00
16	286°7.34	78°2.76 2.94	46°48.65 54.17	169°2.70 12.46	289° 13.26 0.65	Alnilam 275°36.80 -1°11.00   Betelgeuse 270°51.12 7°24.80
17	301°9.81	93°2.27 4.08	61°49.24 54.56	184°5.12 12.46	304°15.81 0.68	Canopus 263°51.75 -52°42.24
18	316° 12.27	108°1.77 \$10°5.22	76°49.83 \$20°54.94	199°7.54 N21°12.46	319°18.37 S04°0.71	Sirius 258°25.45 -16°44.90
19 20	331°14.73 346°17.20	123°1.27 6.36 138°0.78 7.50	91°50.41 55.33 106°51.00 55.72	214°9.96 12.46 229°12.38 12.46	334°20.92 0.74 349°23.47 0.77	Adhara 255° 5.15 -29° 0.17
21	1°19.66	153°0.28 · · 8.64	121°51.59 · · 56.10	244°14.80 · · 12.46	4°26.02 · · 0.80	Procyon 244°50.02 5°9.60
22	16°22.13	167°59.78 9.78	136°52.17 56.49	259°17.22 12.45	19°28.57 0.83	Pollux 243°16.37 27°57.76
23	31°24.59	182°59.28 10.91	151°52.76 56.87	274°19.64 12.45	34°31.12 0.86	Avior 234°14.36 -59°35.16   Suhail 222°45.84 -43°31.89
Meri	pass. 20:55	ν-0.5' d1.1' m-3.91	ν0.6' d0.4' m1.43	ν2.4' d-0.0' m-2.36	$\nu$ 2.6' $d$ 0.0' $m$ 0.79	Suhail 222°45.84 -43°31.89   Miaplacidus 221°38.20 -69°49.01
- IVICI.	pass. 20.55	ν-0.5 α1.1 π-5.91		ν2. <del>4</del> α-0.0 III-2.30		Alphard 217°47.14 -8°46.09
						Regulus 207°33.83 11°50.47
Fri	GHA	GHA Dec	GHA Dec	<b>GHA Dec</b> 289°22.07 N21°12.45	<b>GHA Dec</b> 49°33.67 <b>S</b> 04°0.89	Dubhe 193°40.51 61°36.47
0 1	46°27.06 61°29.52	197°58.79 \$10°12.05 212°58.29 13.19	166°53.34 \$20°57.26 181°53.93 57.65	289°22.07 N21°12.45 304°24.49 12.45	49°33.67 <b>S</b> 04°0.89 64°36.22 0.92	Denebola 182°24.49 14°25.67
2	76°31.98	227°57.79 14.32	196°54.51 58.03	319°26.91 12.45	79°38.77 0.95	Gienah 175°43.17 -17°40.99
3	91°34.45	242°57.29 · · 15.46	211°55.09 · · 58.41	334°29.33 · · 12.45	94°41.32 · · 0.97	Acrux 172°59.95 -63°14.32   Gacrux 171°51.41 -57°15.26
4	106°36.91	257°56.79 16.60	226°55.68 58.80	349°31.76 12.45	109°43.87 1.00	Gacrux 171°51.41 -57°15.26   Alioth 166°12.86 55°49.04
5	121°39.38	272°56.29 17.73	241°56.26 59.18	4°34.18 12.45	124°46.42 1.03	Spica 158°21.91 -11°17.68
6	136°41.84	287°55.79 \$10°18.87	256°56.85 \$20°59.56	19°36.61 N21°12.45	139°48.97 S04°1.06	Alkaid 152°51.94 49°10.99
7	151° 44.30	302°55.29 20.00	271°57.43 20°59.95	34°39.03 12.44	154°51.52 1.09	Hadar 148°35.73 -60°29.74
8 9	166° 46.77 181° 49.23	317°54.79 21.13 332°54.29 · · 22.27	286°58.01 21°0.33 301°58.59 · · 0.71	49°41.45 12.44 64°43.88 •• 12.44	169°54.07 1.12 184°56.62 · · 1.15	Menkent 147°57.24 -36°29.71
10	196°51.70	347°53.78 23.40	316°59.18 1.09	79°46.30 12.44	199°59.17 1.18	Arcturus 145°47.64 19°2.90
11	211°54.16	2°53.28 24.53	331°59.76 1.48	94°48.73 12.44	215°1.72 1.21	Rigil Kent. 139°40.08 -60°56.45   Kochab 137°20.97 74°2.87
12	226° 56.63	17°52.78 \$10°25.67	347°0.34 <b>S</b> 21°1.86	109°51.16 N21°12.44	230°4.27 <b>S</b> 04°1.23	Kochab 137°20.97 74°2.87 Zuben'ubi 136°55.62 -16°8.87
13	241°59.09	32°52.28 26.80	2°0.92 2.24	124°53.58 12.44	245°6.81 1.26	Alphecca 126°3.54 26°37.72
14	257°1.55	47°51.77 27.93	17° 1.50 2.62	139°56.01 12.44	260°9.36 1.29	Antares 112°15.37 -26°29.33
15	272°4.02	62°51.27 · · 29.06	32°2.08 · · 3.00	154°58.44 · · 12.44	275°11.91 · · 1.32	Atria 107° 9.49 -69° 4.51
16 17	287°6.48 302°8.95	77°50.76 30.19 92°50.26 31.32	47°2.66 3.38 62°3.24 3.76	170°0.87 12.44 185°3.29 12.44	290°14.46 1.35 305°17.01 1.38	Sabik 102°2.32 -15°45.38
18	317° 11.41	107°49.75 \$10°32.45	77°3.82 <b>S</b> 21°4.14	200°5.72 N21°12.44	320°19.56 S04°1.40	Shaula 96°9.80 -37°7.39
19	332° 13.88	122°49.25 33.58	92°4.40 4.52	215°8.15 12.44	335°22.10 1.43	Rasalhague 95°58.21 12°32.58   Eltanin 90°42.27 51°29.29
20	347°16.34	137°48.74 34.71	107°4.98 4.90	230°10.58 12.44	350°24.65 1.46	Eltanin 90°42.27 51°29.29   Kaus Aust. 83°31.90 -34°22.39
21	2°18.80	152°48.24 · · 35.84	122° 5.56 · · 5.28	245°13.01 · · 12.44	5°27.20 · · 1.49	Vega 80°33.04 38°48.64
22	17°21.27	167° 47.73 36.97	137°6.14 5.65	260°15.44 12.44	20°29.75 1.52	Nunki 75°47.14 -26°15.91
23	32°23.73	182°47.22 38.10	152°6.72 6.03	275°17.87 12.44	35°32.29 1.54	Altair 61°59.43 8°56.32
Mer.	pass. 20:51	u-0.5 $'$ $d1.1'$ m-3.91	$ u 0.6' \ d0.4' \ { m m} 1.43$	$\nu$ 2.4′ <i>d</i> -0.0′ m-2.36	$ u 2.6' \ d0.0' \ m0.80$	Peacock 53°4.79 -56°39.31
						Deneb 49°25.42 45°22.63
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.10 9°59.76 Al Na'ir 27°31.95 -46°50.30
0	47° 26.20	197°46.72 \$10°39.22	167°7.30 <b>S</b> 21°6.41	290°20.30 N21°12.44	50°34.84 <b>S</b> 04°1.57	Fomalhaut 15°13.61 -29°29.17
1	62°28.66	212°46.21 40.35	182°7.88 6.79	305°22.73 12.44	65°37.39 1.60	Scheat 13°44.39 28°13.61
2	77°31.13	227°45.70 41.48 242°45.19 • 42.60	197°8.46 7.16	320°25.16 12.44	80°39.93 1.63 95°42.48 · · 1.65	Markab 13°29.08 15°20.84
3 4	92°33.59 107°36.05	242°45.19 · · 42.60 257°44.68 43.73	212°9.03 · · 7.54 227°9.61 7.92	335°27.59 · · 12.44 350°30.03 12.44	95°42.48 · · 1.65 110°45.03 1.68	Nov 06 Thu SHA Mer.pass
5	122°38.52	272°44.17 44.85	242°10.19 8.29	5°32.46 12.44	125° 47.57 1.71	Venus 152°42.73 10:48
6	137° 40.98	287°43.66 \$10°45.98	257°10.76 S21°8.67	20°34.89 N21°12.44	140°50.12 S04°1.74	Mars 121°11.31 12:53
7	152°43.45	302°43.15 47.10	272°11.34 9.04	35°37.32 12.44	155° 52.66 1.76	Jupiter 242°56.12 04:46
8	167° 45.91	317°42.64 48.23	287°11.92 9.42	50°39.76 12.44	170°55.21 1.79	Saturn 3°4.50 20:42
9	182°48.37	332°42.13 · · 49.35	302°12.49 · · 9.79	65°42.19 · · 12.44	185°57.76 · · 1.82	Nov 07 Fri SHA Mer.pass
10 11	197° 50.84 212° 53.30	347°41.62 50.47 2°41.11 51.60	317°13.07 10.17 332°13.64 10.54	80°44.62 12.45 95°47.06 12.45	201°0.30 1.84 216°2.85 1.87	Venus 151°31.73 10:48
12	212 55.30 227°55.77	17°40.60 \$10°52.72	347°14.22 S21°10.92	110°49.49 N21°12.45	231°5.39 \$04°1.90	Mars 120°26.29 12:52
13	242°58.23	32°40.08 53.84	2°14.80 11.29	125°51.93 12.45	246°7.94 1.92	Jupiter 242°55.01 04:42
14	258°0.70	47°39.57 54.96	17°15.37 11.66	140°54.36 12.45	261°10.48 1.95	Saturn 3° 6.62 20:38
15	273°3.16	62°39.06 · · 56.08	32°15.94 · · 12.03	155°56.80 · · 12.45	276°13.03 · · 1.98	Nov 08 Sat SHA Mer.pass
16	288°5.62	77°38.54 57.20	47°16.52 12.41	170°59.24 12.45	291°15.57 2.00	Venus 150°20.52 10:49
17	303°8.09	92°38.03 58.32	62°17.09 12.78	186°1.67 12.45	306°18.12 2.03	Mars 119°41.10 12:51
18 19	318° 10.55 333° 13.02	107°37.51 \$10°59.44 122°37.00 11°0.56	77°17.67 S21°13.15 92°18.24 13.52	201°4.11 N21°12.45 216°6.55 12.46	321°20.66	Jupiter 242°54.10 04:38
20	348° 15.48	137°36.48 1.68	107°18.81 13.89	231°8.99 12.46	351°25.75 2.11	Saturn 3°8.64 20:34
21	3° 17.95	152°35.97 · · 2.80	122°19.39 · · 14.26	246°11.42 · · 12.46	6°28.29 · · 2.14	Horizontal parallax
22	18°20.41	167° 35.45 3.92	137°19.96 14.63	261°13.86 12.46	21°30.84 2.16	Venus: 0.1
23	33°22.87	182°34.93 5.04	152°20.53 15.00	276°16.30 12.46	36°33.38 2.19	Mars: 0.1
Mer.	pass. 20:47	ν-0.5′ d1.1′ m-3.91	ν0.6' d0.4' m1.43	ν2.4' d0.0' m-2.37	ν2.5' d0.0' m0.80	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184° 5.72	S15°59.30	359°0.99	4.2'	N22°10.12	11.9'	61.4'
1 2	199° 5.70 214° 5.68	16°0.05 0.80	13°24.16 27°47.22	4.1' 4.0'	22°22.00 22°33.73	11.7' 11.6'	61.4' 61.4'
3	229° 5.65	• 1.55	42°10.18	3.8'	22°45.29	11.4	61.4
4	244°5.63	2.29	56°33.03	3.7'	22°56.69	11.2'	61.4'
5	259° 5.60	3.04	70°55.77	3.6'	23°7.92	11.1'	61.4'
6 7	274° 5.58 289° 5.55	\$16°3.78 4.53	85°18.41 99°40.95	3.5' 3.4'	N23°18.98 23°29.88	10.9' 10.7'	61.4' 61.4'
8	304° 5.52	5.27	114°3.38	3.4	23°40.60	10.7	61.3
9	319°5.50	• • 6.02	128°25.71	3.2'	23°51.14	10.4'	61.3'
10	334° 5.47	6.76	142°47.95	3.1'	24°1.51	10.2'	61.3'
11 12	349°5.44 4°5.41	7.50 \$16°8.25	157°10.09 171°32.13	3.0' 2.9'	24°11.70 N24°21.71	10.0' 9.8'	61.3' 61.3'
13	19° 5.38	8.99	185°54.08	2.9'	24°31.54	9.6'	61.3'
14	34°5.36	9.73	200°15.93	2.8'	24°41.19	9.5'	61.3'
15	49° 5.33	• • 10.47	214°37.70	2.7'	24°50.64	9.3'	61.3'
16 17	64° 5.30 79° 5.27	11.21 11.95	228°59.38 243°20.97	2.6' 2.5'	24°59.91 25°9.00	9.1' 8.9'	61.3' 61.3'
18	94° 5.24	S16°12.69	257°42.48	2.4'	N25° 17.89	8.7'	61.3'
19	109° 5.21	13.43	272°3.90	2.3'	25° 26.58	8.5'	61.2'
20	124°5.18 139°5.14	14.17	286°25.24 300°46.51	2.3' 2.2'	25°35.08 25°43.39	8.3'	61.2' 61.2'
21 22	139°5.14 154°5.11	· · 14.91 15.65	300°46.51 315°7.70	2.2'	25° 43.39 25° 51.50	8.1' 7.9'	61.2'
23	169° 5.08	16.39	329°28.82	2.0'	25°59.41	7.7'	61.2'
	SD = 16.1'	d = 0.7'		SI	D = 16.7'		
Fri	<b>GHA</b> 184° 5.05	<b>Dec</b> \$16°17.12	<b>GHA</b> 343°49.87	$\nu$	Dec	d 7 F	HP
0 1	184° 5.05 199° 5.02	17.86	343°49.87 358°10.85	2.0' 1.9'	N26°7.12 26°14.62	7.5' 7.3'	61.2' 61.2'
2	214° 4.98	18.59	12°31.76	1.9'	26°21.93	7.1	61.2'
3	229°4.95	• • 19.33	$26^{\circ}52.61$	1.8'	$26^{\circ}29.03$	6.9'	61.1'
4	244° 4.92 259° 4.88	20.07	41°13.40	1.7'	26°35.92	6.7'	61.1'
5 6	259° 4.88 274° 4.85	20.80 \$16°21.53	55°34.14 69°54.81	1.7' 1.6'	26° 42.60 N26° 49.08	6.5' 6.3'	61.1' 61.1'
7	289° 4.81	22.27	84°15.44	1.6'	26°55.35	6.1	61.1'
8	304° 4.78	23.00	98°36.02	1.5'	27°1.41	5.8'	61.0'
9	319° 4.74	• • 23.73	112°56.55	1.5'	27°7.26	5.6'	61.0'
10 11	334° 4.70 349° 4.67	24.47 25.20	127°17.04 141°37.49	1.5' 1.4'	27° 12.89 27° 18.31	5.4' 5.2'	61.0' 61.0'
12	4° 4.63	S16°25.93	155°57.91	1.4'	N27°23.52	5.0'	61.0'
13	19° 4.59	26.66	170°18.29	1.4'	27°28.52	4.8'	60.9'
14 15	34° 4.56 49° 4.52	27.39 •• 28.12	184°38.64 198°58.96	1.3' 1.3'	27°33.30 27°37.86	4.6' 4.3'	60.9' 60.9'
16	64° 4.48	28.85	213°19.26	1.3'	27°42.21	4.3 4.1'	60.9
17	79° 4.44	29.58	227°39.54	1.3'	27°46.34	3.9'	60.9'
18	94°4.40	\$16°30.31	241°59.80	1.2'	N27°50.25	3.7'	60.8'
19 20	109° 4.36 124° 4.32	31.04 31.76	256°20.05 270°40.28	1.2' 1.2'	27°53.95 27°57.42	3.5' 3.3'	60.8' 60.8'
21	139° 4.28	• • 32.49	285° 0.52	1.2'	28°0.68	3.0'	60.8
22	154°4.24	33.22	299°20.74	1.2'	$28^{\circ}3.72$	2.8'	60.7'
23	169°4.20	33.94	313°40.97	1.2'	28°6.55	2.6'	60.7'
	SD = 16.1'	d = 0.7'		SI	D = 16.7'		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	$184^{\circ}4.16$	S16°34.67	328°1.20	1.2'	$N28^{\circ}9.15$	2.4'	60.7'
1	199° 4.12	35.39	342°21.43	1.2'	28° 11.54	2.2'	60.7'
2	214° 4.08 229° 4.04	36.12 •• 36.84	356°41.68 11°1.94	1.3' 1.3'	28° 13.71 28° 15.65	1.9' 1.7'	60.6' 60.6'
4	244° 3.99	37.57	25°22.22	1.3'	28° 17.39	1.5'	60.6
5	259° 3.95	38.29	39°42.51	1.3'	28° 18.90	1.3'	60.5'
6	274° 3.91	\$16°39.01	54°2.83	1.3'	N28° 20.19	1.1'	60.5'
7 8	289°3.86 304°3.82	39.73 40.46	68°23.18 82°43.56	1.4' 1.4'	28°21.27 28°22.13	0.9' 0.6'	60.5' 60.5'
9	319° 3.77	• • 41.18	97°3.97	1.4'	28° 22.78	0.4	60.4
10	334° 3.73	41.90	111°24.42	1.5'	28°23.21	0.2'	60.4'
11 12	349°3.68 4°3.64	42.62 \$16°43.34	125°44.91 140°5.44	1.5' 1.6'	28°23.42 N28°23.42	-0.0' -0.2'	60.4' 60.3'
13	4 3.04 19°3.59	44.06	140 5.44 154°26.02	1.6'	28° 23.42	-0.2 -0.4'	60.3
14	34°3.55	44.78	168°46.65	1.7'	28°22.78	-0.6'	60.3'
15	49°3.50	• • 45.50	183°7.34	1.7'	28° 22.14	-0.9'	60.3'
16 17	64°3.45 79°3.40	46.21 46.93	197°28.08 211°48.88	1.8' 1.9'	28°21.29 28°20.23	-1.1' -1.3'	60.2' 60.2'
18	94° 3.36	\$16°47.65	211 40.00 226°9.74	1.9'	N28° 18.96	-1.5'	60.2
19	109°3.31	48.36	240°30.67	2.0'	28°17.48	-1.7'	60.1'
20	124° 3.26	49.08	254°51.67	2.1'	28° 15.79	-1.9'	60.1'
21 22	139° 3.21 154° 3.16	· · 49.79 50.51	269°12.74 283°33.89	2.1' 2.2'	28°13.90 28°11.80	-2.1' -2.3'	60.1' 60.0'
23	169° 3.11	51.22	297°55.11	2.3'	28°9.49	-2.5'	60.0'
	SD = 16.1'	d = 0.7'		SI	D = 16.6'		

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

Lat.		Moonris	e		Moonse	t
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
<b>N</b> 70°						
68°						
66°						
64°	14:02			10:55		
62°	14:43	14:33		10:15	12:42	
60°	15:11	15:28	16:18	09:48	11:47	13:16
N 58°	15:33	16:01	16:57	09:26	11:15	12:38
56°	15:51	16:25	17:24	09:09	10:51	12:11
54°	16:06	16:45	17:45	08:54	10:31	11:50
52°	16:19	17:02	18:03	08:41	10:15	11:32
50°	16:31	17:16	18:18	08:30	10:01	11:17
45°	16:56	17:45	18:48	08:07	09:32	10:46
<b>N</b> 40°	17:15	18:08	19:12	07:48	09:09	10:22
35°	17:32	18:27	19:32	07:33	08:51	10:02
30°	17:46	18:44	19:49	07:19	08:35	09:46
20°	18:11	19:12	20:17	06:57	08:08	09:17
N 10°	18:32	19:36	20:41	06:37	07:45	08:52
0°	18:52	19:58	21:04	06:19	07:23	08:30
<b>S</b> 10°	19:12	20:21	21:27	06:01	07:02	08:07
20°	19:34	20:45	21:51	05:41	06:39	07:42
30°	19:59	21:13	22:20	05:19	06:12	07:13
35°	20:14	21:30	22:36	05:06	05:56	06:56
40° 45°	20:32	21:50	22:56	04:51 04:33	05:38	06:37
_	20:53	22:13	23:20		05:16	06:13
<b>S</b> 50°	21:20	22:44	23:50	04:11	04:48	05:42
52°	21:33	22:59		04:01	04:35	05:26
54°	21:48	23:17	•• ••	03:49	04:20	05:08
56°	22:06	23:39	00.07	03:36	04:01	04:46
58° <b>S</b> 60°	22:27		00:07	03:21	03:39	04:18
<b>5</b> 00°	22:55		00:47	03:03	03:11	03:38

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.	Mer.Pass.	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	16-18
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-91%
06	16:23	16:22	11:44	00:04	12:35	
07	16:20	16:19	11:44	01:08	13:41	
08	16:17	16:15	11:44	02:14	14:47	

### November 09, 10, 11 UT (Sun., Mon., Tue.)

10   10   10   10   10   10   10   10	h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
1	Sun	CHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
1 967700 2017338 0 727									
2 97°8327 227°838 8.90 127°228 11649 327°326 1247 81°4101 2.27 846 85°28 18 6 30°38 18 1 18 1 17 8 20°228 11649 328°66 1247 1247 1247 1247 1247 1247 1247 1247									
1							1		
1	3								
Bigs   1917	4	108°35.20		227°23.39 16.85	351°28.50 12.47	111°46.10 2.32			
Section   1.5	5	123°37.66			6°30.94 12.47	126°48.64 2.34			
8 1887405 317 327 15 15 77 2972587 18.3									
10   16   16   16   17   18   18   18   18   18   18   18									
10   10   10   10   10   10   10   10									4°11.59
11 22195 24 29370 1841 327278 1942 9968 60 1240 22763 80 2.50 12731 80 2.50 12731 12415737 327265 2064 27831 207215 121180 124720 32765 2064 27831 207215 121180 124720 32765 2064 27831 207215 121180 124720 20721 1211 22475737 3272765 2064 27831 207215 1211 22475737 3272765 2064 27831 207215 1211 22475737 3272765 2064 27831 207215 1211 22475737 372765 2064 20721 20721 1211 20721 207							1		49°57.24
122   225   5.0   17   28.18   5.11   20.52   20.51							Aldebaran	290°38.52	16°33.75
13 245°57.37 297.06 20 64 279316 20 15 126°50.48 12.49 20 2718.97 255 14 286°50.48 12.49 20 2711.80 2712.81 271.00 2711.10 271.00 271.10 271.00 271.1							Rigel	281°2.92	-8°10.16
14 25g*99.64 02 62*264 22266 32*26.65 2088 141*92.93 12.90 26*211.51 27*21.06 2.50 27*14.06 2.50 2.00 10 20.00 2.00 2.00 2.00 2.00 2.00									
15   224°47.30   77°20°20   2397   47°30°50   2088   150°55.77   12.90   227°14.06   2.00							1		
299 '4.77 '30 '22' 52.7 '20.09 '22.97 '47' 50.22 '21.25 '17' 57.62 '52.09 '21.65 '17' 50.09 '12.09 '17' 50.09	15						1		
391-169   391	16	289°4.77	77°26.09 23.97	47°30.22 21.25	171°57.82 12.50				
29 349°140 217°240 217°240 2240 275°240 227°24	17	304°7.23	92°25.57 25.08	62°30.79 21.61		307° 19.14 2.65	1		
23 34°14.66   17°13.09   26.00   10°13.46   22°10   22°17.70   1.21   33°19.75   27°17.00   27°17.00   1.21   33°19.57   27°17.00   1.21   1.2									
21							1		
A									5°9.59
Mor. parts							1		27°57.75
Mon   GHA   GHA   Dec   GHA							Avior	$234^{\circ}14.32$	-59°35.17
Mon GHA		34 22.02					Suhail		-43°31.90
CHA	Mer.p	ass. 20:43	u-0.5 $'$ $d1.1'$ m-3.91	$ u$ 0.6 $^{\prime}$ $d$ 0.4 $^{\prime}$ m1.42	$\nu$ 2.4′ $d$ 0.0′ m-2.38	$ u 2.5' \ d0.0' \ m0.81$			-69°49.01
Mon   GHA   GHA   Obc   Obc   GHA   Obc   Obc   GHA   Obc   Obc   Obc   GHA   Obc									
1 64 264 9 1272 136 5173 283 1673 475 521°24 15 92°173 9 N21'1255 52°369 594°282   1 64 269 9 1272 136 33 93 182°36.52 245 13 97°194 44 125.5 67°39.46 2.84   2 79°29.41 227°20.83 35.04 197°35.88 2.48 7 322°22.9 1253 82°42.00 2.87   3 44 31.67 242°20.30 3.614 22°36.55 2.52°3.33°24.74 125.5 82°42.00 2.87   4 109°34.34 257°19.78 37.25 227°37.01 25.59 35°27.19 12.54 112°47.08 2.92   4 109°34.34 257°19.78 37.25 227°37.01 25.59 35°27.19 12.54 112°47.08 2.92   4 109°34.34 257°19.78 37.25 227°37.01 25.59 35°27.19 12.54 112°47.08 2.92   4 109°34.34 257°19.78 31°3.44 257°35.1 521°20.31 22°32.09 112.55 147°52.15 504′2.36   5 124°36.00 272°19.5 31.35 4.06 257°35.1 521°20.31 22°32.09 112.55 147°52.15 504′2.36   5 124°36.00 272°19.5 31.35 4.06 257°35.1 521°20.31 22°32.09 112.55 147°52.15 504′2.36   5 164°1.40 347°1.13 4.76 302°39.38 27.39 67°39.44 12.56 187°39.77 3.03   10 199°4.12 347°1.60 4.38 7 312°40.39 2.77.5 32°31.89 12.55 187°39.77 3.03 306   11 214°51.59 2°16.00 4.38 7 312°40.39 2.77.5 32°31.89 12.55 187°39.77 3.03 3.06   11 214°51.59 2°16.00 4.38 7 312°40.39 2.77.5 32°31.89 12.55 12.57 248°9.92 3.13   12 229°54.00 177°15.59 11°40.07 374°41.52 2.30°22.1 3.06   12 229°54.00 177°15.59 11°40.07 374°41.5 2.25 2.30°23.1 3.06   13 244°55.1 32°15.00 471.7 2°42.08 2.82 212°49.5 12.57 248°9.92 3.13   14 269°58.99 47°14.47 48.27 177°42.64 2.91 181°25.1 25.59 278°15.00 3.18   15 275°14.4 62°13.99 .09.37 32°43.20 2.954 157°64.15 12.59 288°17.35 3.02   15 275°14.40 52°13.99 .09.37 32°43.20 2.954 157°64.15 12.59 288°17.35 3.02   15 280°39 10 77°13.00 5.64 6 474.37 2.99 172°56.01 12.59 288°17.59 3.30   16 290°39 10 77°13.00 5.64 6 474.37 2.99 172°56.01 12.59 288°17.35 3.02   17 305°6.77 30 12.57 50.50 137°47.13 2.03 30.50 187°9.00 338°25.14 50.00 3.30 38°45.14   10 20°39 10 77°13.00 5.64 6 50°40 3.30 33°40 1.20 1.20 33°40 3.00 18°50.00 1.20 1.20 1.20 1.20 1.20 1.20 1.20	Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	-		
2 79 29.4   227 20.8   3.93   182 35.3   24.51   307 19.48   2.53   67 39.40   2.87   Acrus   175 43.1   1.74 0.9   3.9   3.9   4.1   1.74 0.9   3.9   3.9   4.1   1.74 0.9   3.9   3.9   4.1   3.2   3.9   4.1   3.2   3.9   4.1   3.2   3.9   4.1   3.2   3.9   4.1   3.2   3.9   4.1   3.2   3.9   4.1   3.2   3.9   4.1   3.2									
2 79 '2944   27 '2083   30 04   197 '30 88   24 87   322' 2229   1253   82' 4200   2.87   34 118   2.98   34 118   34 119   34 128   34 119   34 11	1	64°26.94	212°21.36 33.93	182°35.32 24.51	307°19.84 12.53	67°39.46 2.84			
3 94-31.87 242-20.30 3, 50.14 212-36.45 22.3 337-24.74 12.54 12.47 45.28 12.28 12.24 12.24 12.25 12.24 12.24 12.25 12.24 12.24 12.25 12.24 12.24 12.25 12.24 12.24 12.25 12.24 12.25 12.24 12.24 12.25 12.24 12.25 12.24 12.25 12.24 12.25 12.24 12.25 12.24 12.25 12.2	2	79°29.41		197°35.88 24.87			1		
1 109° 34.34   25° 19.78   3.725   22° 37.01   25.59   35° 22° 71.9   12.54   112′ 47.08   2.92   5 124° 30.80   27° 19.75   53.85   3.725   22° 37.75   22° 59.5   7° 90.64   12.54   12° 40.62   2.94   6 1 39° 30.26   28° 18.72   31° 30.60   25° 38.14   521° 26.13   22° 32.09   N21° 12.55   12° 52.15   504° 29.6   8 1 69° 44.19   31° 17° 16.6   4.66   28° 38.27   2.70   52° 36.99   12.55   12° 57.52   3.0   8 1 69° 44.19   31° 17° 16.6   4.66   28° 38.27   2.70   52° 36.99   12.55   12° 57.27   3.0   10 1 64° 46.6   33° 11.6   4.22   30° 39.88   2.77   56° 39.8   10 1 24° 51.59   27° 16.06   4.97   33° 29.88   2.77   56° 39.8   10 1 24° 51.59   27° 16.06   4.97   33° 29.88   2.77   56° 30° 20.7   11 2 24° 56.51   32° 15.00   4.77   2° 42.09   2.98   12° 57   23° 38   30.8   12 29° 54.00   17° 15.53   51° 40° 0   2.98   12° 10° 10° 10° 10° 10° 10° 10° 10° 10° 10							1		-57°15.26
8 139°39.6 287°18.72 511°39.46 257°38.14 \$21°26.31 22°32.09 N21°12.55 157°54.0 2.99							1		55°49.02
154°41.73 302°18.19 40.56 272°38.70 26.67 37°34.54 12.55 157°54.69 2.99 Hadd 18.33.50 4.93.10 199°4.19 317°1.76 41.66 42.87 302°39.83 27.39 67°39.44 12.56 187°59.77 3.01 Hadd 18.33.50 4.93.10 199°4.91 234°71.66 41.68 287°39.27 27.73 25°3.69 12.55 127°2.67 23.01 3.01 199°4.91 234°71.66 41.68 43.87 317°4.03 27.75 28.24 1.89 12.56 233°2.31 3.06 11 214°51.59 2°16.06 43.87 317°4.03 27.75 28.24 1.89 12.56 233°2.31 3.06 11 214°51.59 2°16.06 43.87 317°4.03 22°2.84 71 12.55 26.23°2.31 3.06 11 214°51.59 2°16.06 43.87 31°4.15 28.21°2.84 71 12.57 238°3.93 3.04 3.11 224°56.51 32°15.00 47.17 2°42.08 28.82 127°49.25 12.57 248°9.92 3.13 4.00 40.6 40°56.51 21.50 20°3.13 4.00 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40.6 40°56.50 40							Spica	$158^{\circ}21.89$	-11°17.68
169°44.19 317°17.66 41.66 287°39.27 27.03 52°36.99 12.55 172°57.28 3.01 Charles 147°57.22 35°36.70 1919°49.12 347°16.60 44.97 302°39.83 27.75 82°41.89 12.56 187°59.77 3.03 Arcturu 31.97°47.62 36°32.31 3.06 Arcturu 31.97°47.69 302°39.83 27.75 82°41.89 12.56 203°2.31 3.08 Arcturu 31.97°40.69 4.96 4.97 32°40.90 28.11 97°44.34 12.57 218°4.85 3.08 Arcturu 31.97°40.69 4.95 4.95 4.95 4.95 4.95 4.95 4.95 4.9							Alkaid		49°10.97
19   184°46 66   332°17.13   42,76   302°39.83   77.39   67°39.44   12.56   187°59.77   3.03     10   199°412   347°16.06   43.87   317°40.93   27.75   28°41.80   12.56   203°2.31   3.06     11   214°51.59   2°16.06   44.97   337°40.96   281.11   97°44.34   12.57   218°4.85   3.08     12   22°94.05   17°15.55   511°46.07   347°4.152   521°28.47   12.26   29.18   12.25   203°3.73   504°3.11     13   244°96.51   32°15.00   47.17   24°2.08   28.82   127°4.92   12.57   248°9.92   31.3     14   259°58.98   47°14.77   48.27   17°4.26   42.91.8   142°51.70   12.58   263°11.24   3.15     15   275°1.44   62°13.93   49.37   32°43.20   29.54   157°54.15   12.58   278°15.00   3.18     16   290°3.91   77°13.40   50.46   47°4.37   72.89   157°54.15   12.58   278°15.00   3.18     17   305°6.37   02°12.87   51.56   62°4.33   30.25   187°9.90   12.59   308°20.07   3.22     18   320°84   107°12.33   511°52.66   77°44.89   302°3.152   12.12   203°3.52   12.25     18   320°84   107°12.33   511°52.66   77°44.89   321°30.61   203°15.52   12.12   203°3.52   13.34     19   335°11.30   122°11.80   53.76   92°45.45   30.96   218°3.97   12.60   338°25.14   3.27     20   350°3.15   137°11.26   54.85   107°46.61   31.32   233°6.43   12.61   33°30.25   33.4     21   5°16.23   152°10.73   55.59   122°46.57   31.67   248°8.88   12.61   33°30.25   33.4     Mer.pass. 20.39   20.5° d1.1° m-3.91   20.06° d0.4° m1.42   22.4° d0.0° m-2.39   22.5° d0.0° m.81     Mer.pass. 20.39   20.5° d1.1° m-3.91   20.06° d0.4° m1.42   22.4° d0.0° m-2.39   22.5° d0.0° m.81     Mer.pass. 20.39   20.5° d1.1° m-3.91   20.06° d0.4° m1.42   22.4° d0.0° m-2.39   22.5° d0.0° m.81     Mer.pass. 20.39   20.5° d1.1° m-3.91   20.0° d0.4° m1.42   22.4° d0.0° m-2.39   22.5° d0.0° m.81     Mer.pass. 20.39   20.5° d1.1° m-3.91   20.0° d0.4° m1.42   22.2° d0.0° m-2.39   22.5° d0.0° m.81     Mer.pass. 20.39   20.5° d1.1° m-3.91   20.0° d0.4° m1.42   20.2° d0.0° m-2.39   20.2° d0.4° d0.3° d0.4° d0									-60°29.73
10 199°49.12 347°16.60 43.87 317°40.39 22.75 82°41.89 12.56 203°2.31 3.06 Rigil Kent 1 1246.15 92°16.06 44.97 332°40.06 28.11 79°44.34 12.57 218°48.55 3.08 Kochab 137°2.07 747°2.84 122°46.70 N21°12.57 248°48.55 3.08 Kochab 137°2.07 747°2.84 122°46.70 N21°12.57 248°9.92 3.13 34°45.65 132°15.00 47.17 2°42.08 28.82 122°49.55 12.57 248°9.92 3.13 Alphecca 138°55.02 1-6°8.8 Mochab 137°2.07 747°2.84 122°46.70 N21°12.57 248°9.92 3.13 Alphecca 138°55.02 1-6°8.8 Mochab 137°2.07 747°2.84 122°46.70 N21°12.57 248°9.92 3.13 Alphecca 126°3.54 26°3.71 21°2.57 248°3.54 26°3.71 21°2.58 248°15.50 3.15 Alphecca 126°3.54 26°3.71 21°2.57 248°3.54 26°3.71 21°2.58 248°15.50 3.15 Alphecca 126°3.54 26°3.71 21°2.54 26°3							1		
11 214°51.59 2°16.06 44.97 332°40.96 28.11 97°44.34 12.57 218°4.85 3.08 Kochal 137°2.09 77.4°2.28 12 22°4.54 15.7°15.55 \$11°46.07 \$47.17 24.08 28.82 127°49.25 12.57 248°9.92 31.3 Alpheca 128°2.54 25°3.77 Alpheca 128°3.77 Alpheca 128°3.75 Alp							1		
12 229'54.05 17"15.30 \$17"15.30 \$17"15.30 \$17"15.00 \$47.17 \$2"42.08 \$28.82 \$127"a9.25 \$12.57 \$43"9.92 \$3.13 \$4 259"58.99 \$47"14.47 \$48.27 \$17"42.64 \$29.18 \$142"51.70 \$12.58 \$263"12.46 \$3.15 \$41"15"15"15"15"15"15"15"15"15"15"15"15"15	11	214°51.59					_		
13 244°56.51 32°15.00 47.17 2°42.08 2882 127°49.25 12.57 248°9.92 3.13 Alpheca 126°3.54 26°3.57 14 25°55.98 47°14.47 48.27 17°42.64 2918 142°51.70 12.58 26°31.24 6 3.15 15 275°1.44 62°13.93 49.37 32°43.20 79.54 157°54.15 1.25.80 28°31.53 3.20 16 20°3.91 77°13.40 50.46 47°43.77 29.89 157°54.15 1.25.80 28°31.53 3.20 17°305°6.37 92°12.87 51.56 62°44.33 30.25 187°99.06 12.59 308°20.07 3.22 50°10.33 11°2.23 511°52.66 77°44.89 521°30.61 203°15.25 120°10.23 332°22.61 54°3.24 1.26 12.35 11°2.25 11	12	229° 54.05	17°15.53 \$11°46.07	347°41.52 \$21°28.47		233°7.38 S04°3.11	1		
14 259°5898 47°1447 48.27 17°4264 29.18 142′59.70 12.58 263°14.66 3.15 21.59 276°15.00 3.18 16 290°3.91 7°13.40 50.46 47°43.77 29.89 17°256.61 12.59 293°17.53 3.20 293°17.53 20.20 293°17.53 3.20 293°17.53 20.20									26°37.70
16 290°3.91 7°13.40 50.46 47°43.77 29.89 172°56.61 12.59 293°17.53 3.20 536ik 102°3.1 135′43.20 18 30°6.37 9°12.87 51.56 62°4.43 3 30.26 187°59.06 12.59 30°20.07 3.22 536ik 102°3.1 135′43.20 18 30°8.84 107°12.33 \$11°52.66 77°4.48 8521°30.61 203°1.52 N21°12.60 338°2.21.6 50°3.24 83.30°1.37 613°1.10 122°11.80 \$3.76 92°45.45 30.96 218°3.97 12.60 338°25.14 3.27 838.30°1.37 613°1.12 54.85 107°46.01 31.32 233°6.43 12.61 8°30.22 · 3.31									-26°29.33
18 309°6.37 92°12.87 51.56 62°44.33 30.25 187°99.06 12.59 308°20.07 3.22 53.28 12.23 18 30.28 8.4 107°2.33 \$11°2.26 67 7°4.48 9 \$21°3.06 10 203°1.52 N21°12.60 338°25.14 3.27							Atria	$107^{\circ}9.49$	-69°4.50
19   336° 13.0   122° 11.80   53.76   92° 15.55   30.96   218° 30.61   233° 12.60   338° 25.14   3.27     20   350° 13.76   132° 11.26   54.85   107° 46.01   31.32   233° 6.43   12.61   353° 27.68   3.29     21   5° 16.23   152° 10.73   · 55.95   122° 46.57   · 31.67   248° 8.88   · 12.61   8° 30.22   · 3.31     22   20° 18.69   167° 10.19   57.05   137° 47.13   32.03   263° 11.34   12.62   23° 32.75   3.34     35° 21.16   182° 9.65   58.14   152° 47.69   32.38   278° 13.79   12.62   38° 35.29   3.36     Mer.pass. 20:39   ν-0.5′ d1.1′ m-3.91   ν-0.6′ d0.4′ m1.42   ν-2.4′ d0.0′ m-2.39   ν-2.5′ d0.0′ m0.81     1   65° 25.08   212° 8.81   12° 0.33   182° 48.81   33.09   308° 18.71   12.62   55° 37.83   504° 3.34     2   80° 28.55   227° 8.04   1.42   197° 49.36   33.44   323° 21.16   12.63   83° 42.90   3.43     3   95° 31.01   242° 75.0   ×-2.52   212° 90.92   3.379   338° 32.62   12.64   113° 47.97   3.47     3   110° 33.48   257° 6.96   3.61   227° 50.48   34.15   353° 26.08   12.64   113° 47.97   3.47     5   125° 33.94   272° 6.42   4.70   242° 51.06   242° 51.05   35.20   38° 33.46   12.66   158° 55.57   356   346   32° 20.9   185° 48.80   332° 4.26   · 9.97   302° 53.27   305° 53.27   35.50   68° 38.38   12.67   189° 0.64   3.58     10   200° 48.26   347° 3.72   10.16   317° 33.3   36.62   38° 33.46   12.66   158° 55.55   3.74     12   230° 53.19   17° 2.04   512° 13.33   347° 54.94   521° 36.0   318° 56.0   38° 31.0   12.72   248° 13.3   3.69     10   200° 48.26   347° 3.72   10.16   317° 58.2   35.00   38° 31.46   12.66   158° 55.55   3.74     12   230° 53.19   17° 2.04   512° 13.33   347° 54.94   521° 50.59   37.50   188° 50.1   12.71   294° 18.3   3.60     12   230° 53.19   17° 2.04   512° 13.33   347° 54.94   521° 50.0   31° 43° 50.0   12.73   339° 20.9   3.76     13   321° 7.79   106° 59.3   71° 7.066   16.68   47° 57.1   38.35   11° 34.57   12.72   324° 23.45   504° 3.78     13   321° 7.79   106° 59.3   712° 18.66   77° 58.27   31.90   31° 37.0   12.74   39° 30.5   3.80     13   321° 7.79   106° 5							Sabik		-15°45.38
19   335° 11.30   122° 11.80   53.76   92° 45.45   30.96   218°3.97   12.60   338° 25.14   32.77   336° 31.26   336° 31.36   353° 27.68   3.29   90° 42.26   38° 31.20   215° 10.73   55.95   122° 46.57   31.67   248° 8.88   12.61   8° 30.22   3.31   33° 27.61   32° 20° 10.69   167° 10.19   57.05   137° 47.13   32.03   263° 11.34   12.62   23° 32.75   3.34   33° 48.6   32° 35° 21.16   182° 96.5   58.14   152° 47.69   32.38   278° 13.79   12.62   38° 35.29   3.36   38° 48.6   38° 33.0   38° 48.6   38° 33.29   3.36   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33.29   38° 48.6   38° 33° 4									
23 35°13.76 137°11.26 54.85 107°40.01 31.32 233°6.43 12.61 353°27.68 3.29   29°18.69 167°10.19 57.05 137°47.13 32.03 263°11.34 12.62 23°32.75 3.34   Ner.pass. 20:39 \(\nu \)							1		
22 20°18.69 167°10.19 57.05 137°47.13 32.03 263°11.34 12.62 23°32.75 3.34   Vega 80°33.03 38°48.61 23.61 8°30.223.11   Vega 80°33.03 38°48.61 8°30.223.11   Vega 80°33.03 38°48.61 8°30.223.11   Vega 80°33.03 38°48.61 8°30.223.11   Vega 80°33.03 38°48.61 8°30.23   Vega 80°33.03 38°48.61 8°30.23   Vega 80°33.03 8°48.61 8°30.23   Vega 80°33.03 8°48.61 8°30.23   Vega 80°33.03 8°48.61 8°30.23   Vega 80°33.61 8°30.03 8°48.61 8°30.03 8°40.0									
22 20°18.69 167°10.19 57.05 137°47.13 32.03 263°11.34 12.62 38°32.75 3.34   Mer.pass. 20:39									
Mer.pass. 20:39   \( \nu \cdot \cd	22	20° 18.69	167°10.19 57.05	137°47.13 32.03	263°11.34 12.62	23°32.75 3.34			
Mer.pass. 20:39         ν-0.5′ d1.1′ m-3.91         ν0.6′ d0.4′ m1.42         ν2.4′ d0.0′ m-2.39         ν2.5′ d0.0′ m0.81         Peacock         53° 4.80         -56° 30.3           Tue         GHA         Dec         GHA         Dec         GHA         Dec         GHA         Dec         GHA         Dec         Enfif         33° 38.10         9° 95.7         Al Na¹r         20° 95.7         Al Na¹r         20° 92.1°         Al Na¹r         20° 93.3°         Al Na¹r         20° 93.3°         Al Na¹r         20° 92.1°         Al Na¹r         20° 92.1°         Al Na²r         20° 92.1°         Al Na²r         20° 92.1°         Al Na²r         20° 92.1°         Al Na²r         Al Na²r         20° 92.1°         Al Na²r         Na²r         Al Na²r	23	$35^{\circ}21.16$	182°9.65 58.14	152°47.69 32.38	278°13.79 12.62	38°35.29 3.36	1		
Tue GHA GHA GHA Dec GH	Mer r	ass 20·39	ν-0.5′ d1.1′ m-3.91	ν0 6' d0 4' m1 42	v2.4' d0.0' m-2.39	v2 5' d0 0' m0 81	1		-56°39.31
Tue GHA GHA Dec GHA DE			- 0.3 d1.1 m 3.31			72.3 40.0 1110.01			45°22.63
0 50°33.62 197°9.12 \$11°59.24 167°48.25 \$21°32.73 293°16.25 \$12°12.62 53°37.83 \$04°3.38	_						Enif	33°38.10	9°59.76
2 80°28.55 227°8.04 1.42 197°49.36 33.44 323°21.16 12.63 88°40.36 3.40 24°75.00 1.42 197°49.36 33.44 323°21.16 12.63 83°42.90 3.43 34°2.90 3.43 395°31.01 242°75.00 1.42 197°49.36 33.44 323°21.16 12.63 83°42.90 3.43 34°2.90 3.45 34°2.90 3.4									-46°50.30
2 80°28.55 227°8.04 1.42 197°49.36 33.44 323°21.16 12.63 83°42.90 3.43   3 95°31.01 242°7.50 · 2.52 212°49.92 · 33.79 338°23.62 · 12.64 98°45.43 · 3.45   4 110°33.48 257°6.96 3.61 227°50.48 34.15 353°26.08 12.64 113°47.97 3.47   5 125°35.94 272°6.42 4.70 242°51.04 34.50 8°28.54 12.65 128°50.50 3.49   6 140°38.41 287°5.88 512°5.79 257°51.60 521°34.85 23°31.00 N21°12.66 143°53.04 504°3.52   7 155°40.87 302°5.34 6.88 272°52.15 35.20 38°33.46 12.66 158°55.57 3.54   8 170°43.33 317°4.80 7.98 287°52.71 35.55 53°35.92 12.67 173°58.11 3.56   10 200°48.26 347°3.72 10.16 317°53.83 36.25 83°40.84 12.68 204°3.18 3.60   11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63   12 230°53.19 17°2.64 512°12.33 347°54.94 \$21°36.95 113°45.76 N21°12.69 234°8.25 \$04°3.65   13 245°55.65 32°2.09 13.42 2°55.49 37.30 128°48.22 12.69 249°10.78 3.67   14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°55.06 12.71 294°18.38 3.73   17 306°55.19 17°5.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76   18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 324°23.45 504°3.78   19 336°10.44 121°58.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80   20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°54.66 12.74 354°28.51 3.82   21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86   23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88    1.22 33°60.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88    1.24 110°33.44 320°75.04 14.04 3.04 30							1		-29°29.17
3 95°31.01 242°7.50 · 2.52 212°49.92 · 33.79 338°23.62 · 12.64 98°45.43 · 3.45   Mars 118°03.348 257°6.96 3.61 227°50.48 34.15 353°26.08 12.64 113°47.97 3.47   Mov 09 Sun SHA Mer.pas 110°33.48 257°6.96 3.61 227°50.48 34.15 353°26.08 12.66 128°50.50 3.49   Mov 09 Sun SHA Mer.pas 118°55.76 125°535.94 272°6.42 4.70 242°51.04 34.50 8°28.54 12.65 128°50.50 3.49   Mov 09 Sun SHA Mer.pas 118°55.76 125°540.87 302°5.34 6.88 272°52.15 35.20 38°33.46 12.66 158°55.57 3.54   Mars 118°55.76 12.55   Mars 118°10.27 12.45   Mars 118°10.27							1		28°13.62
4 110°33.48 257°6.96 3.61 227°50.48 34.15 353°26.08 12.64 113°47.97 3.47 5 125°35.94 272°6.42 4.70 242°51.04 34.50 8°28.54 12.65 128°50.50 3.49 Venus 149°9.08 10.56 140°38.41 287°5.88 512°5.79 257°51.60 \$21°34.85 23°31.00 N21°12.66 143°53.04 \$04°3.52 Mars 118°55.76 12.55 125°50.68 170°43.33 317°4.80 7.98 287°52.71 35.55 53°35.92 12.67 173°58.11 3.56 310 200°48.26 ·· 9.07 302°53.27 ·· 35.90 68°38.38 ·· 12.66 188°55.57 3.54 Jupiter 242°53.40 04:3 530°4.26 ·· 9.07 302°53.27 ·· 35.90 68°38.38 ·· 12.66 204°3.18 3.60 11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 125°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 125°50.56 32°2.09 13.42 2°55.49 37.30 128°48.22 12.69 234°8.25 \$04°3.65 13°2.44 242°52.91							Markab	13°29.08	15°20.84
5 125°35.94 272°6.42 4.70 242°51.04 34.50 8°28.54 12.65 128°50.50 3.49 6140°38.41 287°5.88 \$12°5.79 257°51.60 \$21°34.85 23°31.00 N21°12.66 143°53.04 \$04°3.52 7155°40.87 300°5.34 6.88 272°52.15 35.20 38°33.46 12.66 158°55.57 3.54 8 170°43.33 317°4.80 7.98 287°52.71 35.55 53°35.92 12.67 173°58.11 3.56 91.85°45.80 332°4.26 · 9.07 302°53.27 · 35.90 68°38.38 · 12.67 189°0.64 · 3.58 10 200°48.26 347°3.72 10.16 317°53.83 36.60 98°43.30 12.68 204°3.18 3.60 11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 12 230°53.19 17°2.64 512°12.33 347°54.94 \$21°36.95 113°45.76 N21°12.69 234°8.25 \$04°3.65 13 245°55.65 32°2.09 13.42 2°55.49 37.30 128°48.22 12.69 249°10.78 3.67 14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°50.68 12.70 264°13.31 3.69 15 276°0.58 62°1.01 · 15.60 32°56.60 · 38.00 158°53.14 · 12.71 279°15.85 · 3.71 16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.73 17 306°5.51 91°59.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76 140°45.50 10.55 18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 324°23.45 \$04°3.78 117°24.63 12:44 20:26 11 12°18.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80 20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21°6°15.37 151°57.74 · 22.11 122°59.93 · 40.09 249°7.92 · 12.74 9°31.05 · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 140°12.14 140°12							Nov 09 Sun	SHA	Mer.pass
6 140°38.41 287°5.88 \$12°5.79 257°51.60 \$21°34.85 23°31.00 N21°12.66 143°53.04 \$04°3.52 7 155°40.87 302°5.34 6.88 272°52.15 35.20 38°33.46 12.66 158°55.57 3.54 317°0.43.33 317°4.80 7.98 287°52.71 35.55 53°35.92 12.67 173°58.11 3.56 318°3.45 80 332°4.26 · · 9.07 302°53.27 · · 35.90 68°38.38 · · 12.67 189°0.64 · · 3.58 10 200°48.26 347°3.72 10.16 317°53.83 36.25 83°40.84 12.68 204°3.18 3.60 11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 12 230°53.19 17°2.64 \$12.33 347°54.94 \$21°36.95 113°45.76 N21°12.69 249°10.78 3.67 14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°50.68 12.70 264°13.31 3.69 15 276°0.58 62°1.01 · · 15.60 32°56.60 · · 38.00 158°53.14 · · 12.71 279°15.85 · · 3.71 16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.73 17 306°5.51 91°59.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76 18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 324°23.45 \$04°3.78 14.21 20.22 11.21°55.93 19.94 92°58.82 39.39 210°3.00 12.73 339°25.98 3.80 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88 186									10:50
8 170°43.33 317°4.80 7.98 287°52.71 35.55 53°35.92 12.67 173°58.11 3.56 9 185°45.80 332°4.26 · · 9.07 302°53.27 · · 35.90 68°38.38 · · 12.67 189°0.64 · · 3.58 10 200°48.26 347°3.72 10.16 317°53.83 36.25 83°40.84 12.68 204°3.18 3.60 11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 12 230°53.19 17°2.64 \$12°12.33 347°54.94 \$21°36.95 113°45.76 N21°12.69 244°8.25 \$04°3.65 32°2.09 13.42 2°55.49 37.30 128°48.22 12.69 249°10.78 3.67 14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°50.68 12.70 264°13.31 3.69 15 276°0.58 62°1.01 · · 15.60 32°56.60 · · 38.00 158°53.14 · · 12.71 279°15.85 · · 3.71 16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.73 17 306°5.51 91°59.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76 18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 324°23.45 \$04°3.78 19 336°10.44 121°58.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80 20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · · · · 22.11 122°59.93 · · 40.09 249°7.92 · · 12.74 9°31.05 · · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88    Saturn 3°10.58 20:30   Nov 10 Mon SHA Mer.pas							Mars	118°55.76	12:50
9 185°45.80 332°4.26 · · 9.07 302°53.27 · · 35.90 68°38.38 · · 12.67 189°0.64 · · 3.58 10 200°48.26 347°3.72 10.16 317°53.83 36.25 83°40.84 12.68 204°3.18 3.60 11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 12 230°53.19 17°2.64 \$12°12.33 347°54.94 \$21°36.95 113°45.76 N21°12.69 234°8.25 \$04°3.65 13 245°55.65 32°2.09 13.42 2°55.49 37.30 128°48.22 12.69 249°10.78 3.67 14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°50.68 12.70 264°13.31 3.69 15 276°0.58 62°1.01 · · 15.60 32°56.60 · · 38.00 158°53.14 · · · 12.71 279°15.85 · · 3.71 16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.73 17 306°5.51 91°59.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76 18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 309°20.91 3.76 19 336°10.44 121°58.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80 20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · · · 22.11 122°59.93 · · · 40.09 249°7.92 · · 12.74 9°31.05 · · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88	7	155°40.87	302°5.34 6.88	272°52.15 35.20	38°33.46 12.66	158°55.57 3.54			04:34
10 200°48.26 347°3.72 10.16 317°53.83 36.25 83°40.84 12.68 204°3.18 3.60 11 215°50.73 2°3.18 11.24 332°54.38 36.60 98°43.30 12.68 219°5.71 3.63 12 230°53.19 17°2.64 512°12.33 347°54.94 521°36.95 113°45.76 N21°12.69 234°8.25 504°3.65 13 245°55.65 32°2.09 13.42 2°55.49 37.30 128°48.22 12.69 249°10.78 3.67 14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°50.68 12.70 264°13.31 3.69 15 276°0.58 62°1.01 · 15.60 32°56.60 · 38.00 158°53.14 · 12.71 279°15.85 · 3.71 16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.76 18 321°7.97 106°59.37 512°18.86 77°58.27 521°39.04 204°0.53 N21°12.72 309°20.91 3.76 18 321°7.97 106°59.37 512°18.86 77°58.27 521°39.04 204°0.53 N21°12.72 324°23.45 504°3.78 19 336°10.44 121°58.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80 20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · 22.11 122°59.93 · 40.09 249°7.92 · 12.74 9°31.05 · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88							Saturn	3°10.58	20:30
10 200 48.26 347 3.72 10.16 317 53.83 36.25 83 40.84 12.68 204 3.18 3.00 12.68 219 5.71 3.63 12 230 53.19 17 2.64 \$12 0 12.33 347 0 12.64 \$12 0 12.65 13 240 0 12.65 13 240 0 12.65 13 240 0 12.65 13 240 0 12.65 13 240 0 12.65 14.51 17 0 12.65 14.51 17 0 12.65 14.51 17 0 12.65 14.51 17 0 12.65 14.51 17 0 12.65 14.55 14.51 17 0 12.65 14.55 14.51 17 0 12.65 14.55 14.51 17 0 12.65 14.55 14.51 17 0 12.65 14.55							Nov 10 Mon	SHA	Mer.pass
11 215 50.73							1		10:51
13  245°55.65							Mars	$118^{\circ}10.27$	12:49
14 260°58.12 47°1.55 14.51 17°56.05 37.65 143°50.68 12.70 264°13.31 3.69 15 276°0.58 62°1.01 · · 15.60 32°56.60 · · · 38.00 158°53.14 · · 12.71 279°15.85 · · · 3.71 16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.73 17 306°5.51 91°59.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76 18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 324°23.45 \$04°3.78 19 336°10.44 121°58.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80 20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · · · 22.11 122°59.93 · · 40.09 249°7.92 · · 12.74 9°31.05 · · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88									04:30
15							Saturn	3°12.44	20:26
16 291°3.05 77°0.46 16.68 47°57.16 38.35 173°55.61 12.71 294°18.38 3.73 Venus 146°45.50 10:5: 17 306°5.51 91°59.92 17.77 62°57.71 38.70 188°58.07 12.72 309°20.91 3.76 Mars 117°24.63 12:44 18 321°7.97 106°59.37 \$12°18.86 77°58.27 \$21°39.04 204°0.53 N21°12.72 324°23.45 \$04°3.78 Jupiter 242°52.63 04:20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · · · · · · · · · · · · · · · · · · ·							Nov 11 Tue	SHA	Mer.pass
18  321°7.97  106°59.37  \$12°18.86  77°58.27  \$21°39.04  204°0.53  N21°12.72  324°23.45  \$04°3.78									10:52
19 336°10.44 121°58.83 19.94 92°58.82 39.39 219°3.00 12.73 339°25.98 3.80 20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · · · 22.11 122°59.93 · · · 40.09 249°7.92 · · 12.74 9°31.05 · · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88    Mars: 0.1									12:48
20 351°12.90 136°58.28 21.03 107°59.38 39.74 234°5.46 12.74 354°28.51 3.82 21 6°15.37 151°57.74 · · · 22.11 122°59.93 · · · 40.09 249°7.92 · · 12.74 9°31.05 · · 3.84 22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88    Mars: 0.1									04:26
21 6°15.37 151°57.74 · · · 22.11 122°59.93 · · · 40.09 249°7.92 · · · 12.74 9°31.05 · · · 3.84 Horizontal parallax  22 21°17.83 166°57.19 23.19 138°0.48 40.43 264°10.39 12.75 24°33.58 3.86 Venus: 0.1  23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88 Mars: 0.1							Saturn	3°14.21	20:22
22       21°17.83       166°57.19       23.19       138°0.48       40.43       264°10.39       12.75       24°33.58       3.86       Venus: 0.1         23       36°20.30       181°56.64       24.28       153°1.04       40.78       279°12.85       12.75       39°36.11       3.88       Mars: 0.1							Horizon	tal parallax	
23 36°20.30 181°56.64 24.28 153°1.04 40.78 279°12.85 12.75 39°36.11 3.88 Mars: 0.1								Venus:	
								Mars:	0.1
Mer.pass. 20:35 $\nu$ -0.5 $'$ d1.1 $'$ m-3.91 $\nu$ 0.6 $'$ d0.4 $'$ m1.41 $\nu$ 2.5 $'$ d0.0 $'$ m-2.39 $\nu$ 2.5 $'$ d0.0 $'$ m0.82	Mer.p	ass. 20:35	ν-0.5' d1.1' m-3.91	$\nu$ 0.6' d0.4' m1.41	ν2.5' d0.0' m-2.39	ν2.5' d0.0' m0.82			

h	Su	n			Moon		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°3.06	S16°51.94	312° 16.41	2.4'	N28°6.99	-2.7'	60.0'
1	199°3.01	52.65	326°37.80	2.5'	28°4.28	-2.9'	59.9'
2	214°2.96	53.36	340°59.27	2.6'	28°1.37	-3.1'	59.9'
3	229°2.91	• • 54.08	355°20.83	2.7'	27°58.27	-3.3'	59.9'
4 5	244°2.86 259°2.80	54.79 55.50	9°42.49 24°4.23	2.7' 2.8'	27°54.96 27°51.46	-3.5' -3.7'	59.8' 59.8'
6	259 2.80 274°2.75	55.50 \$16°56.21	24 4.23 38°26.07	2.8	N27° 47.77	-3.1' -3.9'	59.8 59.7'
7	289°2.70	56.92	52°48.01	3.0'	27°43.88	-3.9 -4.1'	59.7'
8	304°2.65	57.63	67° 10.06	3.1'	27°39.80	-4.3'	59.7'
9	319°2.59	• • 58.34	81°32.20	3.2'	27°35.53	-4.5'	59.6'
10	334°2.54	59.05	95°54.45	3.4'	27°31.07	-4.6'	59.6'
11	349°2.48	16°59.76 \$17°0.47	110° 16.80	3.5'	27°26.43	-4.8'	59.6'
12 13	4°2.43 19°2.37	1.17	124°39.27 139°1.85	3.6' 3.7'	N27°21.60 27°16.59	-5.0' -5.2'	59.5' 59.5'
14	34°2.32	1.17	153°24.53	3.8'	27°11.39	-5.4'	59.5'
15	49°2.26	• • 2.59	167° 47.34	3.9'	27°6.02	-5.6'	59.4'
16	64°2.21	3.29	$182^{\circ}10.26$	4.0'	27°0.47	-5.7'	59.4'
17	79°2.15	4.00	196°33.30	4.2'	26°54.74	-5.9'	59.3'
18	94°2.09	S17°4.70	210°56.46	4.3'	N26° 48.84	-6.1'	59.3'
19	109°2.04	5.41	225° 19.74	4.4'	26° 42.77	-6.2'	59.3'
20 21	124°1.98 139°1.92	6.11 •• 6.82	239° 43.14 254° 6.67	4.5' 4.7'	26°36.52 26°30.11	-6.4' -6.6'	59.2' 59.2'
21	139°1.92 154°1.86	7.52	254°6.67 268°30.32	4.7° 4.8'	26° 23.52	-6.7'	59.2' 59.2'
23	169°1.80	8.22	200 30.32 282°54.10	4.0 4.9'	26° 16.78	-6.7 -6.9	59.2 59.1'
	SD = 16.1'	d = 0.7'					
	אר = 10.1′	u = 0.7		51	D = 16.4'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	184°1.74	S17°8.92	297° 18.01	5.0'	N26°9.87	-7.1'	59.1'
1	199°1.69	9.63	311° 42.05	5.2'	26°2.80	-7.2'	59.0'
2	214°1.63 229°1.57	10.33 •• 11.03	326°6.21 340°30.51	5.3' 5.4'	25°55.57 25°48.18	-7.4' -7.5'	59.0' 59.0'
3 4	229 1.57 244°1.50	11.73	340 30.51 354°54.94	5.4 5.6'	25 48.18 25°40.63	-7.5 -7.7'	59.0 58.9'
5	259°1.44	12.43	9° 19.50	5.7'	25° 32.94	-7.8	58.9'
6	274°1.38	S17°13.12	23°44.20	5.8'	N25°25.09	-8.0'	58.9'
7	289°1.32	13.82	38°9.03	6.0'	25° 17.09	-8.1'	58.8'
8	304°1.26	14.52	52°34.00	6.1'	25°8.94	-8.3'	58.8'
9	319°1.20	• • 15.22	66°59.10	6.2'	25°0.65	-8.4'	58.7'
10	334°1.13	15.92	81°24.33	6.4'	24° 52.22	-8.6'	58.7'
11 12	349°1.07 4°1.01	16.61 \$17°17.31	95°49.71 110°15.22	6.5' 6.6'	24°43.64 N24°34.92	-8.7' -8.9'	58.7' 58.6'
13	19°0.94	18.00	124° 40.86	6.8	24° 26.07	-0.9 -9.0'	58.6'
14	34°0.88	18.70	139°6.65	6.9'	24° 17.08	-9.1'	58.5'
15	49°0.81	• • 19.39	153°32.57	7.1'	24°7.96	-9.3'	58.5'
16	64°0.75	20.09	167°58.63	7.2'	23°58.70	-9.4'	58.5'
17	79°0.68	20.78	182°24.82	7.3'	23°49.31	-9.5'	58.4'
18	94°0.62 109°0.55	\$17°21.47	196°51.16 211°17.63	7.5'	N23°39.80 23°30.16	-9.6'	58.4'
19 20	109 0.55 124°0.48	22.16 22.86	211 17.03 225°44.24	7.6' 7.7'	23° 20.40	-9.8' -9.9'	58.3' 58.3'
21	139°0.42	. 23.55	240° 10.98	7.7 7.9'	23° 10.51	-9.9 -10.0'	58.3
22	154°0.35	24.24	254° 37.87	8.0'	23°0.50	-10.1'	58.2'
23	169°0.28	24.93	269°4.89	8.2'	$22^{\circ}50.38$	-10.2'	58.2'
	SD = 16.1'	d = 0.7'		SI	D = 16.1'		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°0.21	S17°25.62	283°32.05	8.3'	N22°40.14	-10.4'	58.2'
1	199°0.14	26.31	297° 59.34	8.4'	22°29.78	-10.5'	58.1'
2	214°0.07	27.00	312°26.77	8.6'	22°19.31	-10.6'	58.1'
3	229°0.01 243°59.94	• • 27.68	326°54.33 341°22.04	8.7' 8.8'	22°8.73 21°58.05	-10.7'	58.0'
4 5	243°59.94 258°59.87	28.37 29.06	341°22.04 355°49.87	9.0'	21°58.05 21°47.25	-10.8' -10.9'	58.0' 58.0'
6	273°59.80	\$17°29.75	10° 17.84	9.0	N21°36.35	-10.9	57.9'
7	288°59.72	30.43	24° 45.94	9.2	21°25.35	-11.1	57.9'
8	303°59.65	31.12	39°14.18	9.4'	21°14.24	-11.2'	57.8'
9	318°59.58	• • 31.80	53° 42.54	9.5'	21°3.04	-11.3'	57.8'
10	333°59.51	32.49	68°11.04	9.6'	20°51.73	-11.4'	57.8'
11 12	348°59.44 3°59.36	33.17 \$17°33.85	82°39.67 97°8.43	9.8' 9.9'	20°40.34 N20°28.84	-11.5' -11.6'	57.7' 57.7'
13	3 59.30 18°59.29	34.54	97 8.43 111°37.32	9.9 10.0'	20° 17.26	-11.0 -11.7'	57.7'
14	33°59.22	35.22	111 37.32 126°6.34	10.1	20° 5.58	-11. <i>1</i> -11.8'	57.6'
15	48°59.14	• • 35.90	140°35.48	10.3	19°53.82	-11.9	57.6'
16	63°59.07	36.58	155°4.76	10.4'	19°41.96	-11.9'	57.5'
17	78°59.00	37.26	169°34.15	10.5'	19°30.02	-12.0'	57.5'
18	93°58.92	\$17°37.94	184°3.67	10.6'	N19°18.00	-12.1'	57.5'
19 20	108°58.85 123°58.77	38.62 39.30	198°33.32 213°3.09	10.8' 10.9'	19°5.90 18°53.71	-12.2' -12.3'	57.4' 57.4'
20	123°58.77 138°58.69	39.30 · · 39.98	213°3.09 227°32.98	10.9	18° 53.71 18° 41.45	-12.3'	57.4'
22	150 50.09 153°58.62	40.66	242°2.99	11.1'	18° 29.10	-12.3 -12.4'	57.4 57.3'
23	168°58.54	41.34	256° 33.12	11.2'	18° 16.69	-12.5'	57.3'
	SD = 16.1'	d = 0.7'		SI	D = 15.9'		

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

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

		Sun			Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age		
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21		
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	83-63%		
09	16:12	16:10	11:44	03:19	15:51			
10	16:07	16:04	11:44	04:21	16:50			
11	16:01	15:57	11:44	05:17	17:43			

### November 12, 13, 14 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
0	51°22.76	196°56.10 \$12°25		294°15.32 N21°12.76	54°38.64 <b>S</b> 04°3.90			
1	66°25.22		i.44 183°2.14 41.47	309°17.79 12.77	69°41.18 3.92	Alpheratz	357°33.84 353°6.15	29°14.22 -42°9.99
2	81°27.69	226°55.00 27	7.52 198°2.70 41.81	324°20.25 12.77	84°43.71 3.95	Ankaa Schedar	349°29.84	56°41.01
3	96°30.15		3.60 213°3.25 · · 42.16	339°22.72 · · 12.78	99°46.24 · · 3.97	Diphda	348°46.35	-17°50.64
4 5	111°32.62 126°35.08		228°3.80 42.50 0.77 243°4.35 42.85	354°25.19 12.79 9°27.65 12.79	114°48.77 3.99 129°51.30 4.01	Achernar	$335^{\circ}19.12$	-57°6.37
6	120 35.06 141° 37.54	286°52.80 \$12°31		24°30.12 N21°12.80	144°53.83 S04°4.03	Hamal	327°50.09	23°35.23
7	156° 40.01		2.92 273°5.45 43.53	39°32.59 12.81	159° 56.37 4.05	Polaris	313°11.07	89°22.42
8	171°42.47	316°51.70 34	.00 288°6.00 43.88	54°35.06 12.81	174°58.90 4.07	Acamar Menkar	315°10.81 314°5.10	-40°11.98 4°11.59
9	186° 44.94	331°51.15 · · 39		69°37.53 · · 12.82	190°1.43 · · 4.09	Mirfak	308°26.76	49° 57.25
10	201°47.40		5.16 318°7.10 44.56	84°39.99 12.83	205°3.96 4.11	Aldebaran	290°38.50	16° 33.75
11 12	216° 49.87 231° 52.33	1°50.04 37 16°49.49 \$12°38	7.24 333°7.65 44.90 8.31 348°8.20 \$21°45.24	99°42.46 12.84 114°44.93 N21°12.84	220°6.49 4.13 235°9.02 \$04°4.15	Rigel	$281^{\circ}2.91$	-8°10.17
13	246°54.79		0.39 3°8.75 45.59	129°47.40 12.85	250°11.55 4.17	Capella	280°20.45	46°1.39
14	261°57.26		0.46 18°9.30 45.93	144°49.87 12.86	265°14.08 4.19	Bellatrix Elnath	278°21.85 278°0.67	6°22.47 28°37.75
15	276°59.72	61°47.83 · · 41		159°52.35 · · 12.86	280° 16.61 · · 4.21	Alnilam	275°36.75	-1°11.01
16	292°2.19		46.61 48°10.40 46.61	174°54.82 12.87	295°19.14 4.23	Betelgeuse	270°51.07	7°24.79
17 18	307°4.65 322°7.11	91°46.72 43 106°46.16 \$12°44	6.69 63°10.95 46.95 6.76 78°11.50 \$21°47.29	189°57.29 12.88 204°59.76 N21°12.89	310°21.67 4.25 325°24.20 \$04°4.27	Canopus	$263^{\circ}51.69$	-52° 42.27
19	337°9.58		5.83 93°12.05 47.63	220°2.23 12.89	340°26.73 4.29	Sirius	258°25.40	-16°44.92
20	352° 12.04		5.90 108°12.59 47.96	235°4.71 12.90	355°29.26 4.31	Adhara	255°5.10	-29°0.19
21	$7^{\circ}14.51$	151°44.49 · · 47		250°7.18 · · 12.91	10°31.79 · · 4.33	Procyon Pollux	244°49.96 243°16.30	5°9.58 27°57.75
22	22°16.97		0.05 138°13.69 48.64	265°9.65 12.92	25°34.31 4.35	Avior	234°14.28	-59°35.18
23	37° 19.43	181°43.38 50	0.12 153°14.23 48.98	280°12.13 12.93	40°36.84 4.37	Suhail	222°45.78	-43°31.91
Mer.p	pass. 20:31	$\nu$ -0.5 $'$ $d1.1'$ m-3	91 $\nu$ 0.6′ $d$ 0.3′ $m$ 1.41	$\nu 2.5' \ d0.0' \ \text{m-}2.40$	$\nu 2.5' \ d0.0' \ \text{m}0.82$	Miaplacidus	221°38.09	-69°49.02
						Alphard	217°47.08	-8°46.11
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus	207°33.77	11°50.45
0	52°21.90	196°42.82 \$12°51	19 168°14.78 <b>S</b> 21°49.32	295°14.60 N21°12.93	55°39.37 <b>S</b> 04°4.38	Dubhe Denebola	193°40.42 182°24.44	61°36.44 14°25.64
1	67°24.36		2.26 183°15.33 49.65	310°17.08 12.94	70°41.90 4.40	Gienah	175°43.12	-17°41.00
2	82°26.83		3.33 198°15.87 49.99	325°19.55 12.95	85°44.43 4.42	1	172°59.88	-63°14.31
3 4	97°29.29 112°31.75	241°41.14 · · · 54 256°40.58	213°16.42 · · 50.33 6.46 228°16.97 50.66	340°22.03 ·· 12.96 355°24.50 12.97	100°46.96 · · 4.44 115°49.48 4.46	Gacrux	$171^{\circ}51.34$	-57° 15.26
5	112 31.73 127°34.22		5.53 243°17.51 51.00	10°26.98 12.97	130°52.01 4.48	Alioth	166°12.80	55°49.00
6	142°36.68	286°39.46 \$12°57		25°29.45 N21°12.98	145°54.54 S04°4.50	Spica	158°21.87	-11°17.69 49°10.95
7	$157^{\circ}39.15$	301°38.90 58	3.66 273°18.60 51.67	40°31.93 12.99	$160^{\circ}57.07$ 4.52	Alkaid Hadar	152°51.91 148°35.68	-60°29.73
8	172°41.61	316°38.34 12°59		55°34.41 13.00	175°59.59 4.54	Menkent	147°57.21	-36° 29.71
9	187° 44.08	331°37.78 13°0		70°36.89 · · 13.01	191°2.12 · · 4.55		145°47.62	19°2.87
10 11	202° 46.54 217° 49.00		.86 318°20.23 52.67 .92 333°20.78 53.00	85°39.36 13.02 100°41.84 13.02	206°4.65 4.57 221°7.17 4.59	Rigil Kent.	139°40.04	-60°56.43
12	232°51.47	16°36.09 \$13°3		115°44.32 N21°13.03	236°9.70 S04°4.61	Kochab	137°20.96	74°2.83
13	247°53.93		5.05 3°21.86 53.67	130°46.80 13.04	251°12.23 4.63	Zuben'ubi Alphecca	136°55.61 126°3.53	-16°8.88 26°37.69
14	$262^{\circ}56.40$		5.11 18°22.41 54.00	145°49.28 13.05	266° 14.75 4.65	Antares	112° 15.36	-26° 29.33
15	277°58.86	61°34.39 · · ·		160°51.76 · · 13.06	281°17.28 · · 4.66	Atria	107°9.49	-69°4.49
16 17	293°1.32 308°3.79		3.24 48°23.49 54.67 0.30 63°24.03 55.00	175°54.24 13.07 190°56.72 13.08	296°19.81 4.68 311°22.33 4.70	Sabik	$102^{\circ}2.31$	-15°45.38
18	323°6.25	106°32.69 \$13°10		205°59.20 N21°13.09	326°24.86 S04°4.72	Shaula	96°9.80	-37°7.38
19	338°8.72		42 93°25.12 55.66	221°1.68 13.10	341°27.38 4.74	Rasalhague	95°58.21	12°32.56 51°29.27
20	353°11.18		2.48 108°25.66 55.99	236°4.16 13.11	356°29.91 4.75	Eltanin Kaus Aust.	90°42.30 83°31.90	-34° 22.39
21	8°13.64	151°30.99 · · 13		251°6.64 · · 13.11	11°32.43 · · 4.77	Vega	80°33.06	38° 48.62
22 23	23° 16.11 38° 18.57		1.59 138°26.74 56.65 1.65 153°27.28 56.98	266°9.13 13.12	26°34.96 4.79 41°37.48 4.81	Nunki	$75^{\circ}47.15$	-26°15.91
				281°11.61 13.13		Altair	61°59.44	8°56.31
Mer.p	pass. 20:27	$\nu$ -0.6′ $d$ 1.1′ m-3	91 $\nu 0.5' \ d0.3' \ m1.40$	$\nu 2.5' \ d0.0' \ \text{m-}2.41$	$\nu 2.5' \ d0.0' \ m0.83$	Peacock	53°4.82	-56°39.31
						Deneb Enif	49°25.46 33°38.11	45°22.62 9°59.76
Fri	GHA	GHA Dec		GHA Dec	GHA Dec	Al Na'ir	27°31.97	-46°50.31
0	53°21.04	196°29.28 \$13°16		296°14.09 N21°13.14	56°40.01 S04°4.82	Fomalhaut	15°13.62	-29°29.17
1 2	68° 23.50 83° 25.96		7.76 183°28.36 57.64 8.82 198°28.90 57.96	311°16.58 13.15 326°19.06 13.16	71°42.53 4.84 86°45.06 4.86	Scheat	13°44.40	28°13.62
3	98° 28.43	241°27.57 · · 19		341°21.54 · · 13.17	101°47.58 · · 4.88	Markab	13°29.09	15°20.84
4	113°30.89		0.93 228°29.98 58.62	356°24.03 13.18	116°50.11 4.89	Nov 12 Wed	SHA	Mer.pass
5	128° 33.36		98 243°30.52 58.95	11°26.51 13.19	131°52.63 4.91		145°33.34	10:53
6	143°35.82	286°25.86 \$13°23		26°29.00 N21°13.20	146°55.15 S04°4.93		116°38.83	12:47
7	158° 38.28		273°31.60 59.60	41°31.48 13.21	161°57.68 4.94	Jupiter Saturn	242°52.56 3°15.88	04:22 20:18
8 9	173° 40.75 188° 43.21		5.14 288°32.14 21°59.93 5.19 303°32.67 22°0.25	56°33.97 13.22 71°36.46 · · 13.23	177°0.20 4.96 192°2.72 • 4.98			
10	203°45.68		7.24 318°33.21 0.58	86°38.94 13.24	207°5.25 4.99	Nov 13 Thu	SHA	Mer.pass
11	218°48.14	1°22.99 28	3.30 333°33.75 0.90	101°41.43 13.25	222°7.77 5.01		144°20.92 115°52.88	10:54 12:47
12	233°50.61	16°22.42 \$13°29		116°43.92 N21°13.26	237°10.29 <b>S</b> 04°5.03		242°52.70	04:18
13	248° 53.07		1.40 3°34.82 1.55	131°46.41 13.27	252°12.81 5.04	Saturn	3°17.47	20:14
14 15	263° 55.53 278° 58.00	46°21.27 31 61°20.69 · · 32	44 18°35.36 1.88 49 33°35.90 · · 2.20	146°48.89 13.28 161°51.38 · · 13.29	267°15.34 5.06 282°17.86 • 5.08	Nov 14 Fri	SHA	
16	294°0.46		3.54 48°36.43 2.52	176°53.87 13.30	297°20.38 5.09	Venus	3HA 143°8.25	Mer.pass 10:54
17	309°2.93		.59 63°36.97 2.85	191°56.36 13.31	312°22.90 5.11	Mars	115°6.79	12:46
18	324°5.39	106°18.96 \$13°35		206°58.85 N21°13.32	327°25.43 <b>S</b> 04°5.13	Jupiter	242°53.06	04:14
19	339°7.85		6.68 93°38.04 3.49	222°1.34 13.34	342°27.95 5.14	Saturn	3°18.97	20:10
20 21	354° 10.32 9° 12.78	136°17.80 37 151°17.22 · · 38	7.73 108°38.58 3.81 8.77 123°39.11 · · 4.13	237°3.83 13.35 252°6.32 · · 13.36	$357^{\circ}30.47$ 5.16 $12^{\circ}32.99$ · · 5.17	Horizon	tal parallax	
22	24° 15.25		0.82 138°39.65 4.46	267°8.81 13.37	27°35.51 5.19		Venus:	0.1
23	39° 17.71		0.86 153°40.18 4.78	282°11.31 13.38	42°38.03 5.21		Mars:	0.1
Merr	pass. 20:23	ν-0.6' d1.1' m-3	91 ν0.5′ d0.3′ m1.40	ν2.5' d0.0' m-2.42	ν2.5' d0.0' m0.83			
					1 2.2 20.0 7110.00			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.46	<b>S</b> 17°42.02	271°3.37	11.4'	$N18^{\circ}4.19$	-12.6'	57.3'
1	198°58.39	42.69	285°33.74	11.5'	17°51.63	-12.6'	57.2'
2	213°58.31 228°58.23	43.37 •• 44.04	300°4.22 314°34.82	11.6' 11.7'	17°38.99 17°26.29	-12.7' -12.8'	57.2' 57.1'
4	243°58.15	44.72	329°5.53	11.8'	17° 13.51	-12.8'	57.1'
5	258°58.07	45.39	343°36.36	11.9'	17°0.67	-12.9'	57.1'
6	273°57.99	<b>S</b> 17°46.07	358°7.29	12.0'	N16°47.76	-13.0'	57.0'
7	288°57.91	46.74	12°38.34	12.2' 12.3'	16°34.80	-13.0'	57.0'
8 9	303°57.83 318°57.75	47.41 •• 48.09	27°9.50 41°40.76	12.4	16°21.76 16°8.67	-13.1' -13.2'	57.0' 56.9'
10	333°57.67	48.76	56°12.14	12.5'	15°55.52	-13.2'	56.9'
11	348°57.59	49.43	70°43.61	12.6'	$15^{\circ}42.31$	-13.3'	56.9'
12	3°57.51	\$17°50.10	85°15.20	12.7'	N15°29.04	-13.3'	56.8'
13 14	18°57.42 33°57.34	50.77 51.44	99°46.88 114°18.67	12.8' 12.9'	15°15.72 15°2.35	-13.4' -13.4'	56.8' 56.8'
14 15	48°57.26	52.11	114 18.67 128°50.56	13.0'	15 2.35 14°48.92	-13.4 -13.5'	56.7'
16	63°57.18	52.78	143°22.55	13.1'	14°35.44	-13.5'	56.7'
17	78°57.09	53.45	157°54.63	13.2'	$14^{\circ}21.91$	-13.6'	56.7'
18	93°57.01	\$17°54.11	172°26.81	13.3'	N14°8.34	-13.6'	56.6'
19 20	108°56.92 123°56.84	54.78 55.45	186°59.09 201°31.46	13.4' 13.5'	13°54.71 13°41.04	-13.7' -13.7'	56.6' 56.6'
21	138°56.75	56.11	216°3.93	13.6'	13°27.33	-13.7 -13.8'	56.5
22	153°56.67	56.78	230°36.48	13.6'	13°13.57	-13.8'	56.5
23	$168^{\circ}56.58$	57.44	$245^{\circ}9.13$	13.7'	12°59.77	-13.8'	56.5'
	SD = 16.1'	d = 0.7'		SI	D = 15.6'		
TI.	CUA	D	CILA		D-:	.ı	LIP
Thu 0	<b>GHA</b> 183°56.50	Dec \$17°58.11	<b>GHA</b> 259°41.86	u 13.8'	<b>Dec</b> N12°45.93	<i>d</i> -13.9′	<b>HP</b> 56.4'
1	198°56.41	58.77	274°14.69	13.9'	12°32.05	-13.9'	56.4
2	213°56.32	17°59.43	288°47.59	14.0'	$12^{\circ}18.13$	-14.0'	56.4'
3	228°56.23	18°0.10	303°20.59	14.1'	12°4.18	-14.0'	56.3'
4 5	243°56.15 258°56.06	0.76 1.42	317°53.66 332°26.82	14.2' 14.2'	11°50.19 11°36.16	-14.0' -14.1'	56.3' 56.3'
6	273°55.97	\$18°2.08	347°0.06	14.2	N11°22.10	-14.1	56.2
7	288°55.88	2.74	1°33.38	14.4'	11°8.01	-14.1'	56.2
8	303°55.79	3.40	16°6.78	14.5'	10°53.88	-14.2'	56.2'
9	318°55.70	• • 4.06	30°40.25	14.5'	10°39.73	-14.2'	56.1'
10 11	333°55.61 348°55.52	4.72 5.38	45°13.80 59°47.42	14.6' 14.7'	10°25.54 10°11.33	-14.2' -14.2'	56.1' 56.1'
12	3°55.43	\$18°6.04	74°21.11	14.8'	N09°57.09	-14.3'	56.1'
13	18°55.34	6.69	88°54.88	14.8'	09°42.82	-14.3'	56.0'
14	33°55.25	7.35	103°28.71	14.9'	09°28.53	-14.3'	56.0'
15 16	48°55.16 63°55.06	· · 8.01 8.66	118°2.62 132°36.59	15.0' 15.0'	09°14.21 08°59.87	-14.3' -14.4'	56.0' 55.9'
17	78°54.97	9.32	132 30.59 147°10.63	15.1'	08°45.51	-14.4'	55.9'
18	93°54.88	S18°9.97	161°44.73	15.2'	N08°31.13	-14.4'	55.9'
19	108°54.79	10.63	176°18.89	15.2'	08°16.73	-14.4'	55.8'
20	123°54.69	11.28	190°53.12 205°27.40		08°2.31		55.8'
21 22	138°54.60 153°54.50	· · 11.93 12.59	205°27.40 220°1.75	15.3' 15.4'	07°47.87 07°33.41	-14.5' -14.5'	55.8' 55.8'
23	168°54.41	13.24	234°36.15	15.5'	07°18.94	-14.5'	55.7'
	SD = 16.2'	d = 0.7'		SI	D = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.31	\$18°13.89	249°10.61	ν 15.5'	N07°4.45	-14.5'	55.7'
1	198°54.22	14.54	263°45.13	15.6'	$06^{\circ}49.95$	-14.5'	55.7'
2	213°54.12	15.19	278°19.70	15.6'	06°35.43	-14.5'	55.7'
3 4	228°54.02 243°53.93	· · 15.84 16.49	292°54.32 307°28.99	15.7' 15.7'	06°20.91 06°6.37	-14.5' -14.5'	55.6' 55.6'
4 5	243 53.93 258°53.83	16.49	307 28.99 322°3.71	15.7 15.8'	05°51.82	-14.5 -14.6'	55.6'
6	273°53.73	S18°17.78	336°38.48	15.8'	N05°37.26	-14.6'	55.5'
7	288°53.63	18.43	351°13.30	15.9'	05°22.69	-14.6'	55.5'
8 9	303°53.54 318°53.44	19.08 •• 19.72	5°48.16 20°23.07	15.9' 16.0'	05°8.11 04°53.53	-14.6' -14.6'	55.5' 55.5'
10	318°53.44 333°53.34	20.37	20°23.07 34°58.02	16.0'	04°53.53 04°38.94	-14.6'	55.5° 55.4'
11	348°53.24	21.02	49°33.02	16.0'	04°24.34	-14.6'	55.4'
12	3°53.14	S18°21.66	64°8.05	16.1'	N04°9.74	-14.6'	55.4'
13	18°53.04	22.30	78°43.13	16.1'	03°55.14	-14.6'	55.4'
14 15	33°52.94 48°52.84	22.95 •• 23.59	93°18.24 107°53.39	16.1' 16.2'	03°40.54 03°25.93	-14.6' -14.6'	55.3' 55.3'
16	63°52.74	24.23	107 55.59 122°28.57	16.2'	03°25.93	-14.6'	55.3'
17	78°52.63	24.87	137°3.79	16.3'	02°56.71	-14.6'	55.3'
18	93°52.53	S18°25.52	151°39.04	16.3'	N02°42.10	-14.6'	55.3'
19 20	108°52.43 123°52.33	26.16 26.80	166°14.33 180°49.64	16.3' 16.3'	02°27.49 02°12.89	-14.6' -14.6'	55.2' 55.2'
20	123°52.33 138°52.22	26.80	180°49.64 195°24.98	16.4	02°12.89 01°58.29	-14.6'	55.2' 55.2'
22	153°52.12	28.07	210°0.35	16.4	01°43.69	-14.6'	55.2'
23	168°52.02	28.71	224°35.75	16.4'	01°29.09	-14.6'	55.1'
	SD = 16.2'	d = 0.7'		SI	D = 15.2'		
			-				

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
	00 <sup>h</sup> 12 <sup>h</sup>		Pass	Upper Lower		22-24	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	53-32%	
12	15:54	15:50	11:44	06:08	18:31		
13	15:46	15:42	11:44	06:54	19:15		
14	15:37	15:33	11:44	07:36	19:57		

## November 15, 16, 17 UT (Sat., Sun., Mon.)

h	Aries	Venu	IS	Ma	ars	Jup	oiter	Sat	urn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	54°20.17		13°41.90	168°40.71	S22°5.10	297°13.80	N21°13.39	57°40.55	S04°5.22			
1	69°22.64	211°14.90	42.94	183°41.25	5.42	312°16.29	13.40	72°43.07	5.24	Alpheratz	357°33.85	29°14.22
2	84°25.10	226°14.32	43.99	198°41.78	5.74	$327^{\circ}18.78$	13.41	87°45.59	5.25	Ankaa Schedar	353°6.16	-42°10.01 56°41.02
3	99°27.57		• • 45.03	213°42.32	• • 6.06	$342^{\circ}21.28$	• • 13.42	102°48.11	• • 5.27	Diphda	349°29.85 348°46.36	-17°50.65
4	114°30.03	256° 13.16	46.07	228°42.85	6.38	357°23.77	13.43	117°50.63	5.28	Achernar	335°19.13	-57°6.39
5	129°32.49	271°12.57	47.11	243°43.38	6.69	12°26.26	13.45	132°53.15	5.30	Hamal	327°50.09	23°35.24
6 7	144°34.96 159°37.42	286°11.99 Si 301°11.41	13°48.15 49.19	258°43.91 273°44.45	\$22°7.01 7.33	27°28.76 42°31.25	N21°13.46 13.47	147°55.67 162°58.19	\$04°5.31 5.33	Polaris	313°11.05	89°22.44
8	174°39.89	316° 10.82	50.23	288° 44.98	7.65	57°33.75	13.48	178° 0.71	5.34	Acamar	$315^{\circ}10.81$	-40°11.99
9	189° 42.35		• • 51.26	303°45.51	• • 7.97	72°36.24	• • 13.49	193°3.23	5.36	Menkar	314°5.10	4°11.58
10	204°44.81	346°9.65	52.30	318°46.04	8.28	87°38.74	13.50	208°5.75	5.37	Mirfak	308°26.76	49°57.26
11	$219^{\circ}47.28$	1°9.07	53.34	333°46.57	8.60	102°41.23	13.51	223°8.27	5.39	Aldebaran Rigel	290°38.49 281°2.90	16°33.75 -8°10.18
12	234° 49.74		13°54.37	348°47.10	S22°8.91	117°43.73	N21° 13.53	238° 10.79	S04°5.40	Capella	280°20.43	46°1.39
13	249°52.21	31°7.89	55.41	3°47.64	9.23	132°46.23	13.54	253°13.31	5.42	Bellatrix	278°21.84	6°22.47
14 15	264° 54.67 279° 57.13	46°7.31 61°6.72	56.45 •• 57.48	18°48.17 33°48.70	9.55 •• 9.86	147°48.72 162°51.22	13.55 •• 13.56	268° 15.83 283° 18.35	5.43 •• 5.45	Elnath	278°0.66	28°37.76
16	279 57.13 294°59.60	76°6.13	58.51	48°49.23	10.18	102 51.22 177°53.72	13.57	298° 20.86	5.46	Alnilam	275°36.74	-1°11.02
17	310°2.06		13°59.55	63°49.76	10.49	192°56.22	13.59	313°23.38	5.48	Betelgeuse	270°51.06	7°24.79
18	325°4.53		S14°0.58	78°50.29	S22°10.80	207°58.71	N21° 13.60	328°25.90	S04°5.49	Canopus	263°51.67	-52°42.28
19	$340^{\circ}6.99$	121°4.36	1.61	93°50.82	11.12	223°1.21	13.61	343°28.42	5.51	Sirius Adhara	258°25.39 255°5.08	-16°44.93 -29°0.20
20	355°9.46	136°3.77	2.64	108°51.34	11.43	238°3.71	13.62	358° 30.94	5.52	Procyon	244°49.94	5°9.58
21	10°11.92	151°3.18	• • 3.67	123°51.87	• • 11.74	253°6.21	• • 13.64	13°33.45	• • 5.53	Pollux	243°16.28	27°57.75
22	25°14.38	166°2.59	4.70	138°52.40	12.06	268°8.71	13.65	28° 35.97	5.55	Avior	234°14.25	-59°35.18
23	40° 16.85	181°2.00	5.73	153°52.93	12.37	283°11.21	13.66	43°38.49	5.56	Suhail	222°45.75	-43°31.91
Mer.p	pass. 20:19	$\nu$ -0.6' $d1.0'$	m-3.91	$\nu$ 0.5′ d0.	3′ m1.39	$\nu 2.5' \ d0.$	0′ m-2.42	$\nu 2.5' \ d0.$	$0' \; m0.84$	Miaplacidus	221°38.04	-69°49.02
										Alphard	217°47.06	-8°46.11
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Regulus	207°33.75	11°50.44
0	$55^{\circ}19.31$		S14°6.76	168°53.46	522°12.68	$298^{\circ}13.71$	N21° 13.67	58°41.00	S04°5.58	Dubhe Denebola	193°40.39 182°24.43	61°36.43 14°25.63
1	$70^{\circ}21.78$	211°0.82	7.79	183°53.99	12.99	$313^{\circ}16.21$	13.69	73°43.52	5.59	Gienah	175°43.10	-17°41.00
2	85°24.24	226°0.22	8.82	198°54.51	13.30	328°18.72	13.70	88°46.04	5.60	Acrux	172°59.85	-63°14.31
3	100°26.70	240°59.63	• • 9.84	213°55.04	• • 13.61	343°21.22	• • 13.71	103°48.55	5.62	Gacrux	171°51.32	-57°15.25
4	115°29.17	255°59.04	10.87	228°55.57	13.92	358°23.72	13.72	118°51.07	5.63	Alioth	166°12.78	55°48.99
5 6	130°31.63 145°34.10	270°58.44 285°57.85 S	11.90 14°12.92	243°56.10 258°56.62	14.23 \$22°14.54	13°26.22 28°28.73	13.74 N21°13.75	133°53.59 148°56.10	5.64 \$04°5.66	Spica	158°21.86	-11°17.69
7	160°36.56	300°57.25	13.95	273°57.15	14.85	43°31.23	13.76	163°58.62	5.67	Alkaid	152°51.89	49°10.93
8	175°39.02	315°56.66	14.97	288°57.67	15.16	58°33.73	13.78	179°1.13	5.68	Hadar	148°35.67 147°57.20	-60°29.71 -36°29.71
9	190°41.49	330°56.06	• • 15.99	303°58.20	• • 15.47	73°36.24	• • 13.79	194°3.65	• • 5.70	Menkent Arcturus	147 57.20 145°47.61	-36 29.71 19°2.86
10	205°43.95	345°55.46	17.02	318°58.73	15.78	88°38.74	13.80	$209^{\circ}6.16$	5.71	Rigil Kent.	139°40.03	-60°56.42
11	220° 46.42	0°54.87	18.04	333°59.25	16.09	103°41.25	13.82	224°8.68	5.72	Kochab	137°20.96	74°2.81
12	235° 48.88		14°19.06	348°59.78	S22°16.39	118°43.75	N21° 13.83	239°11.19	S04°5.74	Zuben'ubi	136°55.60	-16°8.88
13 14	250°51.34 265°53.81	30°53.67 45°53.07	20.08 21.10	4°0.30 19°0.83	16.70	133°46.26 148°48.76	13.84 13.86	254°13.71 269°16.22	5.75 5.76	Alphecca	126°3.53	26°37.67
15	280° 56.27		• • 22.12	34° 1.35	17.01 •• 17.32	163°51.27	13.87	284° 18.74	. 5.78	Antares	112°15.36	-26°29.33
16	295°58.74	75°51.87	23.14	49° 1.87	17.62	178°53.78	13.88	299°21.25	5.79	Atria	107° 9.50	-69°4.48
17	311°1.20	90°51.27	24.16	64°2.40	17.93	193°56.28	13.90	314°23.77	5.80	Sabik Shaula	102°2.32 96°9.81	-15°45.38 -37°7.38
18	326°3.66	105°50.67 S	14°25.18	79°2.92	S22°18.23	208°58.79	N21°13.91	329°26.28	S04°5.81	Rasalhague	95°58.22	12°32.55
19	341°6.13	120°50.07	26.19	94°3.44	18.54	224°1.30	13.92	344°28.79	5.83	Eltanin	90°42.31	51°29.25
20	356°8.59	135° 49.47	27.21	109°3.97	18.84	239°3.81	13.94	359°31.31	5.84	Kaus Aust.		-34°22.39
21 22	11°11.06 26°13.52	150°48.87 165°48.26	· · 28.23 29.24	124° 4.49 139° 5.01	· · 19.15 19.45	254°6.31 269°8.82	· · 13.95 13.96	14°33.82 29°36.34	· · 5.85 5.86	Vega	80°33.08	38°48.61
23	41° 15.98	180° 47.66	30.26	154° 5.54	19.45	284°11.33	13.98	44° 38.85	5.88	Nunki	75°47.16	-26°15.91
						-				Altair	61°59.46	8°56.31
Mer.p	pass. 20:15	$\nu$ -0.6' $d1.0'$	m-3.91	$\nu$ 0.5′ d0.	პ′ m1.39	$\nu 2.5' d0.$	0′ m-2.43	$\nu 2.5' d0.$	U′ m0.85	Peacock Deneb	53°4.84 49°25.48	-56°39.31 45°22.62
										Enif	33°38.13	9°59.76
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°31.99	-46°50.31
0	56° 18.45		14°31.27	169°6.06	\$22°20.06	299°13.84	N21°13.99	59°41.36	S04°5.89	Fomalhaut	15°13.64	-29°29.18
1	71°20.91	210°46.45	32.28	184° 6.58	20.36	314°16.35	14.01	74°43.87	5.90 5.01	Scheat	13°44.42	28°13.62
2	86°23.38 101°25.84	225°45.85 240°45.24	33.30 · · 34.31	199°7.10 214°7.62	20.66 •• 20.96	329°18.86 344°21.37	14.02 •• 14.04	89°46.39 104°48.90	5.91 •• 5.92	Markab	13°29.10	15°20.84
4	116° 28.31	255°44.64	35.32	229°8.14	21.27	359°23.88	14.05	119° 51.41	5.94	Nov 15 Sat	SHA	Mer.pass
5	131°30.77	270°44.03	36.33	244°8.66	21.57	14°26.40	14.06	134°53.92	5.95	Venus	141°55.31	10:55
6	146° 33.23	285°43.43 S	14°37.34	259° 9.18	S22°21.87	29°28.91	N21°14.08	149°56.44	S04°5.96			12:45
7	161°35.70	300°42.82	38.35	274° 9.71	22.17	44°31.42	14.09	164°58.95	5.97	Jupiter		04:10
8	176°38.16	315°42.21	39.36	289°10.23	22.47	59°33.93	14.11	180°1.46	5.98	Saturn	3°20.38	20:06
9	191°40.63		40.37	304°10.75	•• 22.77	74°36.45	14.12	195°3.97	· · 5.99	Nov 16 Sun	SHA	Mer.pass
10 11	206° 43.09 221° 45.55	345°41.00 0°40.39	41.38 42.38	319°11.26 334°11.78	23.07 23.37	89°38.96 104°41.47	14.14 14.15	210°6.48 225°8.99	6.01 6.02	Venus	$140^{\circ}42.10$	10:56
12	236° 48.02		14°43.39	349°12.30	\$22°23.67	119°43.99	N21° 14.17	240°11.50	504°6.03	Mars		12:44
13	251° 50.48	30°39.17	44.39	4°12.82	23.96	134°46.50	14.18	255° 14.02	6.04	Jupiter	242°54.40	04:06
14	$266^{\circ}52.95$	45°38.56	45.40	19°13.34	24.26	$149^{\circ}49.02$	14.20	$270^{\circ}16.53$	6.05	Saturn	3°21.69	20:02
15	281°55.41		• • 46.40	34°13.86	• • 24.56	164°51.53	• • 14.21	285°19.04	• • 6.06	Nov 17 Mon	SHA	Mer.pass
16	296° 57.87	75°37.33	47.41	49°14.38	24.86	179°54.05	14.23	300°21.55	6.07		139°28.61	10:57
17 18	312°0.34 327°2.80	90°36.72 105°36.11 S	48.41 14°49.41	64°14.89 79°15.41	25.15 \$22°25.45	194°56.56 209°59.08	14.24 N21°14.26	315°24.06 330°26.57	6.08 \$04°6.09		112°47.61	12:43
19	342°5.27	105 30.11 3. 120°35.50	50.42	94° 15.41	25.75	209 59.06 225°1.59	14.27	345° 29.08	6.10	Jupiter Saturn	242°55.39 3°22.91	04:02 19:58
20	357°7.73	135°34.88	51.42	109°16.45	26.04	240°4.11	14.29	0°31.59	6.12			19.00
21	$12^{\circ}10.19$	150°34.27	• • 52.42	$124^{\circ}16.96$	• • 26.34	255°6.63	• • 14.30	15°34.10	. 6.13	Horizoi	ntal parallax	
22	27° 12.66	165°33.66	53.42	139°17.48	26.63	270°9.15	14.32	30°36.61	6.14		Venus:	0.1
23	42° 15.12	180°33.04	54.42	154°18.00	26.93	285°11.66	14.33	45°39.12	6.15		Mars:	0.1
Mer.	pass. 20:11	ν-0.6' d1.0'	m-3.91	$\nu$ 0.5′ d0.	3′ m1.38	$\nu 2.5' \ d0.$	0′ m-2.44	$\nu$ 2.5′ d0.	0′ m0.85			

h	Su	n	Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.91	S18°29.35	$239^{\circ}11.18$	16.4'	$N01^{\circ}14.51$	-14.6'	55.1'
1	198°51.81	29.99	253°46.63	16.5'	00°59.92	-14.6'	55.1'
2	213°51.70 228°51.60	30.62 · · 31.26	268°22.10 282°57.59	16.5' 16.5'	00°45.35 00°30.78	-14.6' -14.6'	55.1' 55.0'
4	243°51.49	31.90	297°33.11	16.5'	00°16.22	-14.5'	55.0'
5	258°51.38	32.53	$312^{\circ}8.64$	16.6'	N00°1.67	-14.5'	55.0'
6	273°51.28	\$18°33.17	326°44.19	16.6	S00°12.87	14.5'	55.0'
7 8	288°51.17 303°51.06	33.80 34.43	341°19.76 355°55.35	16.6' 16.6'	00°27.40 00°41.91	14.5' 14.5'	55.0' 54.9'
9	318°50.96	• • 35.07	10°30.95	16.6'	00°56.42	14.5'	54.9'
10	333°50.85	35.70	25°6.56	16.6'	01°10.91	14.5'	54.9'
11	348°50.74 3°50.63	36.33 \$18°36.96	39°42.19 54°17.83	16.6' 16.6'	01°25.39 \$01°39.85	14.5' 14.4'	54.9'
12 13	3 50.63 18°50.52	37.59	54 17.83 68°53.47	16.7	01°54.30	14.4 14.4'	54.9' 54.8'
14	33°50.41	38.22	83°29.13	16.7'	02°8.73	14.4'	54.8'
15	48°50.30	• • 38.85	98°4.80	16.7'	02°23.15	14.4'	54.8'
16 17	63°50.19 78°50.08	39.48 40.11	112°40.47 127°16.14	16.7' 16.7'	02°37.54 02°51.92	14.4' 14.4'	54.8' 54.8'
18	93°49.97	\$18°40.73	141°51.82	16.7	503°6.28	14.4	54.8'
19	108°49.86	41.36	156°27.51	16.7'	03°20.62	14.3'	54.7'
20	123°49.75	41.99	171°3.19	16.7'	03°34.94	14.3'	54.7'
21 22	138°49.64 153°49.52	· · 42.61 43.24	185°38.88 200°14.57	16.7' 16.7'	03°49.24 04°3.52	14.3' 14.3'	54.7' 54.7'
23	153 49.52 168°49.41	43.24 43.86	200 14.57 214°50.26	16.7	04 3.52 04°17.77	14.3	54.7'
	SD = 16.2'	d = 0.6'			D = 15.0'		
				JI			
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	183°49.30 198°49.18	\$18°44.49 45.11	229°25.94 244°1.62	16.7' 16.7'	\$04°32.00 04°46.21	14.2' 14.2'	54.6' 54.6'
2	198 49.18 213 49.07	45.11 45.73	244°1.62 258°37.30	16.7'	04°46.21 05°0.39	14.2'	54.6'
3	228°48.95	• • 46.36	273°12.97	16.7'	05°14.54	14.1'	54.6'
4	243°48.84	46.98	287°48.63	16.7'	05°28.67	14.1'	54.6'
5 6	258°48.73 273°48.61	47.60 \$18°48.22	302°24.29 316°59.93	16.6' 16.6'	05°42.77 \$05°56.84	14.1' 14.0'	54.6' 54.5'
7	288°48.49	48.84	331°35.57	16.6'	06°10.89	14.0'	54.5
8	303°48.38	49.46	$346^{\circ}11.20$	16.6'	06°24.90	14.0'	54.5'
9	318°48.26	• • 50.08	0°46.81	16.6'	06°38.89	14.0'	54.5'
10 11	333°48.14 348°48.03	50.70 51.32	15°22.41 29°58.00	16.6' 16.6'	06°52.84 07°6.76	13.9' 13.9'	54.5' 54.5'
12	3°47.91	\$18°51.93	44°33.57	16.6'	507°20.65	13.9	54.5
13	18°47.79	52.55	59°9.13	16.5'	$07^{\circ}34.51$	13.8'	54.4'
14	33°47.67	53.17	73°44.66	16.5'	07°48.33	13.8'	54.4'
15 16	48°47.55 63°47.43	· · 53.78 54.40	88°20.18 102°55.69	16.5' 16.5'	08°2.12 08°15.87	13.8' 13.7'	54.4' 54.4'
17	78°47.32	55.01	117°31.17	16.5'	08°29.59	13.7'	54.4'
18	93°47.20	S18°55.62	132°6.63	16.4'	S08°43.27	13.6'	54.4'
19	108°47.07 123°46.95	56.24	146°42.06 161°17.48	16.4	08°56.91 09°10.51	13.6'	54.4'
20 21	138°46.83	56.85 •• 57.46	101 17.48 175°52.87	16.4' 16.4'	09 10.51 09°24.07	13.6' 13.5'	54.3' 54.3'
22	153°46.71	58.07	190°28.24	16.3'	09°37.60	13.5'	54.3'
23	168°46.59	58.68	205°3.57	16.3'	09°51.08	13.4'	54.3'
	SD = 16.2'	d = 0.6'		SI	D = 14.9'		
Mon	GHA	Dec	GHA	ν	Dec	d	НР
0	183°46.47	\$18°59.29	219°38.89	16.3'	\$10°4.52	13.4'	54.3'
1	198°46.35	$18^{\circ}59.90$	$234^{\circ}14.17$	16.3'	$10^{\circ}17.92$	13.4'	54.3'
2	213°46.22 228°46.10	19°0.51	248°49.43 263°24.65	16.2' 16.2'	10°31.28 10°44.59	13.3'	54.3'
3 4	228°46.10 243°45.98	· · 1.12 1.73	263°24.65 277°59.85	16.2'	10°44.59 10°57.86	13.3' 13.2'	54.3' 54.2'
5	258°45.85	2.34	292°35.01	16.1'	11°11.08	13.2'	54.2'
6	273°45.73	S19°2.94	307°10.14	16.1	\$11°24.26	13.1'	54.2'
7 8	288°45.60 303°45.48	3.55 4.15	321°45.24 336°20.31	16.1' 16.0'	11°37.39 11°50.47	13.1' 13.0'	54.2' 54.2'
9	303 45.48 318 45.35	4.15 · · 4.76	350°55.33	16.0'	11°50.47 12°3.51	13.0'	54.2'
10	333°45.23	5.36	5°30.33	16.0'	$12^{\circ}16.49$	12.9'	54.2'
11	348°45.10	5.97	20°5.28	15.9'	12°29.43	12.9'	54.2'
12 13	3°44.97 18°44.85	\$19°6.57 7.17	34°40.20 49°15.08	15.9' 15.8'	\$12°42.31 12°55.14	12.8' 12.8'	54.2' 54.1'
14	33°44.72	7.17	63°49.92	15.8'	12 55.14 13°7.93	12.7	54.1'
15	48°44.59	• • 8.38	78°24.72	15.8'	13°20.65	12.7'	54.1'
16	63°44.46	8.98	92°59.48	15.7'	13°33.33	12.6'	54.1'
17 18	78°44.34 93°44.21	9.58 \$19°10.18	107°34.19 122°8.87	15.7' 15.6'	13°45.94 \$13°58.51	12.6' 12.5'	54.1' 54.1'
19	108°44.08	10.78	136°43.50	15.6'	14°11.01	12.4	54.1
20	123°43.95	11.37	151°18.08	15.5'	14°23.46	12.4'	54.1'
21 22	138°43.82 153°43.69	· · 11.97 12.57	165°52.62 180°27.12	15.5' 15.4'	14°35.86 14°48.19	12.3' 12.3'	54.1' 54.1'
22	153°43.69 168°43.56	12.57	180°27.12 195°1.57	15.4' 15.4'	14°48.19 15°0.46	12.3'	54.1'
	SD = 16.2'	d = 0.6'			D = 14.8'		
					_ 11.0		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper Lower		25-27	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	23-9%	
15	15:28	15:23	11:45	08:17	20:37		
16	15:17	15:12	11:45	08:57	21:17		
17	15:06	15:00	11:45	09:37	21:58		

### November 18, 19, 20 UT (Tue., Wed., Thu.)

h	Aries	. Ver	nus	Mars		Jup	iter	Sati	ırn		Stars	
Tue	GHA	GHA	Dec	GHA D	ec	GHA	Dec	GHA	Dec		SHA	Dec
0	57° 17.59		S14°55.42	169°18.51 S22°		300°14.18	N21° 14.35	60°41.62	S04°6.16	l		
1	72°20.05	$210^{\circ}31.81$	56.41		27.52	$315^{\circ}16.70$	14.37	75°44.13	6.17	Alpheratz	357°33.86	29°14.22
2	87°22.52	$225^{\circ}31.19$	57.41	199°19.54	27.81	$330^{\circ}19.22$	14.38	90°46.64	6.18	Ankaa Schedar	353°6.18 349°29.87	-42°10.02 56°41.03
3	102° 24.98	240°30.58	• • 58.41		28.10	345°21.74	• • 14.40	105°49.15	• • 6.19	Diphda	348°46.37	-17° 50.66
4	117°27.44	255°29.96	14°59.40		28.39	0°24.26	14.41	120°51.66	6.20	Achernar	335°19.15	-57°6.41
5	132°29.91	270°29.34	15°0.40		28.69	15°26.78	14.43	135°54.17	6.21	Hamal	327°50.09	23°35.24
6	147°32.37	285°28.72	\$15°1.39		28.98	30°29.30	N21°14.44	150° 56.68	\$04°6.22	Polaris	313°10.92	89°22.46
7 8	162°34.84 177°37.30	300°28.10 315°27.48	2.39 3.38		29.27 29.56	45°31.82 60°34.34	14.46 14.48	165°59.18 181°1.69	6.23 6.24	Acamar	$315^{\circ}10.82$	-40°12.01
9	177 37.30 192°39.76	330°26.86	• • 4.37		29.30 29.85	75°36.86	• 14.49	196°4.20	. 6.25	Menkar	314°5.10	4°11.58
10	207° 42.23	345°26.24	5.37		30.14	90°39.39	14.51	211°6.71	6.26	Mirfak	308°26.75	49°57.27
11	222° 44.69	0°25.62	6.36		30.43	105°41.91	14.53	226°9.21	6.27	Aldebaran	290°38.48	16°33.75
12	237°47.16	15°25.00	\$15°7.35		30.72	120°44.43	N21°14.54	241°11.72	S04°6.28	Rigel	281°2.89	-8°10.19
13	252°49.62	$30^{\circ}24.38$	8.34	4°25.20	31.01	$135^{\circ}46.96$	14.56	256°14.23	6.28	Capella Bellatrix	280°20.42 278°21.83	46°1.40 6°22.46
14	267°52.08	45°23.76	9.33		31.30	150°49.48	14.57	271°16.73	6.29	Elnath	278°0.64	28° 37.76
15	282° 54.55	60°23.14	• • 10.32		31.59	165°52.00	• • 14.59	286° 19.24	• • 6.30	Alnilam	275°36.73	-1°11.02
16	297°57.01	75°22.51	11.30		31.88	180°54.53	14.61	301°21.75	6.31	Betelgeuse	270°51.05	7°24.78
17	312°59.48	90°21.89	12.29		32.17	195°57.05	14.62	316°24.25	6.32	Canopus	263°51.65	-52°42.30
18	328°1.94	105°21.26 120°20.64	\$15°13.28	79°27.76 <b>S</b> 22° 94°28.27		210°59.58 226°2.10	N21°14.64	331°26.76 346°29.27	504°6.33	Sirius	258°25.37	$-16^{\circ}44.94$
19 20	343°4.41 358°6.87	120 20.64 135°20.01	14.26 15.25		32.74 33.03	241°4.63	14.66 14.67	1°31.77	6.34 6.35	Adhara	255°5.06	-29°0.22
21	13°9.33	150°19.39	. 16.23		33.32	256°7.15	• 14.69	16°34.28	• • 6.36	Procyon	244°49.92	5°9.57
22	28° 11.80	165°18.76	17.22		33.60	271°9.68	14.71	31°36.78	6.37	Pollux	243°16.26	27°57.74
23	43° 14.26	180°18.14	18.20		33.89	286°12.21	14.73	46°39.29	6.37	Avior	234°14.21	-59°35.20
N 4	20.00	0.6/ -/1								Suhail	222°45.72	-43°31.92
ivier.p	pass. 20:08	$\nu$ -0.6′ d1.	0 m-3.91	$\nu$ 0.5′ $d$ 0.3′ m <sup>1</sup>	L.38 	$\nu 2.5' \ d0.0$	0° m-2.45	$\nu 2.5' \ d0.0$	0° mu.85	Miaplacidus Alphard	221°37.99 217°47.04	-69°49.03 -8°46.12
										Regulus	207°33.73	11° 50.43
Wed	GHA	GHA	Dec		ec	GHA	Dec	GHA	Dec	Dubhe	193°40.35	61°36.42
0	58° 16.73		S15°19.18	169°30.83 \$22°		301°14.73	N21° 14.74	61°41.79	S04°6.38	Denebola	182°24.41	14°25.62
1	73° 19.19	210°16.88	20.17		34.46	316°17.26	14.76	76°44.30	6.39	Gienah	175°43.09	-17°41.00
2	88°21.65	225°16.25	21.15		34.74	331°19.79	14.78	91°46.80	6.40	Acrux	$172^{\circ}59.81$	-63°14.30
3 4	103°24.12 118°26.58	240°15.62 255°14.99	· · 22.13 23.11		35.03	346°22.32 1°24.85	· · 14.79 14.81	106°49.31 121°51.81	. 6.41	Gacrux	171°51.29	-57° 15.25
5	133° 29.05	255 14.99 270°14.36	24.09		35.31 35.59	1 24.65 16°27.38	14.83	136°54.32	6.42 6.42	Alioth	166°12.77	55°48.97
6	148° 31.51	285°13.73	\$15°25.06	259°33.88 S22°		31°29.91	N21°14.85	151° 56.82	S04°6.43	Spica	158°21.85	-11°17.70
7	163°33.97	300°13.10	26.04		36.16	46°32.44	14.86	166°59.32	6.44	Alkaid	152°51.88	49° 10.91
8	178° 36.44	315°12.47	27.02		36.44	61°34.97	14.88	182°1.83	6.45	Hadar	148°35.64 147°57.18	-60°29.70 -36°29.70
9	193°38.90	$330^{\circ}11.84$	• • 28.00	304°35.41 · ·	36.72	76°37.50	• • 14.90	197°4.33	• • 6.46	Arcturus	147 57.16 145°47.60	-30 29.70 19°2.85
10	208°41.37	$345^{\circ}11.21$	28.97	319°35.92	37.01	91°40.03	14.92	212°6.83	6.46	Rigil Kent.	139°40.01	-60° 56.41
11	223° 43.83	0° 10.57	29.95		37.29	106°42.56	14.94	227°9.34	6.47	Kochab	137°20.95	74°2.79
12	238°46.30	15°9.94	S15°30.92		37.57	121°45.09	N21°14.95	242°11.84	S04°6.48	Zuben'ubi	136°55.59	-16°8.88
13	253° 48.76	30°9.31	31.90		37.85	136°47.62	14.97	257°14.34	6.49	Alphecca	126°3.53	26°37.66
14	268°51.22	45°8.67 60°8.04	32.87 · · 33.84		38.13	151°50.15	14.99	272°16.85	6.49	Antares	112°15.36	-26°29.33
15 16	283°53.69 298°56.15	75°7.40	· · 33.84 34.81		38.41 38.69	166°52.69 181°55.22	· · 15.01 15.03	287°19.35 302°21.85	· · 6.50 6.51	Atria	107°9.51	-69°4.46
17	313°58.62	90°6.77	35.78		38.97	196°57.75	15.04	317°24.35	6.52	Sabik	102°2.32	-15°45.38
18	329°1.08		S15°36.75	79°39.97 <b>S</b> 22°		212°0.29	N21°15.06	332°26.86	S04°6.52	Shaula	96°9.81	-37°7.37
19	344°3.54	120°5.49	37.72		39.52	227°2.82	15.08	347° 29.36	6.53	Rasalhague	95°58.22	12°32.54
20	359°6.01	135°4.86	38.69		39.80	242°5.36	15.10	2°31.86	6.54	Eltanin Kaus Aust.	90°42.33 83°31.92	51°29.24 -34°22.38
21	14°8.47	$150^{\circ}4.22$	• • 39.66	124°41.49 · ·	40.08	257°7.89	•• 15.12	17°34.36	• • 6.54	Vega	80°33.09	38° 48.60
22	29°10.94	165°3.58	40.63		40.36	272°10.43	15.14	32°36.86	6.55	Nunki	75°47.17	-26° 15.90
23	44°13.40	180°2.94	41.59	154°42.50	40.63	287°12.96	15.15	47°39.36	6.56	Altair	61°59.47	8°56.30
Mer.	pass. 20:04	$\nu$ -0.6′ d1.	0′ m-3.91	$\nu$ 0.5' d0.3' m1	L.37	$\nu 2.5' \ d0.0$	0′ m-2.45	$\nu 2.5' \ d0.0$	0′ m0.86	Peacock	53°4.87	-56°39.30
										Deneb	49°25.50	45°22.61
<b>T</b> I.	CUA	CHA	D	CHA		CHA	D	CIIA	D	Enif	33°38.14	9°59.75
Thu 0	<b>GHA</b> 59° 15.87	GHA 105°2 30	<b>Dec</b> \$15°42.56	<b>GHA D</b> 169°43.00 <b>S</b> 22°	ec 40 01	<b>GHA</b> 302°15.50	<b>Dec</b> N21° 15.17	<b>GHA</b> 62°41.86	<b>Dec</b> \$04°6.56	Al Na'ir	27°32.01	-46°50.32
1	74° 18.33	210°1.66	43.53		41.18	302 15.50 317°18.03	15.17	77°44.37	6.57	Fomalhaut	15°13.65	-29°29.19
2	89°20.79	225°1.02	44.49		41.46	332°20.57	15.13	92°46.87	6.58	Scheat	13°44.43	28° 13.62
3	104°23.26	240°0.38	• • 45.46		41.74	347°23.11	15.23	107°49.37	• • 6.58	Markab	13°29.11	15°20.84
4	119°25.72	254°59.74	46.42		42.01	2°25.65	15.25	122°51.87	6.59	Nov 18 Tue	SHA	Mer.pass
5	134°28.19	269°59.10	47.38		42.28	17°28.18	15.27	137° 54.37	6.60		138°14.84	10:58
6	149°30.65		<b>S</b> 15°48.34	259°46.02 \$22°		32°30.72	N21°15.29	152° 56.87	S04°6.60	Mars	112°0.93	12:42
7	164°33.11	299°57.81	49.30		42.83	47°33.26	15.30	167°59.37	6.61	Jupiter	242°56.60	03:58
8	179°35.58	314°57.17	50.26		43.11	62°35.80	15.32	183°1.87	6.62	Saturn	3°24.04	19:54
9	194° 38.04	329°56.52	51.22		43.38	77°38.34	15.34	198°4.37	· · 6.62	Nov 19 Wed	SHA	Mer.pass
10	209° 40.51 224° 42.97	344°55.88 359°55.23	52.18 53.14		43.65 43.02	92°40.88 107°43.42	15.36 15.38	213°6.87 228°9.36	6.63	Venus	137°0.78	10:59
11 12	224 42.97 239° 45.44		53.14 \$15°54.10	334°48.53 349°49.04 <b>S</b> 22°	43.92 44.20	107°43.42 122°45.96	15.38 N21°15.40	228 9.36 243° 11.86	6.63 \$04°6.64	1	$111^{\circ}14.10$	12:42
13	254° 47.90	29°53.94	55.06		44.47	137°48.50	15.42	258° 14.36	6.64	Jupiter		03:54
14	269° 50.36	44°53.30	56.01		44.74	152°51.04	15.44	273°16.86	6.65	Saturn	3°25.07	19:50
15	284° 52.83	59° 52.65	56.97		45.01	167°53.58	• 15.46	288° 19.36	• • 6.66	Nov 20 Thu	SHA	Mer.pass
16	299°55.29	74°52.00	57.92		45.28	182°56.12	15.48	303°21.86	6.66		135°46.44	11:00
17	314°57.76	89°51.35	58.88	64°51.54	45.55	197°58.67	15.50	318°24.36	6.67		110°27.14	12:41
18	330°0.22		S15°59.83		45.82	213°1.21	N21°15.52	333° 26.85	S04°6.67		$242^{\circ}59.63$	03:50
19	345°2.68	119°50.06	16°0.78		46.09	228°3.75	15.54	348°29.35	6.68	Saturn	3°26.00	19:46
20	0°5.15	134°49.41	1.73		46.36	243°6.29	15.56	3°31.85	6.68	Horizor	ıtal parallax	
21	15°7.61 30°10.08	149°48.76 164°48.11	· · 2.69		46.62 46.89	258°8.84 273°11.38	· · 15.58	18°34.35 33°36.85	· · 6.69	11011201	Venus:	0.1
22 23	30 10.08 45°12.54	104 48.11 179°47.46	3.64 4.59		46.89 47.16	273 11.38 288°13.93	15.60 15.62	48° 39.34	6.69 6.70		Mars:	0.1
										L		
Mer.p	pass. 20:00	$\nu$ -0.6′ d1.	υ′ m-3.91	$ u 0.5' \ d0.3' \ m^{-1}$	1.37	$\nu$ 2.5′ d0.0	∪′ m-2.46	$\nu$ 2.5′ d0.0	J' m0.86			

h	Su		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°43.43	<b>S</b> 19°13.76	209°35.97	15.4'	<b>S</b> 15°12.68	12.2'	54.0'
1	198°43.30	14.36	224°10.32	15.3'	15°24.83	12.1'	54.0'
2	213°43.16 228°43.03	14.95 •• 15.55	238°44.63 253°18.88	15.3' 15.2'	15°36.92 15°48.94	12.0' 12.0'	54.0' 54.0'
4	243°42.90	16.14	267°53.09	15.2'	16°0.91	11.9'	54.0'
5	258°42.77	16.73	282°27.24	15.1'	$16^{\circ}12.81$	11.8'	54.0'
6	273°42.63	\$19°17.33	297°1.35	15.1'	\$16°24.64	11.8'	54.0'
7 8	288°42.50 303°42.37	17.92 18.51	311°35.40 326°9.40	15.0' 14.9'	16°36.41 16°48.11	11.7' 11.6'	54.0' 54.0'
9	318° 42.23	19.10	340°43.34	14.9'	16°59.74	11.6'	54.0'
10	333°42.10	19.69	355°17.23	14.8'	$17^{\circ}11.30$	11.5'	54.0'
11	348°41.96	20.28	9°51.07	14.8'	17°22.79 \$17°34.22	11.4'	54.0'
12 13	3°41.83 18°41.69	\$19°20.87 21.46	24°24.85 38°58.58	14.7' 14.7'	517°34.22 17°45.57	11.4' 11.3'	54.0' 54.0'
14	33°41.56	22.04	53°32.25	14.6'	17°56.85	11.2'	54.0'
15	48°41.42	• • 22.63	68°5.86	14.6'	18°8.06	11.1'	53.9'
16	63°41.28	23.22	82°39.41	14.5'	18°19.19	11.1'	53.9'
17 18	78°41.15 93°41.01	23.80 \$19°24.39	97°12.91 111°46.35	14.4' 14.4'	18°30.25 \$18°41.23	11.0' 10.9'	53.9' 53.9'
19	108°40.87	24.97	126°19.73	14.3'	18°52.14	10.8	53.9'
20	123°40.73	25.56	140°53.05	14.3'	19°2.97	10.8'	53.9'
21	138°40.60	• • 26.14	155°26.32	14.2'	19°13.72	10.7'	53.9'
22	153°40.46 168°40.32	26.72	169°59.52 184°32.66	14.1'	19°24.39 19°34.98	10.6'	53.9'
23		27.30	104 32.00	14.1'		10.5'	53.9'
	SD = 16.2'	d = 0.6'		SE	0 = 14.7'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°40.18	S19°27.89	199°5.74	14.0'	S19°45.49	10.4'	53.9'
1	198°40.04	28.47	213°38.76	14.0'	19°55.92	10.3'	53.9'
2	213°39.90	29.05	228°11.71	13.9'	20°6.27	10.3'	53.9'
3 4	228°39.76 243°39.62	· · 29.63 30.20	242°44.61 257°17.44	13.8' 13.8'	20°16.54 20°26.72	10.2' 10.1'	53.9' 53.9'
5	258°39.47	30.78	271°50.21	13.7'	20°26.72	10.1	53.9'
6	273°39.33	S19°31.36	286°22.92	13.6'	S20°46.82	9.9'	53.9'
7	288°39.19	31.94	300°55.56	13.6'	$20^{\circ}56.74$	9.8'	53.9'
8	303°39.05	32.52	315°28.14	13.5'	21°6.57	9.7'	53.9'
9	318°38.91 333°38.76	• • 33.09	330°0.66 344°33.11	13.5' 13.4'	21°16.32 21°25.98	9.7' 9.6'	53.9' 53.9'
10 11	333 38.76 348°38.62	33.67 34.24	359°5.50	13.4	21 25.98 21°35.54	9.6 9.5'	53.9'
12	3°38.47	S19°34.82	13°37.82	13.3'	S21°45.02	9.4'	53.9'
13	18°38.33	35.39	28°10.08	13.2'	21°54.40	9.3'	53.9'
14	33°38.19	35.96	42°42.27 57°14.40	13.1'	22°3.69 22°12.88	9.2'	53.9'
15 16	48°38.04 63°37.90	· · 36.53	57°14.40 71°46.47	13.1' 13.0'	22°12.88 22°21.98	9.1' 9.0'	53.9' 53.9'
17	78°37.75	37.68	86°18.47	12.9'	22°30.99	8.9'	53.9'
18	93°37.60	S19°38.25	100°50.40	12.9'	S22°39.90	8.8'	53.9'
19	108°37.46	38.82	115°22.27	12.8'	22°48.71	8.7'	53.9'
20	123°37.31 138°37.16	39.39 •• 39.96	129°54.08 144°25.82	12.7' 12.7'	22°57.42 23°6.04	8.6' 8.5'	53.9' 53.9'
21 22	158 37.16 153°37.02	40.52	144 25.82 158°57.50	12.7	23 0.04 23°14.55	8.4'	53.9'
23	168°36.87	41.09	173°29.11	12.5'	23°22.96	8.3'	53.9'
	SD = 16.2'	d = 0.6'		SE	0 = 14.7'		
Thu	GHA	Dec	GHA	ν 12. Γ'	Dec	d	HP
0 1	183°36.72 198°36.57	\$19°41.66 42.22	188°0.65 202°32.13	12.5' 12.4'	\$23°31.28 23°39.49	8.2' 8.1'	53.9' 53.8'
2	213°36.42	42.79	202 32.13 217°3.55	12.4'	23°47.59	8.0'	53.8'
3	228°36.27	• • 43.35	231°34.90	12.3'	23°55.59	7.9'	53.8'
4	243°36.12	43.92	246°6.19	12.2'	24°3.49	7.8'	53.8'
5 6	258°35.98 273°35.82	44.48 \$19°45.04	260°37.41 275°8.57	12.2' 12.1'	24°11.28 \$24°18.97	7.7' 7.6'	53.8' 53.9'
7	273°35.82 288°35.67	45.61	275°8.57 289°39.67	12.1	24°26.54	7.6° 7.5'	53.9'
8	303°35.52	46.17	304°10.70	12.0'	24°34.01	7.4	53.9'
9	318°35.37	• • 46.73	318°41.67	11.9'	24°41.37	7.2'	53.9'
10	333°35.22	47.29	333°12.58	11.8'	24°48.62	7.1'	53.9'
11 12	348°35.07 3°34.92	47.85 \$19°48.41	347°43.42 2°14.21	11.8' 11.7'	24°55.76 \$25°2.79	7.0' 6.9'	53.9' 53.9'
13	18°34.76	48.97	16°44.93	11.7'	25° 9.70	6.8	53.9'
14	33°34.61	49.53	31°15.59	11.6'	$25^{\circ}16.51$	6.7'	53.9'
15	48°34.46	• • 50.08	45°46.19	11.5'	25°23.19	6.6'	53.9'
16	63°34.30	50.64	60°16.73	11.5'	25°29.77	6.5'	53.9'
17 18	78°34.15 93°33.99	51.20 \$19°51.75	74°47.20 89°17.63	11.4' 11.4'	25°36.23 \$25°42.57	6.3' 6.2'	53.9' 53.9'
19	93 33.99 108°33.84	52.31	89 17.03 103°47.99	11.4	25°48.79	6.1	53.9'
20	123°33.68	52.86	118°18.29	11.2'	25°54.90	6.0'	53.9'
21	138°33.53	•• 53.41	132°48.54	11.2'	26°0.89	5.9'	53.9'
22 23	153°33.37 168°33.22	53.97 54.52	147°18.72 161°48.86	11.1' 11.1'	26°6.76 26°12.51	5.7'	53.9' 53.9'
23			101 48.80			5.6'	55.9
	SD = 16.2'	d = 0.6'		SE	0 = 14.7'		

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

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

		Sun		Moon			
Day	Eqn.o	Time	Mer.	Mer.	Pass.	Age	
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	28-0	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	5-0%	
18	14:54	14:47	11:45	10:19	22:41		
19	14:41	14:34	11:45	11:04	23:27		
20	14:27	14:20	11:46	11:51	-:-		

### November 21, 22, 23 UT (Fri., Sat., Sun.)

Fig.   CHA	h	Aries	Venus	Mars	Jupiter	Saturn		Stars	
1	Fri -	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA	Dec
1									
1							1 '		
1 1972-36	2	$90^{\circ}19.93$	224°45.50 7.43	199°56.03 47.96	333°21.56 15.68	93°46.83 6.71			
Section   Personal Content   P	3	$105^{\circ}22.40$	239°44.85 · · 8.38	214°56.53 · · 48.23	348°24.11 · · 15.70	108°49.33 · · 6.72			
0 1 10 20 20 20 20 20 20 20 20 20 20 20 20 20	4	120°24.86	254°44.19 9.32	229°57.03 48.49	3°26.65 15.72	123°51.83 6.72			
1 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1									
1									
Bellevi									
10   2007-986   344-4020   148   3207-001   508   974-194   15.94   2247-80   6.75   74   74   74   74   74   74   74									
1.1 22974211 3397900 15.99 339703 15.99 34 10874-09 1271-09 2471-77 0 1771-09 1271-09							Mirfak	308°26.74	49°57.28
12   267-44.58   147-384   516-16.07   307-10.0   527-50.0   128-70.0   128-70.0   267-14.0   507							Aldebaran	290°38.47	16°33.74
13 29°4" (10 29°329° 17.81 5°1.90 50 50 33°4" (10 20° 15.91 29°1.29° 6.76 16.76 16.70 16.									
14   2070   0.05   0.07   0.05   0.07   0.05   0.									
15   280°51.07   99°18.67   1   1   1   1   1   2   2   2   2   2							1		
18 330° 360 10 10° 320 90° 30° 32° 32° 32° 32° 32° 32° 32° 32° 32° 32	15	285°51.97	59°36.97 · · 19.68	35°2.49 · · 51.39	168°54.69 · · 15.95	289°19.27 · · 6.77	1		
19 306123	16	$300^{\circ}54.43$	74°36.31 20.62	50°2.99 51.65	183°57.24 15.97	304°21.77 6.77	1		
19	17	$315^{\circ}56.90$		65°3.48 51.91	198°59.79 15.99	319°24.26 6.77			
10   10   10   10   10   10   10   10									
1							1		
18							1		
23							,		
St							Avior	234°14.17	
Sat   CHA   CHA   ChC   CHA   Doc   CHA   Doc   CHA   Doc   CHA   Doc   CHA   Doc   CHA   Doc   CHA   ChC									
Sect   CHA	Mer. <sub>I</sub>	pass. 19:56	$\nu$ -0.7′ $d$ 0.9′ m-3.90	$ u 0.5' \ d0.3' \ m1.36$	$ u 2.5' \ d0.0' \ \text{m-}2.47$	$ u 2.5' \ d0.0' \ m0.87$			
Color				-					
0	Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec			
1 9°1961   20°30.35   20°20   185°74.3   53.98   310°20.21   185°74.3   53.98   310°20.21   16.16   79°44.21   6.80   46.70									
2 91°1907 32°2°2°08 299°5 200°7°93 55.24 334°2276 16.18 94°46.70 6.80 172°2977 6.3°14.30 18.10 190°9.20 6.80 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.81 18.10 190°9.20 6.82 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.92 18.10 190°9.20 6.10 190°9.20 6.92 18.10 190°9.20 18.10 190°9.20 6.92 18.10 190°9.20 18.10 190°9.2									
106									
18									-57°15.24
151   289   284   277   02   516   33.66   206   99   022   53.52   343   32.98   34.92   59   34.92   34.9							Alioth	166°12.74	55°48.95
Tele									
18									
9 196°36.32 329°250.1 · 36.44 305°11.37 · 56.03									
10 211°38.79 344°24.31 37.36 320°11.86 56.28 94°43.21 16.36 215°6.64 6.82 Rigil Kenit. 319°3.99 9°6.0°6.50 12 26°4.125 339°2.36° 38.29 335°12.38 56.54 109°45.77 16.38 220°1.31 6.83 24°4.31 16.38 220°5.0°1.31 6.83 24°4.31 16.38 24°4.31 16.38 24°4.31 16.38 16.39 130°5.31 16.39 130°5.31 16.30°5.31 1									
11 220° 41.25 389° 23.67 38.29 335° 12.36 5.654 109° 45.77 16.38 230° 9.13 6.83 172.20 95 5.44 120° 24.72 14° 23.00 16° 24° 23.30° 12.81 5.20° 24.20° 24.20° 24.20° 24.20° 25.20° 25.72 15° 256° 25.11 5° 250° 25.11 5° 20° 24.20° 24.20° 25° 24.20° 25° 25° 25° 25° 25° 25° 25° 25° 25° 25	10						l .		
12 241*43.72 14*23.00 516*39.21 55*012.84 522*56.79 124*43.2 \$245*11.65 26*0*6.83 14*271*48.64 44*21.66 41.05 27*3.3 5*14.3 5*13.3 5*74.3 139*50.88 16.43 26*0*14.11 6.83 26*0*14.11 6.83 15*26*0*3.2 5*26*37.65 15*26*0*2.11*2*2.10*2.3 42.89 5*0*2.13.2 5*7.29 134*53.44 16.45 27*5*16.6 6.83 Ahlares 112*15.35 26*0*32.2 15*3.5 3.6 6.84 10.5 20*0*1.12 16.52 32*0*2.40 7 6.84 107*9.9 6.96*4.45 11.0 16.52 35*0*0*1.0 16.52 30*0*2.10*0*0*0*0*1.0 16.52 32*0*2.40 7 6.84 1107*9.9 6.9 6.9 4.45 11.0 16.52 32*0*0*0*1.0 16.52 32*0*0*0*1.0 16.52 32*0*0*0*0*0*0*0*0*0*0*0*0*0*0*0*0*0*0*0	11	$226^{\circ}41.25$	359°23.67 38.29	335°12.35 56.54		230°9.13 6.83			
13 256°46.18 29°22.33 40.13 5°13.33 5°7.04 139°50.88 10.43 260°14.11 6.83 16.20°13.25 29°13.25 26°15.10 15°20.99 1.4197 35°14.31 57.55 169°50.00 16.47 290°19.09 6.83 16.50 16.50 15.50°10.55 7 47°20.32 42.89 50°14.80 57.80 184°55.56 16.50 30°12.18 6.50 30°12.18 6.50 1831°18.80 104°18.97 516°44.73 80°15.78 522°83.03 21°3.08 12°16.55 320°24.07 6.84 1831°18.80 104°18.97 516°44.73 80°15.78 522°83.03 21°3.08 12°16.55 330°20.05 6.84 19 347°0.97 119°18.30 45.64 99°16.27 58.55 520°6.24 10.56 350°20.05 6.84 19 347°0.97 119°18.30 45.64 99°16.27 58.55 520°6.24 10.56 350°20.05 6.84 19 347°0.97 119°18.30 45.64 99°16.27 58.55 520°6.24 10.56 350°20.05 6.84 19 340°16.95 47.47 12°17.25 59.05 220°13.6 16.61 20°34.03 6.84 19 9°42.34 134°17.63 46.56 110°16.76 58.80 245°8.80 16.59 5°35.15 4 6.84 19 9°42.34 134°17.63 46.56 110°16.76 58.80 245°8.80 16.59 5°35.15 4 6.84 19 9°42.34 134°17.63 46.56 110°16.76 58.80 245°8.80 16.59 5°35.15 4 6.84 19 9°42.34 134°1.28 12°1.33 34°4.22 12°3.25 1.28 12°3.2									
15 286°51.11 59°20.99 · 41.97 35°14.31 · 57.55 169°56.00 · 11.67 200°10.09 · 6.83 1ARTates II 11.5.3							1		
16 301°83.57 74°20.32 42.89 50°14.80 57.80 184°85.56 16.50 305°21.58 6.84 10′9.50 34.81 10′9.50 34.8							Antares	112°15.35	-26°29.32
17 316°56.04 89°19.65 43.81 65°15.29 58.05 200°1.12 16.52 320°24.07 6.84   18 331°385.50 104°18.97 516°4.473 80°15.75 822°58.30 215°5.68 8021°16.56 350°9.09 6.84   19 347°0.97 110°18.30 45.64 95°16.27 58.55 230°6.24 16.56 350°9.09 6.84   11 10°18.30 45.64 95°16.27 58.55 230°6.24 16.56 350°9.09 6.84   12 17°5.89 149°16.95 47.47 125°17.25 5.90.05 260°11.36 1.16.61 20°34.03 1.684   12 23 27°8.36 164°16.28 48.39 140°17.74 19.50 20°71.36 16.63 15°36.52 6.85   14 10°10.82 179°15.60 49.30 155°18.22 59.55 290°16.48 16.66 3 55°36.52 6.85   15 10°40.02 179°15.60 49.30 155°18.22 59.55 290°16.48 16.66 3 55°36.52 6.85   15 10°40.02 179°15.60 49.30 155°18.22 59.55 290°16.48 16.66 3 55°36.52 6.85   15 10°40.82 179°15.60 49.30 155°18.22 59.55 290°16.48 16.66 3 55°36.52 6.85   15 10°40.82 179°15.60 49.30 155°18.22 59.55 290°16.48 16.66 3 55°36.52 6.85   15 10°40.82 179°15.60 49.30 155°18.22 59.55 200°16.48 16.66 3 55°36.52 6.85   15 10°40.82 179°15.60 49.30 155°18.22 59.55 200°16.48 16.66 150°39.01 6.85   15 10°40.92 179°15.50 19.40 10.40							Atria		-69°4.45
18 331°8850 104°1897 516°44.73 80°15.78 522°5830 215°3.68 N21°16.54 335°26.55 504°6.84 19347°0.97 110°18.30 45.64 95°16.27 58.55 230°6.24 16.55 350°29.05 6.84 18.21 10°18.30 45.64 95°16.27 58.55 230°6.24 16.55 350°29.05 6.84 18.22 17°5.89 149°16.95 · 47.47 125°17.25 · 59.05 200°11.36 · 16.61 20°34.03 · 6.84 18.22 32°3.86 164°16.28 48.99 140°17.74 59.90 275°13.92 16.63 33°36.52 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 15°99.01 6.85 18.22 19°35.80 18.22 19°35.80 18.22 19°35.80 18.22 19°35.80 18.22							1		
19 347°0.97 119°18.30 45.64 95°16.27 58.55 230°6.24 16.56 350°29.05 6.84 20 22°3.43 134°17.63 46.55 110°16.76 58.80 245°8.00 16.59 5°31.54 6.84 48.20 17°5.89 149°16.95 · 47.47 125°17.25 · 59.05 260°11.36 · 16.61 20°34.03 · 6.84 22°37.83 164°16.28 48.39 140°17.74 59.30 275°13.92 16.63 35°36.52 6.85 Nunki 75°47.17 26°15.90 16.85 164°10.82 179°15.60 49.30 155°18.82 95.95 290°16.48 16.66 50°39.01 6.85 Nunki 75°47.17 26°15.90 16.85 164°10.82 179°15.60 49.30 155°18.22 95.95 290°16.48 16.66 50°39.01 6.85 Nunki 75°47.17 26°15.90 16.85 164°10.82 179°15.60 49.30 155°18.22 95.95 290°16.48 16.66 50°39.01 6.85 Nunki 75°47.17 26°15.90 16.85 164°10.82 179°15.60 49.30 155°18.22 95.95 290°16.48 16.66 16.30 35°36.52 6.85 Nunki 75°47.17 26°15.90 16.85 165°0.22 Nunki 75°47.17 26°15.90 16.85 16°0.22 Nunki 75°47.17 26°15.90							1		
20 2°3.43 134°1763 46.56 110°16.76 58.80 245°8.80 16.59 5°31.54 6.84 20°3.40.3 6.84 20°3.40.4 6.85 20°3.4 8.8 20°3.4 8.8 20°3.4							_		
21   17° 5.89   149° 16.95   · · · · · · · · · · · · · · · · · ·	20								
22 32°8.36 164°16.28 48.39 140°17.74 59.30 275°13.92 16.63 35°36.52 6.85  Mer.pass. 19:52 \(\nu-0.7'\) d0.9'\) m-3.90 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.0'\) m-2.47 \(\nu-0.5'\) d0.0'\) m0.87 \(\nu-0.5'\) d0.0'\) m0.87 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.0'\) m-2.47 \(\nu-0.5'\) d0.0'\) m0.87 \(\nu-0.5'\) d0.0'\) m0.87 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.0'\) m-2.47 \(\nu-0.5'\) d0.0'\) m0.87 \(\nu-0.5'\) d0.0'\) m0.87 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.3'\) m1.36 \(\nu-0.5'\) d0.0'\) m-2.47 \(\nu-0.5'\) d0.0'\\ m0.87 \(\nu-0.5'\) d0.0'\\ m0.87 \(\nu-0.5'\) d0.3'\\ m1.36 \(\nu-0.5'\) d0.3'\\ m1.36 \(\nu-0.5'\) d0.3'\\ m1.36 \(\nu-0.5'\) d0.0'\\ m-2.47 \(\nu-0.5'\) d0.0'\\ m0.87 \(\nu-	21	17°5.89	149°16.95 · · 47.47	125°17.25 · · 59.05	260°11.36 · · 16.61	20°34.03 · · 6.84			
Mer.pass. 19:52   V-0.7' d0.9' m-3.90   V_0.5' d0.3' m1.36   V_2.6' d0.0' m-2.47   V_2.5' d0.0' m0.87   Peacock   S_3°.4.88   -56°39.31   S_2°2.51   S_3°2.51   S_2°2.51   S_3°3.81   S_3°2.57   S_2°3.81   S_3°3.81   S_3	22								
Mer.pass. 19:52   ν-0.7' d0.9' m-3.90   ν-0.5' d0.3' m1.36   ν-2.6' d0.0' m-2.47   ν-2.5' d0.0' m0.87   Peacok   53°.4.88   -56°.93 a.0   Denb   49°.25.51   45°.22.61   Sun   GHA   Dec   GHA   De	23	47° 10.82	179°15.60 49.30	155°18.22 59.55	290°16.48 16.66	$50^{\circ}39.01$ 6.85			
Sun   GHA   GHA   Dec   GHA   GHA   Dec   GHA	Mer.ı	pass. 19:52	$\nu$ -0.7' $d0.9'$ m-3.90	$\nu 0.5' \ d0.3' \ m1.36$	$\nu$ 2.6' d0.0' m-2.47	$\nu 2.5' \ d0.0' \ m0.87$	1		
Sun   GHA   GHA   Dec   GHA							Deneb	$49^{\circ}25.51$	45°22.61
0 62°13.29 194°14.92 \$16°50.22 170°18.71 \$22°59.80 305°19.05 N21°16.68 65°41.50 \$04°6.85 177°15.75 209°14.25 51.13 185°19.20 23°0.05 320°2.1.61 16.70 80°43.99 6.85 229°2.19	c	CHV	CHV D	CUA D	CHV D	CUA De-	1		
1 77°15.75 209°14.25 51.13 185°19.20 23°0.05 320°21.61 16.70 80°43.99 6.85 29°18.21 224°13.57 52.04 200°19.69 0.29 335°24.17 16.73 95°46.48 6.85 310°20.68 239°12.89 · 52.95 215°20.17 · 0.54 350°26.74 · 16.75 110°48.96 · 6.85 413°24.44 28°13.62 4122°1 53.86 230°20.66 0.79 5°29.30 16.77 125°51.45 6.85 51.37°25.61 269°11.53 54.77 245°21.15 1.03 20°31.86 16.80 140°53.94 6.85 51.52°28.07 284°10.85 516°55.68 260°21.63 523°1.28 35°34.43 N21°16.82 155°56.43 504°8.85 51.20°2.80 284°10.85 516°55.68 260°21.63 523°1.28 35°34.43 N21°16.82 155°56.43 504°8.85 51.20°2.80 280°1.17 56.59 275°22.12 1.53 50°36.99 16.84 170°58.92 6.85 51.20°3.89 6.86 182°33.00 314°9.49 57.49 290°22.61 1.77 65°39.56 16.87 186°1.40 6.85 510°2.80 20							1		
2 92°18.21 224°13.57 52.04 200°19.69 0.29 335°24.17 16.73 95°46.48 6.85									_
3 107°20.68 239°12.89 · 52.95 215°20.17 · 0.54 350°26.74 · 16.75 110°48.96 · 6.85 4 122°23.14 254°12.21 53.86 230°20.66 0.79 5°29.30 16.77 125°51.45 6.85 400 21 1.01 20°3.86 16.80 140°53.94 6.85 137°25.61 269°11.53 54.77 245°21.15 1.03 20°31.86 16.80 140°53.94 6.85 48182°33.00 314°9.49 57.49 290°22.61 1.77 65°39.56 16.87 186°1.40 6.85 48182°33.00 314°9.49 57.49 290°22.61 1.77 65°39.56 16.87 186°1.40 6.85 40 320°3.88 1 0.58.40 305°23.99 · 2.02 80°4.69 16.91 216°6.38 6.86 40 212°37.93 344°8.13 16°59.31 320°23.58 2.26 95°44.69 16.91 216°6.38 6.86 40 212°37.93 344°8.13 16°59.31 320°23.58 2.26 95°44.69 16.91 216°6.38 6.86 40 220°24.286 14°6.77 517°1.11 350°24.55 523°2.75 125°49.82 N21°16.96 246°11.35 504°6.86 40 2.92 20°25.52 3.24 155°54.96 17.01 276°16.33 6.86 40 300°52.71 74°4.03 4.72 50°26.49 3.72 186°0.09 17.06 306°21.30 6.86 53turn 3°27.57 19:38 19 348°0.11 119°1.98 7.42 50°26.49 3.72 186°0.09 17.06 306°21.30 6.86 321°23.78 6.86 40 32°57.64 104°2.66 517°6.52 80°27.94 4.45 231°7.80 17.11 336°26.27 504°6.86 21 18°5.03 149°0.60 • 9.21 125°28.90 • 4.93 261°12.94 • 17.11 336°26.27 504°6.86 22 33°7.50 163°59.91 10.11 140°29.39 5.17 276°15.51 17.20 36°36.21 6.86 40 48°5.94 10.11 180°5.92.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.94 48°9.96 178°5.92.31 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.94 48°9.96 178°5.92.31 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86 40 48°5.92							1		
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16       302°52.71       74°4.03       4.72       50°26.49       3.72       186°0.09       17.06       306°21.30       6.86       Venus       132°1.64       11:04         17       317°55.18       89°3.35       5.62       65°26.97       3.96       201°2.66       17.08       321°23.78       6.86       Mars       108°5.42       12:38         18       332°57.64       104°2.66       \$17°6.52       80°27.45       \$23°4.21       216°5.23       \$N21°17.11       336°26.27       \$504°6.86       Saturn       3°28.21       12:38         19       348°0.11       119°1.98       7.42       95°27.94       4.45       231°7.80       17.13       351°28.76       6.86       Saturn       3°28.21       19:34         20       3°2.57       134°1.29       8.32       110°28.42       4.69       246°10.37       17.16       6°31.24       6.86       Saturn       3°28.21       19:34         21       18°5.03       149°0.60       • 9.21       125°28.90       • 4.93       261°12.94       • 17.18       21°33.73       • 6.86       Horizontal parallax         22       33°7.50       163°59.91       10.11       140°29.39       5.17       276°15.51       17.20       36°36.21							Saturn	J 21.31	19:30
17       317°55.18       89°3.35       5.62       65°26.97       3.96       201°2.66       17.08       321°23.78       6.86       Mars       108°5.42       12:38         18       332°57.64       104°2.66       \$17°6.52       80°27.45       \$23°4.21       216°5.23       \$N21°17.11       336°26.27       \$504°6.86       \$Jupiter       243°5.76       03:38         19       348°0.11       119°1.98       7.42       95°27.94       4.45       231°7.80       17.13       351°28.76       6.86       86       Saturn       3°28.21       19:34         20       3°2.57       134°1.29       8.32       110°28.42       4.69       246°10.37       17.16       6°31.24       6.86       86       Saturn       3°28.21       19:34         21       18°5.03       149°0.60       • 9.21       125°28.90       • 4.93       261°12.94       • 17.18       21°33.73       • 6.86       Horizontal parallax         22       33°7.50       163°59.91       10.11       140°29.39       5.17       276°15.51       17.20       36°36.21       6.86       Mars       Venus:       0.1         23       48°9.96       178°59.23       11.00       155°29.87       5.41       291°18.08 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
18 332°57.64 104°2.66 \$17°6.52 80°27.45 \$23°4.21 216°5.23 N21°17.11 336°26.27 \$04°6.86   19 348°0.11 119°1.98 7.42 95°27.94 4.45 231°7.80 17.13 351°28.76 6.86   20 3°2.57 134°1.29 8.32 110°28.42 4.69 246°10.37 17.16 6°31.24 6.86   21 18°5.03 149°0.60 · 9.21 125°28.90 · 4.93 261°12.94 · 17.18 21°33.73 · 6.86   22 33°7.50 163°59.91 10.11 140°29.39 5.17 276°15.51 17.20 36°36.21 6.86   23 48°9.96 178°59.23 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86    Mars: 0.1							1		
19 348°0.11 119°1.98 7.42 95°27.94 4.45 231°7.80 17.13 351°28.76 6.86 20 3°2.57 134°1.29 8.32 110°28.42 4.69 246°10.37 17.16 6°31.24 6.86 21 18°5.03 149°0.60 · 9.21 125°28.90 · 4.93 261°12.94 · 17.18 21°33.73 · 6.86 22 33°7.50 163°59.91 10.11 140°29.39 5.17 276°15.51 17.20 36°36.21 6.86 23 48°9.96 178°59.23 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86    Saturn 3°28.21 19:34     Horizontal parallax     Venus: 0.1     Mars: 0.1									
20 3°2.57 134°1.29 8.32 110°28.42 4.69 246°10.37 17.16 6°31.24 6.86 21 18°5.03 149°0.60 · · 9.21 125°28.90 · · 4.93 261°12.94 · · 17.18 21°33.73 · · 6.86 22 33°7.50 163°59.91 10.11 140°29.39 5.17 276°15.51 17.20 36°36.21 6.86 23 48°9.96 178°59.23 11.00 155°29.87 5.41 291°18.08 17.23 51°38.70 6.86    Horizontal parallax   Venus: 0.1   Mars: 0.1									
21       18°5.03       149°0.60       · · 9.21       125°28.90       · · 4.93       261°12.94       · · 17.18       21°33.73       · · 6.86       Horizontal parallax         22       33°7.50       163°59.91       10.11       140°29.39       5.17       276°15.51       17.20       36°36.21       6.86       Venus:       0.1         23       48°9.96       178°59.23       11.00       155°29.87       5.41       291°18.08       17.23       51°38.70       6.86       Mars:       0.1							Saturn	J 20.21	19:34
22       33°7.50       163°59.91       10.11       140°29.39       5.17       276°15.51       17.20       36°36.21       6.86       Venus: 0.1         23       48°9.96       178°59.23       11.00       155°29.87       5.41       291°18.08       17.23       51°38.70       6.86       Mars: 0.1							Horizont	al parallax	
25 10 3.35 110 33.25 11.00 133 23.01 3.11 231 10.00 11.25 31 30.10 3.00		33°7.50			276°15.51 17.20				
Mer.pass. 19:48 $\nu$ -0.7' $d$ 0.9' m-3.90 $\nu$ 0.5' $d$ 0.2' m1.35 $\nu$ 2.6' $d$ 0.0' m-2.48 $\nu$ 2.5' $d$ 0.0' m0.88	23	48°9.96	178°59.23 11.00	155°29.87 5.41	291°18.08 17.23	51°38.70 6.86		Mars:	0.1
	Mer.ı	pass. 19:48	$\nu$ -0.7' $d0.9'$ m-3.90	ν0.5' d0.2' m1.35	$\nu 2.6' \ d0.0' \ \text{m-}2.48$	$\nu 2.5' \ d0.0' \ m0.88$			

h	Su		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.06	S19°55.07	176°18.93	11.0'	S26°18.13	5.5'	53.9'
1	198°32.90 213°32.75	55.62 56.17	190°48.96 205°18.92	11.0' 10.9'	26°23.64 26°29.03	5.4' 5.3'	53.9'
2	213 32.75 228° 32.59	56.72	205 16.92 219°48.84	10.9	26°34.29	5.1'	53.9' 53.9'
4	243°32.43	57.27	234°18.70	10.8'	26°39.43	5.0'	53.9'
5	258° 32.27	57.82	248°48.51	10.8'	26°44.44	4.9'	53.9'
6 7	273°32.11 288°31.95	\$19°58.37 58.92	263°18.27 277°47.97	10.7' 10.7'	\$26°49.33 26°54.10	4.8' 4.6'	53.9' 53.9'
8	303°31.80	19°59.46	292°17.63	10.7	26°58.74	4.5	53.9
9	318° 31.64	20°0.01	306°47.24	10.6'	27°3.25	4.4'	53.9'
10	333°31.48	0.55	321°16.80	10.5'	27°7.63	4.3'	53.9'
11 12	348°31.32 3°31.15	1.10 \$20°1.64	335°46.32 350°15.79	10.5' 10.4'	27°11.89 \$27°16.02	4.1' 4.0'	53.9' 53.9'
13	18° 30.99	2.19	4°45.21	10.4	27°20.02	3.9'	53.9'
14	33°30.83	2.73	19°14.59	10.3'	27°23.89	3.7'	53.9'
15	48°30.67	• • 3.27	33°43.92 48°13.22	10.3'	27°27.63	3.6'	53.9'
16 17	63°30.51 78°30.35	3.81 4.35	48 13.22 62°42.47	10.3' 10.2'	27°31.24 27°34.72	3.5' 3.3'	54.0' 54.0'
18	93°30.18	S20°4.89	77°11.69	10.2'	S27°38.07	3.2'	54.0'
19	108° 30.02	5.43	91°40.86	10.1'	27°41.28	3.1'	54.0'
20 21	123°29.86 138°29.69	5.97 •• 6.51	106°10.00 120°39.10	10.1' 10.1'	27°44.36 27°47.31	2.9' 2.8'	54.0' 54.0'
22	158 29.69 153°29.53	7.05	120 39.10 135°8.16	10.1	27 47.31 27°50.12	2.8 2.7'	54.0'
23	168° 29.36	7.59	149°37.19	10.0'	27°52.81	2.5'	54.0'
	SD = 16.2'	d = 0.6'		SD	0 = 14.7'		
Sat	GHA	Dec	GHA	ν 10.0'	Dec	d 2.4'	HP
0 1	183°29.20 198°29.03	\$20°8.12 8.66	164°6.18 178°35.15	10.0' 9.9'	\$27°55.35 27°57.76	2.4' 2.3'	54.0' 54.0'
2	213°28.87	9.19	193° 4.08	9.9'	28°0.04	2.1'	54.0'
3	228°28.70	• • 9.73	207°32.98	9.9'	28°2.18	2.0'	54.0'
4	243°28.54 258°28.37	10.26	222°1.86 236°30.70	9.8'	28°4.19 28°6.05	1.9'	54.0'
5 6	258° 28.37 273° 28.20	10.80 \$20°11.33	250°59.52	9.8' 9.8'	28° 0.05 \$28° 7.78	1.7' 1.6'	54.0' 54.0'
7	288° 28.04	11.86	265°28.32	9.8'	28°9.38	1.5'	54.1'
8	303°27.87	12.39	279°57.09	9.7'	28°10.84	1.3'	54.1'
9	318° 27.70	• • 12.92	294°25.84	9.7'	28°12.16 28°13.34	1.2'	54.1'
10 11	333°27.53 348°27.36	13.45 13.98	308°54.57 323°23.27	9.7' 9.7'	28°13.34 28°14.38	1.0' 0.9'	54.1' 54.1'
12	3°27.19	S20°14.51	337°51.96	9.7'	\$28°15.28	0.8'	54.1'
13	18°27.03	15.04	352°20.63	9.7'	28°16.05	0.6'	54.1'
14 15	33°26.86 48°26.69	15.57 •• 16.09	6°49.29 21°17.93	9.6' 9.6'	28°16.68 28°17.17	0.5' 0.3'	54.1' 54.1'
16	63° 26.52	16.62	35°46.55	9.6'	28°17.51	0.3	54.1
17	78°26.34	17.14	$50^{\circ}15.16$	9.6'	$28^{\circ}17.72$	0.1'	54.1'
18	93°26.17	S20°17.67	64°43.77	9.6'	\$28°17.79	-0.1'	54.2'
19 20	108° 26.00 123° 25.83	18.19 18.72	79°12.36 93°40.94	9.6' 9.6'	28°17.72 28°17.52	-0.2' -0.3'	54.2' 54.2'
21	138° 25.66	19.24	108° 9.52	9.6'	28°17.17	-0.5'	54.2'
22	153°25.49	19.76	122°38.09	9.6'	$28^{\circ}16.68$	-0.6'	54.2'
23	168°25.31	20.28	137° 6.66	9.6'	28°16.05	-0.8'	54.2'
	SD = 16.2'	d = 0.5'		SD	= 14.7'		
Sun	GHA	Dec	GHA	ν	Dec	d	HP
Sun 0	183°25.14	S20°20.80	151°35.22	ν 9.6'	S28°15.28	a -0.9'	<b>пР</b> 54.2'
1	198°24.97	21.33	166°3.78	9.6'	$28^{\circ}14.37$	-1.0'	54.2'
2	213°24.79 228°24.62	21.84	180°32.34	9.6'	28°13.32	-1.2' -1.3'	54.2'
3	228°24.62 243°24.45	· · 22.36 22.88	195°0.90 209°29.47	9.6' 9.6'	28°12.13 28°10.80	-1.3' -1.5'	54.2' 54.3'
5	258° 24.27	23.40	223°58.03	9.6'	$28^{\circ}9.33$	-1.6'	54.3'
6	273°24.10	S20°23.92	238°26.60	9.6'	\$28°7.72	-1.7'	54.3'
7 8	288°23.92 303°23.75	24.43 24.95	252°55.18 267°23.76	9.6' 9.6'	28°5.97 28°4.08	-1.9' -2.0'	54.3' 54.3'
9	318° 23.75	24.95	207 23.76 281°52.35	9.6' 9.6'	28 4.08 28°2.05	-2.0 -2.2'	54.3'
10	333°23.39	25.98	296°20.95	9.6'	$27^{\circ}59.88$	-2.3'	54.3'
11	348°23.22	26.49	310°49.56	9.6'	27°57.57	-2.4'	54.3'
12 13	3°23.04 18°22.86	\$20°27.01 27.52	325°18.18 339°46.82	9.6' 9.6'	\$27°55.13 27°52.54	-2.6' -2.7'	54.4' 54.4'
14	33°22.68	28.03	354°15.47	9.0 9.7'	27°49.81	-2.1' -2.9'	54.4'
15	48°22.51	• • 28.54	8°44.13	9.7'	$27^{\circ}46.95$	-3.0'	54.4'
16	63°22.33 78°22.15	29.05	23°12.82	9.7'	27°43.95	-3.1'	54.4'
17 18	78°22.15 93°21.97	29.56 \$20°30.07	37°41.52 52°10.23	9.7' 9.7'	27°40.81 \$27°37.53	-3.3' -3.4'	54.4' 54.4'
19	108°21.79	30.58	66°38.97	9.8'	27°34.11	-3.4 -3.6'	54.5
20	123°21.61	31.09	81°7.73	9.8'	27°30.55	-3.7'	54.5'
21 22	138°21.43 153°21.25	· · 31.59 32.10	95°36.51 110°5.32	9.8' 9.8'	27°26.86 27°23.03	-3.8' -4.0'	54.5' 54.5'
22	153°21.25 168°21.07	32.10 32.61	110°5.32 124°34.14	9.8° 9.9'	27° 23.03 27° 19.07	-4.0 -4.1'	54.5'
_	SD = 16.2'	d = 0.5'			0 = 14.8'		
	<u> </u>	<u>u = 0.5</u>		JD	_ 17.0		

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

Lat.	Fri				Moonset	
		Sat	Sun	Fri	Sat	Sun
N 72°						
N 70°						
68°						
66°						
64°						
62°	11:44		14:04	13:31		14:47
60°	10:50	12:05	12:48	14:26	14:57	16:03
N 58°	10:17	11:26	12:13	14:59	15:37	16:38
56°	09:53	10:59	11:47	15:23	16:04	17:04
54°	09:34	10:37	11:26	15:42	16:26	17:24
52°	09:18	10:20	11:09	15:59	16:43	17:41
50°	09:04	10:04	10:54	16:13	16:58	17:56
45°	08:35	09:34	10:25	16:42	17:29	18:25
N 40°	08:13	09:10	10:01	17:05	17:53	18:48
35°	07:55	08:51	09:42	17:24	18:12	19:07
30°	07:39	08:34	09:25	17:40	18:29	19:24
20°	07:12	08:06	08:58	18:07	18:57	19:51
N 10° 0°	06:49	07:42	08:34	18:31	19:22	20:14
	06:28	07:19	08:11	18:53	19:44	20:36
<b>S</b> 10°	06:07	06:57	07:49	19:15	20:07	20:58
20°	05:44	06:33	07:25	19:38	20:31	21:21
30° 35°	05:18	06:05	06:57	20:06	20:59	21:48
40°	05:03 04:45	05:48 05:29	06:40 06:21	20:22 20:41	21:16 21:35	22:04 22:23
45°	04:45	05:29	05:58	20:41	21:55	22:25
· 1				-		-
<b>S</b> 50°	03:56	04:36	05:27	21:34	22:29	23:13
52° 54°	03:43 03:28	04:21 04:04	05:13 04:55	21:48 22:05	22:44 23:02	23:27 23:43
54 56°	03:28	04:04	04:55	22:05	23:02	23:43
58°	03:11	03:44	04:34	22:20	23:23	
<b>S</b> 60°	02:49	03:10	04.00	23:26	23.49	00:27

		Sun		Moon			
Day		f Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	1-3	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-7%	
21	14:12	14:05	11:46	12:40	00:15		
22	13:57	13:49	11:46	13:32	01:06		
23	13:41	13:32	11:46	14:24	01:58		

#### November 24, 25, 26 UT (Mon., Tue., Wed.)

	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1	Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				170°30.35 \$23°5.65	306°20.65 N21°17.25	66°41.18 <b>S</b> 04°6.85	
1							l ·
1   1974   1975   19							
S 182 2475 269 509 1.6 30 27 270 269 2130 529 707 28 300 127 130 147 536 0 636							
Section   Control   Cont							
19   19   19   19   19   19   19   19				260°33.24 \$23°7.07			l .
10 213730 3476162 2200 32076157 800 91 91 91 91 91 91 91 91 91 91 91 91 91							
10   223   376   345   1.62   20   20   20   20   325   31   56   825   31   17.50   227   70.0   6.84   227   2							
11 22879.05 38676.08 2 168 38786.66 328 50 11 1978 50 1715 30 2072.00 6.84 172 50 175							
13 2374-44 0							
Beliatrix   1.5							
15   288*   29.0   29.0   29.1   23							
Aller							
19   3479-02   10   3479-02   10   3479-02   10   3479-02   10   3479-02   11							
18   18   18   18   18   18   18   18							
20							Sirius 258°25.33 -16°44.96
19"   19"							
23							
Mer. pass. 194	22	34°6.64			277°17.30 17.81		l .
Mispacetide   V-0.77 d0.97 m-3.90	23	49°9.10	178° 42.55 32.25	155°41.39 11.04	292°19.87 17.84	52°38.29 6.82	
GHA	Mer.p	pass. 19:44	$\nu$ -0.7′ $d$ 0.9′ $m$ -3.90	$ u 0.5' \ d0.2' \ m1.34$	$\nu 2.6' \ d0.0' \ \text{m-}2.49$	$\nu 2.5' \ d$ -0.0' m0.88	l .
The GHA Dec GH							· ·
0 64*11.77 90f-0.82   Chembols   182*24.5   147.55.60   17.99   147.51   182*24.5   147.55.60   17.99   147.51   182*24.5   147.55.60   14	Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	1
1 79-14-03 0 283-41.5 34.00 185-42.3 11.50 322-25.03 17.89 62-43.5 6.82 6.82 6.82 6.83 17.63 1.75-43.3 1.7	0	$64^{\circ}11.57$		170°41.87 <b>S</b> 23°11.27		67°40.77 <b>S</b> 04°6.82	
3 1991 1850 223 40.74 35.74 21943.3 11.72 337.27.61 17.92 97.94.73 6.81 Acris 172°59.72 6.82°14.29 11.72 37.74 11.							
14 124*21.42 23*3*30.04 36.61 230*4.377 12.18 7*32.78 17.97 127*50.69 6.81 130*1.40*1.40*1.40*1.40*1.40*1.40*1.40*1.4							Acrux 172°59.72 -63°14.29
5 139°2389 268°3834 37.49 245°4425 12.41 22°38.36 17.99 142°58.01 157°55.65 804°6.80							l .
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Mer.pass. 19:40   \( \bullet \) -0.7' \( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			163°26.29 52.17			38°35.30 6.75	
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Wed         GHA         CHA         Dec         GHA         Mer.pass           1         86°13.17         208°24.15         54.73         185°53.73         16.88         323°27.05         18.53         83°42.73         6.73         56.76         6.76         20°29.19         56.76         717.01         338°29.64         18.66         98°45.21         6.73         6.72         56.44         125°50.56         253°22.01         57.29         230°55.15         17.73         38°40.00         18.61         18.65°50.16         6.72         6.72         6.155°25.49         288°19.26         17.75         23°37.41         18.65         18.87°50.63         6.72         18.61         43°52.63         6.72         18.61         43°52.63         6.72         18.62         18.62         18.70         173°57.58         6.71         18.62         18.77°75.85 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
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12 245 40.28 13 16.26 S18 4.07 350 58.91 S23 19.27 128 55.55 N21 18.84 249 9.96 S04 0.68 13 260 42.74 28 15.54 4.92 5 5 59.38 19.48 143 58.14 18.87 264 12.43 6.68 14 275 45.21 43 14.82 5.76 20 5 59.85 19.69 159 0.73 18.90 279 14.91 6.67 15 290 47.67 58 14.10 6.60 36 0.32 19.91 174 3.33 18.93 294 17.38 6.67 16 305 50.13 73 13.38 7.45 51 0.79 20.12 189 5.92 18.96 309 19.86 6.66 17 320 52.60 88 12.65 8.29 66 1.25 20.34 204 8.52 18.98 324 22.33 6.65 19 350 57.53 118 11.21 9.97 96 2.19 20.76 234 13.70 19.04 354 27.28 6.64 21 21 22.45 148 9.76 11.64 126 3.13 21.18 264 18.89 19.10 24 32.22 6.63 24 32.22 6.63 23 51 7.38 178 8.31 13.31 156 4.06 21.61 294 24.09 19.16 54 37.17 6.62 31 Mars: 0.1	11			335°58.44 19.05	113°52.96 18.81		I .
13 200 42.74 28 15.54 4.92 5 59.38 19.48 143 58.14 18.87 204 12.43 0.08 14.92 5 59.85 19.69 159°0.73 18.90 279°14.91 6.67 15 290°47.67 58°14.10 · · · · · · · · · · · · · · · · · · ·							
15 290°47.67 58°14.10 · · · 6.60 36°0.32 · · · 19.91 174°3.33 · · · 18.93 294°17.38 · · · 6.67 16 305°50.13 73°13.38 7.45 51°0.79 20.12 189°5.92 18.96 309°19.86 6.66 128°14.16 11:07 17 320°52.60 88°12.65 8.29 66°1.25 20.34 204°8.52 18.98 324°22.33 6.65 18 335°55.06 103°11.93 \$18°9.13 81°1.72 \$23°20.55 219°11.11 N21°19.01 339°24.80 \$04°6.65 19 350°57.53 118°11.21 9.97 96°2.19 20.76 234°13.70 19.04 354°27.28 6.64 21 21°2.45 148°9.76 · · 11.64 126°3.13 · · 21.18 264°18.89 · · 19.10 24°32.22 · · 6.63 23 6°4.92 163°9.03 12.48 141°3.59 21.39 279°21.49 19.13 39°34.70 6.63 23 6°4.92 163°9.03 12.48 141°3.59 21.39 279°21.49 19.13 39°34.70 6.63 178°8.31 13.31 156°4.06 21.61 294°24.09 19.16 54°37.17 6.62 Nov 26 Wed SHA Mer.pass Venus 128°14.16 11:07 11:07 11:07 128°14.16 11:07 11:07 128°14.16 128°14.16 11:07 128°14.16 11:07 128°14.16 128°14.16 128°14.16 128°14.16 128°14.16 128°							
16 305°50.13 73°13.38 7.45 51°0.79 20.12 189°5.92 18.96 309°19.86 6.66 1.25°14.16 11:07 17 320°52.60 88°12.65 8.29 66°1.25 20.34 204°8.52 18.98 324°22.33 6.65 18 335°55.06 103°11.93 \$18°9.13 81°1.72 \$23°20.55 219°11.11 N21°19.01 339°24.80 \$04°6.65 19 350°57.53 118°11.21 9.97 96°2.19 20.76 234°13.70 19.04 354°27.28 6.64 20 5°59.99 133°10.48 10.80 111°2.66 20.97 249°16.30 19.07 9°29.75 6.64 21 21°2.45 148°9.76 · 11.64 126°3.13 · 21.18 264°18.89 · 19.10 24°32.22 · 6.63 22 36°4.92 163°9.03 12.48 141°3.59 21.39 279°21.49 19.13 39°34.70 6.63 23 51°7.38 178°8.31 13.31 156°4.06 21.61 294°24.09 19.16 54°37.17 6.62  Nenus 128°14.16 11:07 11:07 12:06 13:09°19.86 6.66 14:09°19.86 6.66 15:09°19.86 6.66 16.66 16.66 16.66 16.66 16.66 16.66 16.66 16.66 16.66 18.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.86 6.66 19.89°19.80 6.66 19.89°19.80 6.66 19.89°19.80 6.66 19.89°19.80 6.66 19.80°10.80 6.66 19.80°10.80 6.66 19.80°10.80 6.66 19.80°10.80 6.66 1							Nov 26 Wed SHA Mer.nass
18 335°55.06 103°11.93 \$18°9.13 81°1.72 \$23°20.55 219°11.11 N21°19.01 339°24.80 \$04°6.65   19 350°57.53 118°11.21 9.97 96°2.19 20.76 234°13.70 19.04 354°27.28 6.64   20 5°59.99 133°10.48 10.80 111°2.66 20.97 249°16.30 19.07 9°29.75 6.64   21 21°2.45 148°9.76 · 11.64 126°3.13 · 21.18 264°18.89 · 19.10 24°32.22 · 6.63   22 36°4.92 163°9.03 12.48 141°3.59 21.39 279°21.49 19.13 39°34.70 6.63   23 51°7.38 178°8.31 13.31 156°4.06 21.61 294°24.09 19.16 54°37.17 6.62    Jupiter 243°13.76 03:26   Saturn 3°29.55 19:22    Horizontal parallax   Venus: 0.1   Mars: 0.1	16	$305^{\circ}50.13$	73°13.38 7.45	51°0.79 20.12	189°5.92 18.96	309°19.86 6.66	Venus 128°14.16 11:07
19 350°57.53 118°11.21 9.97 96°2.19 20.76 234°13.70 19.04 354°27.28 6.64 20 5°59.99 133°10.48 10.80 111°2.66 20.97 249°16.30 19.07 9°29.75 6.64 21 21°2.45 148°9.76 · 11.64 126°3.13 · 21.18 264°18.89 · 19.10 24°32.22 · 6.63 22 36°4.92 163°9.03 12.48 141°3.59 21.39 279°21.49 19.13 39°34.70 6.63 23 51°7.38 178°8.31 13.31 156°4.06 21.61 294°24.09 19.16 54°37.17 6.62    Saturn 3°29.55 19:22     Horizontal parallax   Venus: 0.1     Mars: 0.1							I .
20 5°59.99 133°10.48 10.80 111°2.66 20.97 249°16.30 19.07 9°29.75 6.64 21 21°2.45 148°9.76 · · 11.64 126°3.13 · · 21.18 264°18.89 · · 19.10 24°32.22 · · 6.63 22 36°4.92 163°9.03 12.48 141°3.59 21.39 279°21.49 19.13 39°34.70 6.63 23 51°7.38 178°8.31 13.31 156°4.06 21.61 294°24.09 19.16 54°37.17 6.62  Horizontal parallax Venus: 0.1 Mars: 0.1							1
21       21°2.45       148°9.76       · · 11.64       126°3.13       · · 21.18       264°18.89       · · 19.10       24°32.22       · · 6.63       Horizontal parallax         22       36°4.92       163°9.03       12.48       141°3.59       21.39       279°21.49       19.13       39°34.70       6.63       Venus:       0.1         23       51°7.38       178°8.31       13.31       156°4.06       21.61       294°24.09       19.16       54°37.17       6.62       Mars:       0.1							Saturn 3 29.55 19:22
23 51°7.38 178°8.31 13.31 156°4.06 21.61 294°24.09 19.16 54°37.17 6.62 Mars: 0.1	21	21°2.45	148°9.76 · · 11.64	126°3.13 · · 21.18	264°18.89 · · 19.10	24°32.22 · · 6.63	-
25 31 1.50 110 0.51 15.51 150 1.00 21.01 27 1.05 15.20 31 51.11 0.02							
Mer.pass. 19:36 $\nu$ -0.7′ $d$ 0.9′ m-3.90 $\nu$ 0.5′ $d$ 0.2′ m1.33 $\nu$ 2.6′ $d$ 0.0′ m-2.50 $\nu$ 2.5′ $d$ -0.0′ m0.89							ividis. U.1
	Mer.p	pass. 19:36	ν-0.7′ d0.9′ m-3.90	$\nu 0.5' \ d0.2' \ m1.33$	ν2.6′ d0.0′ m-2.50	ν2.5′ <i>d</i> -0.0′ m0.89	

h	Su	n		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.89	\$20°33.11	$139^{\circ}3.00$	9.9'	\$27°14.97	-4.2'	54.5'
1	198°20.71	33.62	153°31.88	9.9'	27°10.73	-4.4'	54.5'
2 3	213°20.53 228°20.34	34.12 •• 34.62	168°0.78 182°29.72	9.9' 10.0'	27°6.35 27°1.85	-4.5' -4.6'	54.6' 54.6'
4	243°20.16	35.12	196°58.68	10.0'	26°57.20	-4.8'	54.6'
5	258°19.98	35.63	211°27.68	10.0'	$26^{\circ}52.42$	-4.9'	54.6'
6	273°19.80	\$20°36.13	225°56.70	10.1	\$26°47.51	-5.0'	54.6'
7 8	288°19.61 303°19.43	36.63 37.13	240°25.76 254°54.85	10.1' 10.1'	26°42.47 26°37.29	-5.2' -5.3'	54.6' 54.7'
9	318° 19.25	37.63	269°23.97	10.1	26°31.97	-5.4'	54.7'
10	333°19.06	38.13	283°53.13	10.2'	$26^{\circ}26.53$	-5.6'	54.7'
11	348°18.88 3°18.69	38.62 \$20°39.12	298°22.32	10.2'	26°20.95 \$26°15.25	-5.7'	54.7'
12 13	18°18.59	39.62	312°51.55 327°20.82	10.3' 10.3'	26°9.41	-5.8' -6.0'	54.7' 54.7'
14	33°18.32	40.11	341°50.12	10.3	26°3.44	-6.1'	54.8'
15	48°18.14	• • 40.61	356° 19.46	10.4'	25°57.34	-6.2'	54.8'
16	63°17.95 78°17.76	41.10	10°48.84 25°18.26	10.4'	25°51.12 25°44.76	-6.4'	54.8'
17 18	93°17.78	41.60 \$20°42.09	25°18.26 39°47.72	10.5' 10.5'	25°44.76 \$25°38.27	-6.5' -6.6'	54.8' 54.8'
19	108°17.39	42.58	54°17.22	10.5	25°31.66	-6.7'	54.8'
20	123°17.20	43.07	68°46.76	10.6'	$25^{\circ}24.92$	-6.9'	54.9'
21	138°17.01	• • 43.57	83°16.34	10.6'	25°18.06	-7.0'	54.9'
22 23	153°16.83 168°16.64	44.06 44.55	97°45.97 112°15.63	10.7' 10.7'	25°11.06 25°3.95	-7.1' -7.2'	54.9' 54.9'
23						-1.2	J T. J
	SD = 16.2'	d = 0.5'		51	D = 14.9'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°16.45	\$20°45.04	126°45.34	10.8'	\$24°56.71	-7.4'	54.9'
1	198°16.26 213°16.07	45.52 46.01	141°15.10 155°44.90	10.8' 10.8'	24°49.34 24°41.85	-7.5' -7.6'	55.0' 55.0'
2 3	213° 16.07 228° 15.88	46.01	155°44.90 170°14.74	10.8	24°41.85 24°34.24	-7.6° -7.7'	55.0'
4	243°15.69	46.99	184°44.63	10.9'	24°26.50	-7.9'	55.0'
5	258°15.50	47.47	199°14.56	11.0'	24°18.65	-8.0'	55.1'
6	273°15.31 288°15.12	\$20°47.96	213°44.54 228°14.57	11.0'	\$24°10.67 24°2.57	-8.1'	55.1'
7 8	288°15.12 303°14.93	48.44 48.92	242°44.64	11.1' 11.1'	24°2.57 23°54.35	-8.2' -8.3'	55.1' 55.1'
9	318° 14.74	49.41	257°14.75	11.2'	23°46.02	-8.5	55.1
10	333°14.54	49.89	271°44.92	11.2'	23°37.56	-8.6'	55.2'
11	348°14.35 3°14.16	50.37 \$20°50.85	286°15.13 300°45.38	11.3'	23°28.99 <b>5</b> 23°20.30	-8.7'	55.2' 55.2'
12 13	18°13.97	51.33	300°45.38 315°15.69	11.3' 11.4'	23° 11.49	-8.8' -8.9'	55.2' 55.2'
14	33°13.77	51.81	329°46.04	11.4'	23°2.57	-9.0'	55.2'
15	48°13.58	• • 52.29	344°16.44	11.4'	22°53.53	-9.2'	55.3'
16	63°13.39 78°13.19	52.77 53.25	358°46.88 13°17.38	11.5' 11.5'	22°44.38 22°35.12	-9.3' -9.4'	55.3' 55.3'
17 18	93°13.00	53.25 \$20°53.72	13 17.38 27°47.92	11.6'	522°25.74	-9.4 -9.5'	55.3'
19	108°12.80	54.20	42°18.50	11.6'	22°16.25	-9.6'	55.4'
20	123°12.61	54.68	56°49.14		22°6.65	-9.7'	55.4'
21 22	138°12.41 153°12.22	· · 55.15 55.63	71°19.82 85°50.55	11.7' 11.8'	21°56.94 21°47.12	-9.8' -9.9'	55.4' 55.4'
23	168°12.02	56.10	100°21.32	11.8'	21 47.12 21°37.19	-9.9 -10.0'	55.5'
	SD = 16.2'	d = 0.5'			D = 15.0'		
	3D = 10.2	<u>u = 0.5</u>		- 31	J = 13.0		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°11.82 198°11.63	\$20°56.57	114°52.15 129°23.02	11.9'	\$21°27.15 21°17.01	-10.1'	55.5'
1 2	198°11.63 213°11.43	57.04 57.52	129°23.02 143°53.93	11.9' 12.0'	21°17.01 21°6.76	-10.3' -10.4'	55.5' 55.5'
3	228°11.23	• 57.99	158°24.89	12.0'	20°56.40	-10.5	55.6'
4	243°11.04	58.46	172°55.90	12.1'	20°45.93	-10.6'	55.6'
5 6	258°10.84 273°10.64	58.93 \$20°59.40	187°26.96 201°58.05	12.1' 12.1'	20°35.36 <b>S</b> 20°24.69	-10.7' -10.8'	55.6' 55.6'
6 7	273°10.64 288°10.44	20°59.40 20°59.86	201°58.05 216°29.20	12.1	20°13.92	-10.8° -10.9°	55.6° 55.7'
8	303°10.24	21°0.33	231°0.39	12.2'	20°3.04	-11.0'	55.7'
9	318°10.04	• • 0.80	245°31.62	12.3'	19°52.06	-11.1'	55.7'
10 11	333° 9.84 348° 9.64	1.26 1.73	260°2.90 274°34.22	12.3' 12.4'	19°40.98 19°29.80	-11.2' -11.3'	55.8' 55.8'
11	348 9.64 3° 9.44	1.73 \$21°2.19	274 34.22 289°5.58	12.4'	19°29.80 \$19°18.52	-11.4	55.8'
13	18° 9.24	2.66	303°36.99	12.4'	19°7.14	-11.5'	55.8'
14	33°9.04	3.12	318°8.44	12.5'	18°55.67	-11.6'	55.9'
15 16	48° 8.84 63° 8.64	· · 3.58 4.05	332°39.93 347°11.47	12.5' 12.6'	18°44.09 18°32.43	-11.7' -11.8'	55.9' 55.9'
16 17	78°8.44	4.05 4.51	1°43.04	12.6'	18° 32.43 18° 20.66	-11.8 -11.9'	55.9'
18	93°8.24	S21°4.97	16°14.65	12.7'	S18°8.80	-12.0'	56.0'
19	108°8.03	5.43	30°46.31	12.7'	17°56.85	-12.0'	56.0'
20 21	123°7.83 138°7.63	5.89 •• 6.35	45°18.00 59°49.73	12.7' 12.8'	17°44.81 17°32.67	-12.1' -12.2'	56.0' 56.1'
21	138° 7.63 153° 7.43	6.80	59°49.73 74°21.50	12.8'	17°32.67 17°20.45	-12.2° -12.3'	56.1'
23	168° 7.22	7.26	88°53.31	12.8'	17°8.13	-12.4'	56.1
	SD = 16.2'	d = 0.5'		SI	D = 15.1'		

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

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

	Sun			IVIOON		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	12-28%
24	13:24	13:15	11:47	15:15	02:50	
25	13:06	12:57	11:47	16:05	03:40	
26	12:47	12:38	11:47	16:53	04:29	

### November 27, 28, 29 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	66°9.85	193°7.58 \$18°14.15	171°4.53 \$23°21.82	309°26.68 N21°19.19	69°39.64 \$04°6.61	
1	81°12.31	208°6.86 14.98	186° 5.00 22.03	324°29.28 19.22	84°42.11 6.61	Alpheratz 357°33.87 29°14.23
2	96° 14.78	223°6.13 15.82	201°5.46 22.23	339°31.88 19.24	99°44.59 6.60	Ankaa 353°6.21 -42°10.04
3	111° 17.24	238°5.40 · · 16.65	216°5.93 · · 22.44	354°34.47 · · 19.27	114°47.06 · · 6.60	Schedar 349°29.90 56°41.06
4	$126^{\circ}19.70$	253°4.67 17.48	231°6.40 22.65	9°37.07 19.30	129°49.53 6.59	Diphda 348°46.38 -17°50.67
5	141°22.17	268°3.94 18.31	246°6.86 22.86	24°39.67 19.33	144°52.00 6.58	Achernar 335°19.18 -57°6.44   Hamal 327°50.09 23°35.25
6	156°24.63	283°3.22 <b>S</b> 18°19.14	261°7.33 <b>S</b> 23°23.07	39°42.27 N21°19.36	159°54.47 <b>S</b> 04°6.58	Polaris 313°10.94 89°22.51
7	171°27.10	298°2.49 19.97	276° 7.79 23.28	54°44.87 19.39	174° 56.94 6.57	Acamar 315°10.81 -40°12.05
8	186°29.56	313°1.75 20.80	291°8.26 23.48	69°47.47 19.42	189°59.41 6.56	Menkar 314°5.08 4°11.57
9	201°32.02	328°1.02 · · 21.62	306°8.72 · · 23.69	84°50.07 · · 19.45	205°1.89 · · 6.56	Mirfak 308°26.72 49°57.30
10 11	216°34.49 231°36.95	343°0.29 22.45 357°59.56 23.27	321°9.19 23.90 336°9.65 24.10	99°52.67 19.48 114°55.27 19.51	220°4.36 6.55 235°6.83 6.54	Aldebaran 290°38.44 16°33.74
12	246° 39.42	12°58.83 \$18°24.10	351°10.12 \$23°24.31	129°57.87 N21°19.54	250°9.30 S04°6.54	Rigel 281°2.84 -8°10.21
13	261°41.88	27°58.10 24.92	6°10.58 24.51	145°0.47 19.57	265°11.77 6.53	Capella 280°20.35 46°1.42
14	276° 44.35	42°57.36 25.75	21°11.05 24.72	160°3.07 19.60	280°14.24 6.52	Bellatrix 278°21.78 6°22.45
15	291°46.81	57°56.63 · · 26.57	36°11.51 · · 24.92	175°5.67 · · 19.63	295°16.71 · · 6.51	Elnath 278° 0.58 28° 37.76
16	306°49.27	72°55.89 27.39	51°11.98 25.12	190°8.27 19.66	310° 19.18 6.51	Alnilam 275°36.67 -1°11.04
17	321°51.74	87°55.16 28.21	66°12.44 25.33	205°10.88 19.69	325°21.65 6.50	Betelgeuse 270°50.99 7°24.76 Canopus 263°51.58 -52°42.35
18	336° 54.20	102°54.42 \$18°29.03	81°12.90 <b>S</b> 23°25.53	220°13.48 N21°19.72	340°24.12 <b>S</b> 04°6.49	Sirius 258°25.31 -16°44.97
19	351°56.67	117°53.69 29.85	96°13.37 25.73	235°16.08 19.75	355°26.59 6.48	Adhara 255°4.99 -29°0.26
20	6°59.13	132°52.95 30.66	111°13.83 25.93	250°18.68 19.78	10°29.05 6.48	Procyon 244°49.85 5°9.54
21	22°1.59	147°52.21 · · 31.48	126°14.29 · · 26.14	265°21.29 · · 19.81	25°31.52 · · 6.47	Pollux 243°16.18 27°57.73
22	37°4.06	162°51.48 32.30	141°14.76 26.34	280°23.89 19.84	40°33.99 6.46	Avior 234°14.11 -59°35.23
23	52°6.52	177°50.74 33.11	156°15.22 26.54	295°26.50 19.87	55°36.46 6.45	Suhail 222°45.63 -43°31.95
Mer.	pass. 19:32	u-0.7 $'$ $d$ 0.8 $'$ m-3.90	$ u 0.5' \ d0.2' \ m1.33$	$\nu 2.6' \ d0.0' \ \text{m-}2.51$	$\nu 2.5' \ d$ -0.0' m0.90	Miaplacidus 221°37.83 -69°49.05
						Alphard 217°46.96 -8°46.15
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.65 11°50.40
0	67°8.99	192°50.00 \$18°33.92	171°15.68 \$23°26.74	310°29.10 N21°19.90	70°38.93 <b>S</b> 04°6.45	Dubhe 193°40.22 61°36.38   Denebola 182°24.33 14°25.58
1	82°11.45	207° 49.26 34.74	186°16.14 26.94	325°31.71 19.93	85°41.40 6.44	Gienah 175°43.01 -17°41.03
2	97° 13.91	222° 48.52 35.55	201°16.61 27.14	340°34.31 19.96	100°43.87 6.43	Acrux 172°59.69 -63°14.29
3	112°16.38	237°47.78 · · 36.36	216°17.07 · · 27.34	355°36.92 · · 19.99	115°46.33 · · 6.42	Gacrux 171°51.18 -57°15.24
4	127° 18.84	252°47.04 37.17	231°17.53 27.54	10°39.52 20.02	130°48.80 6.41	Alioth 166°12.68 55°48.92
5 6	142°21.31 157°23.77	267°46.30 37.98 282°45.56 \$18°38.79	246°17.99 27.73 261°18.45 \$23°27.93	25°42.13 20.05 40°44.74 N21°20.08	145°51.27 6.41 160°53.74 \$04°6.40	Spica 158°21.79 -11°17.72
7	172° 26.23	297°44.82 39.60	276°18.91 28.13	55°47.35 20.11	175° 56.20 6.39	Alkaid 152°51.82 49°10.86
8	187°28.70	312°44.07 40.40	291°19.37 28.33	70°49.95 20.14	190°58.67 6.38	Hadar 148°35.55 -60°29.68
9	202°31.16	327°43.33 · · 41.21	306°19.83 · · 28.52	85°52.56 · · 20.17	206°1.14 · · 6.37	Menkent 147°57.12 -36°29.70 Arcturus 145°47.55 19°2.80
10	217°33.63	342°42.59 42.01	321°20.29 28.72	100°55.17 20.21	221°3.60 6.36	Arcturus 145°47.55 19°2.80   Rigil Kent. 139°39.93 -60°56.38
11	232°36.09	357°41.84 42.82	336°20.75 28.92	115°57.78 20.24	236°6.07 6.36	Kochab 137°20.90 74°2.73
12	247°38.56	12°41.10 \$18°43.62	351°21.21 \$23°29.11	131°0.39 N21°20.27	251°8.54 \$04°6.35	Zuben'ubi 136°55.54 -16°8.90
13 14	262°41.02 277°43.48	27°40.35 44.42 42°39.61 45.23	6°21.67 29.31 21°22.13 29.50	146°3.00 20.30 161°5.61 20.33	266°11.00 6.34 281°13.47 6.33	Alphecca 126°3.50 26°37.62
15	277 45.46 292° 45.95	57°38.86 · · 46.03	36°22.59 · · 29.70	176°8.22 · · 20.36	296°15.93 · · 6.32	Antares 112°15.33 -26°29.32
16	307°48.41	72°38.11 46.83	51°23.05 29.89	191°10.83 20.39	311°18.40 6.31	Atria 107°9.48 -69°4.42
17	322°50.88	87°37.36 47.62	66°23.51 30.08	206°13.44 20.42	326°20.87 6.30	Sabik 102°2.30 -15°45.39   Shaula 96°9.80 -37°7.36
18	337°53.34	102°36.62 <b>S</b> 18°48.42	81°23.97 <b>S</b> 23°30.28	221°16.05 N21°20.45	341°23.33 S04°6.29	Rasalhague 95°58.22 12°32.51
19	352° 55.80	117° 35.87 49.22	96°24.43 30.47	236°18.66 20.49	356° 25.80 6.28	Eltanin 90°42.35 51°29.20
20	7°58.27	132°35.12 50.02	111°24.89 30.66	251°21.27 20.52	11°28.26 6.27	Kaus Aust. 83°31.92 -34°22.37
21	23°0.73	147°34.37 · · 50.81	126°25.35 · · 30.85	266°23.88 · · 20.55 281°26.50 20.58	26°30.73 · · 6.26	Vega 80°33.11 38°48.57
22 23	38°3.20 53°5.66	162°33.62 51.60 177°32.87 52.40	141°25.80 31.04 156°26.26 31.23	281°26.50 20.58 296°29.11 20.61	41° 33.19 6.26 56° 35.65 6.25	Nunki 75°47.17 -26°15.90
				-		Altair 61°59.48 8°56.29
Mer.	pass. 19:28	$\nu$ -0.7' $d$ 0.8' m-3.90	$ u 0.5' \ d0.2' \ m1.32$	$ u 2.6' \ d0.0' \ \text{m-}2.52$	$\nu 2.5' \ d$ -0.0' m0.90	Peacock 53°4.91 -56°39.29
						Deneb 49°25.54 45°22.60 Enif 33°38.16 9°59.75
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.05 -46°50.32
0	68°8.12	192°32.12 <b>S</b> 18°53.19	171°26.72 \$23°31.42	311°31.72 N21°20.64	71°38.12 <b>S</b> 04°6.24	Fomalhaut 15°13.68 -29°29.20
1	83° 10.59	207°31.37 53.98	186°27.18 31.61	326°34.33 20.68	86°40.58 6.23	Scheat 13°44.46 28°13.62
2	98° 13.05	222°30.62 54.77	201°27.63 31.80	341°36.95 20.71	101°43.05 6.22	Markab 13°29.13 15°20.84
3	113° 15.52	237°29.86 · · 55.56	216°28.09 · · 31.99	356°39.56 · · 20.74	116°45.51 · · 6.21	No. 27 Thus CHA Manager
4 5	128° 17.98 143° 20.44	252°29.11 56.35 267°28.36 57.14	231°28.55 32.18 246°29.00 32.37	11°42.18 20.77 26°44.79 20.80	131°47.97 6.20 146°50.44 6.19	Nov 27 Thu         SHA         Mer.pass           Venus         126°57.74         11:08
6	143 20.44 158° 22.91	282°27.60 \$18°57.93	261°29.46 S23°32.56	41°47.41 N21°20.84	161°52.90 S04°6.18	Mars 104°54.68 12:35
7	173° 25.37	297°26.85 58.71	276°29.92 32.75	56°50.02 20.87	176°55.36 6.17	Jupiter 243°16.84 03:22
8	188° 27.84	312°26.09 18°59.50	291°30.37 32.93	71°52.64 20.90	191°57.83 6.16	Saturn 3°29.79 19:18
9	203°30.30	327°25.34 19°0.28	306°30.83 · · 33.12	86°55.25 · · 20.93	207°0.29 · · 6.15	N 20 F : CHA NA
10	218°32.77	342°24.58 1.07	321°31.28 33.31	101°57.87 20.96	222°2.75 6.14	Nov 28 Fri SHA Mer.pass Venus 125°41.01 11:09
11	233°35.23	357°23.82 1.85	336°31.74 33.49	117°0.49 21.00	237°5.21 6.13	Mars 104°6.70 12:35
12	248° 37.69	12°23.07	351°32.20 \$23°33.68	132°3.11 N21°21.03	252°7.68 \$04°6.11	Jupiter 243°20.12 03:17
13 14	263° 40.16 278° 42.62	27°22.31 3.41 42°21.55 4.19	6°32.65 33.86 21°33.11 34.05	147°5.72 21.06 162°8.34 21.09	267°10.14 6.10 282°12.60 6.09	Saturn 3°29.94 19:14
14 15	278 42.02 293°45.09	57°20.79 · · 4.97	36°33.56 · · 34.23	162 8.34 21.09 177°10.96 · · 21.13	282 12.60 6.09 297°15.06 · · 6.08	Nov 20 Sat SUA Maria
16	308° 47.55	72°20.03 5.75	51°34.01 34.42	192°13.58 21.16	312°17.52 6.07	Nov 29 Sat SHA Mer.pass Venus 124°23.99 11:10
17	323°50.01	87°19.27 6.52	66°34.47 34.60	207°16.20 21.19	327°19.99 6.06	Mars 103°18.59 12:34
18	338°52.48	102°18.51 \$19°7.30	81°34.92 <b>S</b> 23°34.78	222°18.82 N21°21.22	342°22.45 \$04°6.05	Jupiter 243°23.60 03:13
19	353°54.94	117° 17.75 8.07	96°35.38 34.97	237°21.44 21.26	357°24.91 6.04	Saturn 3°29.99 19:10
20	8°57.41	132°16.99 8.85	111°35.83 35.15	252°24.06 21.29	12°27.37 6.03	Horizontal parallar
21	23°59.87 39°2.33	147°16.23 · · 9.62	126°36.28 · · 35.33	267°26.68 · · 21.32	27°29.83 · · 6.02 42°32.29 6.01	Horizontal parallax Venus: 0.1
22 23	39°2.33 54°4.80	162°15.47 10.39 177°14.70 11.17	141°36.74 35.51 156°37.19 35.69	282°29.30 21.36 297°31.92 21.39	42°32.29 6.01 57°34.75 5.99	Mars: 0.1
ıvıer.	oass. 19:24	$\nu$ -0.8′ $d$ 0.8′ m-3.90	$ u 0.5' \ d0.2' \ m1.32$	$\nu$ 2.6′ $d$ 0.0′ m-2.52	$ u 2.5' \ d$ -0.0 $' \ m 0.91$	

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°7.02	S21°7.72	103°25.15	12.9'	<b>S</b> 16°55.72	-12.5'	56.2'
1	198°6.81	8.17	117°57.04	12.9'	16°43.22	-12.6'	56.2'
2	213°6.61 228°6.40	8.63 • • 9.08	132°28.95 147°0.90	13.0' 13.0'	16°30.64 16°17.97	-12.7' -12.8'	56.2' 56.2'
4	243°6.20	9.54	161°32.89	13.0'	16°5.21	-12.8'	56.3'
5	258°5.99	9.99	176°4.90	13.0'	$15^{\circ}52.37$	-12.9'	56.3'
6	273°5.79	S21°10.44	190°36.95	13.1'	\$15°39.44	-13.0'	56.3'
7 8	288°5.58 303°5.38	10.89 11.34	205°9.03 219°41.15	13.1' 13.1'	15°26.43 15°13.33	-13.1' -13.2'	56.4' 56.4'
9	318°5.17	• • 11.79	234°13.29	13.2	15° 0.15	-13.3'	56.4
10	333°4.96	12.24	248°45.46	13.2'	14°46.90	-13.3'	56.5'
11	348°4.76	12.69	263°17.66	13.2'	14°33.56 \$14°20.14	-13.4'	56.5'
12 13	3°4.55 18°4.34	\$21°13.14 13.59	277°49.89 292°22.14	13.3' 13.3'	14° 6.64	-13.5' -13.6'	56.5' 56.6'
14	33°4.13	14.03	306°54.42	13.3'	13°53.06	-13.7	56.6'
15	48°3.92	• • 14.48	321°26.73	13.3'	13°39.41	-13.7'	56.6'
16	63°3.72	14.93	335°59.06	13.4'	13°25.68	-13.8'	56.7'
17 18	78°3.51 93°3.30	15.37 <b>S</b> 21°15.81	350°31.41 5°3.79	13.4' 13.4'	13°11.88 \$12°58.00	-13.9' -14.0'	56.7' 56.7'
19	95 3.50 108°3.09	16.26	19°36.18	13.4	12°44 04	-14.0'	56.8'
20	123°2.88	16.70	34°8.60	13.4'	12°30.02	-14.1'	56.8'
21	138°2.67	• • 17.14	48°41.03	13.5'	$12^{\circ}15.92$	-14.2'	56.8'
22	153°2.46	17.58	63°13.49	13.5'	12°1.75	-14.2'	56.9'
23	168°2.25	18.02	77°45.96	13.5'	11°47.51	-14.3'	56.9'
	SD = 16.2'	d = 0.5'		SI	D = 15.3'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	183°2.04	S21°18.46	92°18.44	13.5'	<b>S</b> 11°33.20	-14.4'	56.9'
1	198°1.83	18.90	106°50.94	13.5'	11°18.83	-14.4'	57.0'
2	213°1.61 228°1.40	19.34 •• 19.78	121°23.46 135°55.99	13.5' 13.5'	11°4.38 10°49.87	-14.5' -14.6'	57.0' 57.0'
4	243°1.19	20.22	150°28.53	13.6'	10°49.87 10°35.29	-14.6'	57.0°
5	258°0.98	20.65	165°1.08	13.6'	10°20.65	-14.7'	57.1'
6	273°0.76	S21°21.09	179°33.65	13.6'	S10°5.94	-14.8'	57.1'
7	288°0.55	21.52	194°6.22	13.6'	09°51.17	-14.8'	57.2'
8 9	303°0.34 318°0.12	21.96 •• 22.39	208°38.79 223°11.38	13.6' 13.6'	09°36.34 09°21.45	-14.9' -15.0'	57.2' 57.2'
10	332°59.91	22.82	237°43.97	13.6'	09°21.43	-15.0'	57.3'
11	347°59.70	23.25	252°16.56	13.6'	08°51.48	-15.1'	57.3'
12	2°59.48	S21°23.69	266°49.16	13.6'	508°36.41	-15.1'	57.4'
13 14	17°59.27 32°59.05	24.12 24.55	281°21.76 295°54.36	13.6' 13.6'	08°21.28 08°6.10	-15.2' -15.2'	57.4' 57.4'
15	47°58.84	24.98	310°26.96	13.6'	07°50.86	-15.2	57.5'
16	62°58.62	25.40	324°59.56	13.6'	$07^{\circ}35.56$	-15.3'	57.5'
17	77°58.40	25.83	339°32.15	13.6'	07°20.21	-15.4'	57.5'
18 19	92°58.19 107°57.97	\$21°26.26 26.68	354°4.74 8°37.32	13.6' 13.6'	\$07°4.81 06°49.36	-15.5' -15.5'	57.6' 57.6'
20	107 57.97 122° 57.75	27.11	23° 9.90		06°33.85		57.6'
21	137° 57.54	• • 27.54	37°42.47	13.6'	06°18.30	-15.6'	57.7'
22	152° 57.32	27.96	52°15.03	13.6'	$06^{\circ}2.70$	-15.7'	57.7'
23	167°57.10	28.38	66°47.58	13.5'	05°47.05	-15.7'	57.8'
	SD = 16.2'	d = 0.4'		SI	O = 15.5'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182° 56.88	S21°28.81	81°20.12	13.5'	\$05°31.35	-15.7'	57.8'
1 2	197°56.67 212°56.45	29.23 29.65	95°52.65 110°25.16	13.5' 13.5'	05°15.61 04°59.82	-15.8' -15.8'	57.8' 57.9'
3	212 50.45 227°56.23	30.07	110 25.10 124°57.65	13.5'	04 59.62 04°43.99	-15.0 -15.9'	57.9'
4	$242^{\circ}56.01$	30.49	139°30.13	13.5'	04°28.11	-15.9'	57.9'
5	257° 55.79	30.91	154°2.59	13.4'	04°12.20	-16.0'	58.0'
6 7	272°55.57 287°55.35	\$21°31.33 31.75	168°35.03 183°7.45	13.4' 13.4'	\$03°56.24 03°40.25	-16.0' -16.0'	58.0' 58.1'
8	287°55.35 302°55.13	31.75 32.16	183° 7.45 197° 39.85	13.4	03°40.25 03°24.22	-16.0 -16.1'	58.1'
9	317° 54.91	• • 32.58	212°12.22	13.3'	03°8.15	-16.1	58.1
10	332°54.69	33.00	226°44.57	13.3'	02°52.04	-16.1'	58.2'
11	347°54.47	33.41	241°16.89	13.3'	02°35.90	-16.2'	58.2'
12 13	2°54.24 17°54.02	\$21°33.82 34.24	255°49.19 270°21.45	13.3' 13.2'	\$02°19.73 02°3.52	-16.2' -16.2'	58.2' 58.3'
13	32°53.80	34.24 34.65	270 21.45 284°53.68	13.2'	02 3.52 01°47.28	-16.2 -16.3'	58.3'
15	47°53.58	• • 35.06	299°25.89	13.2'	$01^{\circ}31.01$	-16.3	58.4'
16	62°53.36	35.47	313°58.05	13.1'	01°14.72	-16.3'	58.4'
17	77°53.13	35.89 \$21°36.30	328°30.19	13.1'	00°58.39	-16.4'	58.4'
18 19	92°52.91 107°52.69	\$21°36.30 36.70	343°2.29 357°34.34	13.1' 13.0'	\$00°42.04 00°25.66	-16.4' -16.4'	58.5' 58.5'
20	122° 52.46	37.11	12° 6.37	13.0'	500°9.26	-16.4'	58.6'
21	137°52.24	• • 37.52	26°38.35	12.9'	N00°7.16	16.4'	58.6'
22	152°52.01	37.93	41°10.28	12.9'	00°23.60	16.5	58.6'
23	167°51.79	38.33	55°42.18	12.8'	00°40.07	16.5'	58.7'
	SD = 16.2'	d = 0.4'		51	O = 15.8'		

Naut.         Civil         Sunset         Civil         Naut.           N 72°         07:43         09:37         ■         13:58         15:52           N 70°         07:28         09:01         ■         14:34         16:07           68°         07:15         08:36         10:20         13:15         14:59         16:20           66°         07:05         08:16         09:37         13:59         15:19         16:30           64°         06:56         08:00         09:08         14:27         15:35         16:39           62°         06:48         07:47         08:47         14:49         15:48         16:47           60°         06:41         07:36         08:29         15:06         16:00         16:54           N 58°         06:35         07:26         08:15         15:21         16:10         17:00           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:31 <th>Lat.</th> <th>Twi</th> <th>light</th> <th>Sunrise</th> <th>Sunset</th> <th>Twi</th> <th>light</th>	Lat.	Twi	light	Sunrise	Sunset	Twi	light
N 70°         07:28         09:01         ■         14:34         16:07           68°         07:15         08:36         10:20         13:15         14:59         16:20           66°         07:05         08:16         09:37         13:59         15:19         16:30           64°         06:56         08:00         09:08         14:27         15:35         16:39           62°         06:48         07:47         08:47         14:49         15:48         16:47           60°         06:41         07:36         08:29         15:06         16:00         16:54           N 58°         06:35         07:26         08:15         15:21         16:10         17:00           56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:05         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00	Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
68°         07:15         08:36         10:20         13:15         14:59         16:20           66°         07:05         08:16         09:37         13:59         15:19         16:30           64°         06:56         08:00         09:08         14:27         15:35         16:39           62°         06:48         07:47         08:47         14:49         15:48         16:47           60°         06:41         07:36         08:29         15:06         16:00         16:54           N 58°         06:35         07:26         08:15         15:21         16:10         17:00           56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30	N 72°	07:43	09:37			13:58	15:52
66°         07:05         08:16         09:37         13:59         15:19         16:30           64°         06:56         08:00         09:08         14:27         15:35         16:39           62°         06:48         07:47         08:47         14:49         15:48         16:47           60°         06:41         07:36         08:29         15:06         16:00         16:54           N 58°         06:35         07:26         08:15         15:21         16:10         17:06           56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:38           35°         05:48         06:19	<b>N</b> 70°	07:28	09:01			14:34	16:07
64° 06:56 08:00 09:08 14:27 15:35 16:39 62° 06:48 07:47 08:47 14:49 15:48 16:47 60° 06:41 07:36 08:29 15:06 16:00 16:54 N 58° 06:35 07:26 08:15 15:21 16:10 17:00 56° 06:30 07:17 08:02 15:34 16:19 17:06 54° 06:24 07:09 07:51 15:45 16:26 17:11 52° 06:20 07:02 07:42 15:54 16:33 17:16 50° 06:15 06:56 07:33 16:03 16:40 17:20 45° 06:05 06:42 07:15 16:21 16:54 17:31 N 40° 05:56 06:30 07:00 16:36 17:06 17:39 35° 05:48 06:19 06:47 16:49 17:16 17:48 30° 05:41 06:10 06:36 17:00 17:26 17:55 20° 05:26 05:53 06:17 17:19 17:43 18:10 N 10° 05:12 05:38 06:00 17:36 17:58 18:24 0° 04:56 05:22 05:44 17:52 18:14 18:40 S 10° 04:39 05:06 05:29 18:08 18:30 18:57 20° 04:19 04:47 05:11 18:25 18:45 19:12 19:44 35° 03:36 04:11 04:40 18:57 19:25 20:01 40° 03:15 03:55 04:26 19:10 19:26 20:02 20:49 S 50° 02:11 03:09 03:51 19:46 20:28 21:27 52° 01:50 02:56 03:41 19:56 20:66 20:02 20:49 S 6° 01:20 02:41 03:04 20:33 21:37 ////		07:15	08:36	10:20	13:15	14:59	16:20
62°         06:48         07:47         08:47         14:49         15:48         16:47           60°         06:41         07:36         08:29         15:06         16:00         16:54           N 58°         06:35         07:26         08:15         15:21         16:10         17:00           56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:07         17:36         17:58         18:24           0°         04:56         05:22		07:05		09:37	13:59	15:19	
60°         06:41         07:36         08:29         15:06         16:00         16:54           N 58°         06:35         07:26         08:15         15:21         16:10         17:00           56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38		06:56	08:00	09:08	14:27	15:35	16:39
N 58°         06:35         07:26         08:15         15:21         16:10         17:00           56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:49         05:11							
56°         06:30         07:17         08:02         15:34         16:19         17:06           54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:19         04:47	60°	06:41	07:36	08:29	15:06	16:00	16:54
54°         06:24         07:09         07:51         15:45         16:26         17:11           52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47	<b>N</b> 58°	06:35	07:26	08:15	15:21	16:10	17:00
52°         06:20         07:02         07:42         15:54         16:33         17:16           50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47         05:11         18:25         18:49         19:18           30°         03:35         04:25		06:30	07:17	08:02	15:34	16:19	17:06
50°         06:15         06:56         07:33         16:03         16:40         17:20           45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47         05:11         18:25         18:49         19:18           30°         03:52         04:25         04:52         18:45         19:12         19:44           35°         03:36         04:11			07:09			16:26	
45°         06:05         06:42         07:15         16:21         16:54         17:31           N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47         05:11         18:25         18:49         19:18           30°         03:52         04:25         04:52         18:45         19:12         19:44           35°         03:36         04:11         04:40         18:57         19:25         20:01           40°         03:15         03:55							
N 40°         05:56         06:30         07:00         16:36         17:06         17:39           35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47         05:11         18:25         18:49         19:18           30°         03:52         04:25         04:52         18:45         19:12         19:44           35°         03:36         04:11         04:40         18:57         19:25         20:01           40°         03:15         03:55         04:26         19:10         19:42         20:22           45°         02:48         03:35							
35°         05:48         06:19         06:47         16:49         17:16         17:48           30°         05:41         06:10         06:36         17:00         17:26         17:55           20°         05:26         05:53         06:17         17:19         17:43         18:10           N 10°         05:12         05:38         06:00         17:36         17:58         18:24           0°         04:56         05:22         05:44         17:52         18:14         18:40           S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47         05:11         18:25         18:49         19:18           30°         03:52         04:25         04:52         18:45         19:12         19:44           35°         03:36         04:11         04:40         18:57         19:25         20:01           40°         03:15         03:55         04:26         19:10         19:42         20:22           45°         02:48         03:35         04:10         19:26         20:02         20:49           \$ 50°         02:11         03:09	45°	06:05	06:42	07:15	16:21	16:54	17:31
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						17:06	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		05:48	06:19			17:16	17:48
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
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S 10°         04:39         05:06         05:29         18:08         18:30         18:57           20°         04:19         04:47         05:11         18:25         18:49         19:18           30°         03:52         04:25         04:52         18:45         19:12         19:44           35°         03:36         04:11         04:40         18:57         19:25         20:01           40°         03:15         03:55         04:26         19:10         19:42         20:22           45°         02:48         03:35         04:10         19:26         20:02         20:49           S 50°         02:11         03:09         03:51         19:46         20:28         21:27           52°         01:50         02:56         03:41         19:56         20:41         21:48           54°         01:22         02:41         03:31         20:06         20:56         22:17           56°         00:37         02:23         03:18         20:19         21:15         23:05           58°         ////         02:01         03:04         20:33         21:37         ////							-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		04:56	05:22	05:44	17:52	18:14	18:40
30°         03:52         04:25         04:52         18:45         19:12         19:44           35°         03:36         04:11         04:40         18:57         19:25         20:01           40°         03:15         03:55         04:26         19:10         19:42         20:22           45°         02:48         03:35         04:10         19:26         20:02         20:49           \$ 50°         02:11         03:09         03:51         19:46         20:28         21:27           52°         01:50         02:56         03:41         19:56         20:41         21:48           54°         01:22         02:41         03:31         20:06         20:56         22:17           56°         00:37         02:23         03:18         20:19         21:15         23:05           58°         ////         02:01         03:04         20:33         21:37         ////					18:08	18:30	18:57
35°         03:36         04:11         04:40         18:57         19:25         20:01           40°         03:15         03:55         04:26         19:10         19:42         20:22           45°         02:48         03:35         04:10         19:26         20:02         20:49           \$ 50°         02:11         03:09         03:51         19:46         20:28         21:27           52°         01:50         02:56         03:41         19:56         20:41         21:48           54°         01:22         02:41         03:31         20:06         20:56         22:17           56°         00:37         02:23         03:18         20:19         21:15         23:05           58°         ////         02:01         03:04         20:33         21:37         ////	_	04:19	04:47		18:25	18:49	
40°         03:15         03:55         04:26         19:10         19:42         20:22           45°         02:48         03:35         04:10         19:26         20:02         20:49           S 50°         02:11         03:09         03:51         19:46         20:28         21:27           52°         01:50         02:56         03:41         19:56         20:41         21:48           54°         01:22         02:41         03:31         20:06         20:56         22:17           56°         00:37         02:23         03:18         20:19         21:15         23:05           58°         ////         02:01         03:04         20:33         21:37         ////							-
45°         02:48         03:35         04:10         19:26         20:02         20:49           \$ 50°         02:11         03:09         03:51         19:46         20:28         21:27           52°         01:50         02:56         03:41         19:56         20:41         21:48           54°         01:22         02:41         03:31         20:06         20:56         22:17           56°         00:37         02:23         03:18         20:19         21:15         23:05           58°         ////         02:01         03:04         20:33         21:37         ////							
S 50°         02:11         03:09         03:51         19:46         20:28         21:27           52°         01:50         02:56         03:41         19:56         20:41         21:48           54°         01:22         02:41         03:31         20:06         20:56         22:17           56°         00:37         02:23         03:18         20:19         21:15         23:05           58°         ////         02:01         03:04         20:33         21:37         ////	_						-
52°     01:50     02:56     03:41     19:56     20:41     21:48       54°     01:22     02:41     03:31     20:06     20:56     22:17       56°     00:37     02:23     03:18     20:19     21:15     23:05       58°     ////     02:01     03:04     20:33     21:37     ////		02:48	03:35	04:10	19:26	20:02	20:49
54°     01:22     02:41     03:31     20:06     20:56     22:17       56°     00:37     02:23     03:18     20:19     21:15     23:05       58°     ////     02:01     03:04     20:33     21:37     ////		02:11	03:09	03:51	19:46	20:28	21:27
56° 00:37 02:23 03:18 20:19 21:15 23:05 58° //// 02:01 03:04 20:33 21:37 ////							-
58°   /// 02:01 03:04   20:33 21:37 ///							
<b>S</b> 60°   /// 01:31 02:48   20:50 22:08 ///							
	<b>S</b> 60°	////	01:31	02:48	20:50	22:08	////

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

	Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	37-58%	
27	12:28	12:18	11:48	17:39	05:16		
28	12:08	11:58	11:48	18:24	06:02		
29	11:48	11:37	11:48	19:10	06:47	9	

### November 30, 01, 02 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	69°7.26	192°13.94 <b>S</b> 19°11.94	171°37.64 \$23°35.87	312°34.54 N21°21.42	72°37.21 <b>S</b> 04°5.98	
1	84°9.73	207°13.18 12.71	186°38.10 36.05	327°37.16 21.46	87°39.67 5.97	Alpheratz 357°33.89 29°14.23
2	99°12.19	222°12.41 13.47	201°38.55 36.23	342°39.78 21.49	102°42.13 5.96	Ankaa 353°6.22 -42°10.05
3	114° 14.65	237°11.65 · · 14.24	216°39.00 · · 36.41	357°42.41 · · 21.52	117°44.59 · · 5.95	Schedar 349°29.92 56°41.07
4	129° 17.12	252°10.88 15.01	231°39.45 36.59	12°45.03 21.55	132°47.05 5.94	Diphda 348°46.39 -17°50.68 Achernar 335°19.20 -57°6.45
5	$144^{\circ}19.58$	267°10.12 15.77	246°39.91 36.77	27°47.65 21.59	147°49.51 5.92	Achernar 335°19.20 -57°6.45 Hamal 327°50.09 23°35.25
6	159°22.05	282°9.35 <b>S</b> 19°16.54	261°40.36 <b>S</b> 23°36.95	42°50.27 N21°21.62	162°51.97 <b>S</b> 04°5.91	Polaris 313°11.32 89°22.53
7	174°24.51	297°8.58 17.30	276°40.81 37.12	57°52.90 21.65	177° 54.43 5.90	Acamar 315°10.82 -40°12.06
8	189°26.97	312°7.82 18.07	291°41.26 37.30	72°55.52 21.69	192°56.88 5.89	Menkar 314°5.08 4°11.57
9	204° 29.44	327°7.05 · · 18.83	306°41.71 · · 37.48	87°58.15 · · 21.72	207°59.34 · · 5.88	Mirfak 308°26.72 49°57.31
10 11	219°31.90 234°34.37	342°6.28 19.59 357°5.51 20.35	321°42.16 37.65 336°42.62 37.83	103°0.77 21.76 118°3.40 21.79	223°1.80 5.86 238°4.26 5.85	Aldebaran 290°38.44 16°33.74
12	249° 36.83	12°4.74 \$19°21.11	351°43.07 \$23°38.00	133°6.02 N21°21.82	253°6.72 \$04°5.84	Rigel 281°2.83 -8°10.22
13	264° 39.30	27°3.97 21.87	6°43.52 38.18	148°8.65 21.86	268°9.18 5.83	Capella 280°20.34 46°1.43
14	279°41.76	42°3.20 22.63	21°43.97 38.35	163°11.27 21.89	283°11.63 5.81	Bellatrix 278°21.77 6°22.45
15	294°44.22	57°2.43 · · 23.38	36°44.42 · · 38.53	178°13.90 · · 21.92	298°14.09 · · 5.80	Elnath 278° 0.57 28° 37.76
16	309°46.69	72°1.66 24.14	51°44.87 38.70	193°16.53 21.96	313°16.55 5.79	Alnilam 275°36.67 -1°11.05
17	324°49.15	87°0.89 24.89	66°45.32 38.88	208°19.15 21.99	328° 19.01 5.78	Betelgeuse 270°50.98 7°24.76 Canopus 263°51.57 -52°42.36
18	339°51.62	102°0.11 \$19°25.65	81°45.77 <b>S</b> 23°39.05	223°21.78 N21°22.03	343°21.46 <b>S</b> 04°5.76	Sirius 258°25.30 -16°44.98
19	354°54.08	116°59.34 26.40	96°46.22 39.22	238°24.41 22.06	358°23.92 5.75	Adhara 255°4.98 -29°0.27
20	9°56.54	131°58.57 27.15	111°46.67 39.39	253°27.04 22.09	13°26.38 5.74	Procyon 244°49.83 5°9.54
21 22	24°59.01 40°1.47	146°57.79 · · 27.90	126°47.11 · · 39.57	268°29.67 · · 22.13 283°32.30	28°28.83 · · 5.72	Pollux 243°16.16 27°57.73
22	40 1.47 55°3.94	161°57.02 28.65 176°56.24 29.40	141°47.56 39.74 156°48.01 39.91	283°32.30 22.16 298°34.92 22.20	43°31.29 5.71 58°33.75 5.70	Avior 234°14.08 -59°35.24
_						Suhail 222°45.61 -43°31.96
Mer.p	pass. 19:20	ν-0.8' d0.8' m-3.90	$\nu 0.5' \ d0.2' \ m1.31$	$\nu 2.6' \ d0.0' \ \text{m-}2.53$	$\nu 2.5' \ d$ -0.0' m0.91	Miaplacidus 221°37.78 -69°49.06
						Alphard 217°46.94 -8°46.16 Regulus 207°33.63 11°50.40
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.63 11°50.40 Dubhe 193°40.18 61°36.38
0	70°6.40	191°55.47 \$19°30.15	171°48.46	313°37.55 N21°22.23	73°36.20 <b>S</b> 04°5.68	Denebola 182°24.31 14°25.57
1	85°8.86	206°54.69 30.90	186°48.91 40.25	328°40.18 22.27	88° 38.66 5.67	Gienah 175°42.99 -17°41.03
2	100°11.33	221°53.92 31.64	201°49.36 40.42	343°42.81 22.30	103°41.11 5.66	Acrux 172°59.65 -63°14.29
3 4	115° 13.79	236°53.14 · · 32.39 251°52.36 33.13	216°49.81 · · 40.59 231°50.25 40.75	358°45.44 · · 22.33	118°43.57 · · 5.64	Gacrux 171°51.15 -57°15.24
5	130° 16.26 145° 18.72	251°52.36 33.13 266°51.58 33.88	231°50.25 40.75 246°50.70 40.92	13°48.08 22.37 28°50.71 22.40	133°46.02 5.63 148°48.48 5.62	Alioth 166°12.65 55°48.91
6	160°21.18	281°50.81 S19°34.62	261°51.15 \$23°41.09	43°53.34 N21°22.44	163°50.93 \$04°5.60	Spica 158°21.77 -11°17.72
7	175°23.65	296°50.03 35.36	276°51.60 41.26	58°55.97 22.47	178° 53.39 5.59	Alkaid 152°51.80 49°10.84
8	190°26.11	311°49.25 36.10	291°52.04 41.43	73°58.60 22.51	193°55.84 5.58	Hadar 148°35.53 -60°29.68 Menkent 147°57.10 -36°29.70
9	205°28.58	326°48.47 · · 36.84	306°52.49 · · 41.59	89°1.23 · · 22.54	208°58.30 · · 5.56	Arcturus 145°47.54 19°2.79
10	220°31.04	341°47.69 37.58	321°52.94 41.76	104°3.87 22.58	224°0.75 5.55	Rigil Kent. 139°39.91 -60°56.38
11	235°33.50	356°46.91 38.32	336°53.38 41.92	119°6.50 22.61	239°3.21 5.53	Kochab 137°20.88 74°2.71
12	250° 35.97	11°46.12 \$19°39.05	351°53.83 \$23°42.09	134°9.13 N21°22.65	254°5.66 \$04°5.52	Zuben'ubi 136°55.53 -16°8.90
13 14	265°38.43 280°40.90	26°45.34 39.79 41°44.56 40.52	6°54.28 42.25 21°54.72 42.42	149°11.77 22.68 164°14.40 22.72	269°8.11 5.51 284°10.57 5.49	Alphecca 126° 3.49 26° 37.60
15	295° 43.36	56° 43.78 · · 41.26	36°55.17 · · 42.58	179°17.04 · · 22.75	299°13.02 · · 5.48	Antares 112°15.33 -26°29.32
16	310° 45.83	71°42.99 41.99	51°55.61 42.75	194°19.67 22.79	314°15.47 5.46	Atria 107°9.48 -69°4.41
17	325°48.29	86°42.21 42.72	66°56.06 42.91	209°22.31 22.82	329°17.93 5.45	Sabik 102°2.30 -15°45.39 Shaula 96°9.80 -37°7.35
18	340°50.75	101°41.42 \$19°43.45	81°56.50 <b>S</b> 23°43.07	224°24.94 N21°22.86	344°20.38 <b>S</b> 04°5.43	Rasalhague 95°58.22 12°32.50
19	355° 53.22	116°40.64 44.18	96°56.95 43.23	239°27.58 22.89	359°22.83 5.42	Eltanin 90°42.36 51°29.18
20	10°55.68	131°39.85 44.91	111°57.39 43.40	254°30.22 22.93	14°25.29 5.40	Kaus Aust. 83°31.93 -34°22.37
21	25°58.15	146°39.07 · · 45.64	126°57.84 · · 43.56	269°32.85 · · 22.96	29°27.74 · · 5.39	Vega 80°33.12 38°48.55
22 23	41°0.61 56°3.07	161°38.28 46.37 176°37.49 47.09	141°58.28 43.72 156°58.73 43.88	284°35.49 23.00 299°38.13 23.04	44°30.19 5.37 59°32.64 5.36	Nunki 75°47.18 -26°15.90
						Altair 61°59.49 8°56.28
Mer.p	pass. 19:16	$\nu$ -0.8 $'$ d0.7 $'$ m-3.90	$ u 0.4' \ d0.2' \ m1.31$	$\nu$ 2.6′ $d$ 0.0′ m-2.54	$\nu 2.5' \ d$ -0.0' m0.91	Peacock 53°4.93 -56°39.28
						Deneb 49°25.56 45°22.59 Enif 33°38.18 9°59.74
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.18 9°59.74 Al Na'ir 27°32.07 -46°50.32
0	71°5.54	191°36.71 <b>S</b> 19°47.82	171°59.17 \$23°44.04	314°40.76 N21°23.07	74°35.09 <b>S</b> 04°5.34	Fomalhaut 15°13.69 -29°29.20
1	86°8.00	206°35.92 48.54	186°59.61 44.20	329°43.40 23.11	89°37.55 5.33	Scheat 13°44.47 28°13.62
2	101° 10.47	221°35.13 49.26	202°0.06 44.36	344°46.04 23.14	104°40.00 5.31	Markab 13°29.15 15°20.84
3	116° 12.93	236°34.34 · · 49.99	217° 0.50 · · 44.52	359°48.68 · · 23.18	119° 42.45 · · 5.30	
4	131°15.39	251°33.55 50.71	232°0.95 44.68	14°51.32 23.21	134°44.90 5.28	Nov 30 Sun SHA Mer.pass Venus 123°6.68 11:12
5 6	146° 17.86 161° 20.32	266° 32.76 51.43 281° 31.97 \$19° 52.15	247°1.39 44.84 262°1.83 \$23°44.99	29°53.96 23.25 44°56.60 N21°23.29	149° 47.35 5.27 164° 49.80 \$04° 5.25	Venus 123°6.08 11:12 Mars 102°30.38 12:33
7	176° 22.79	296°31.18 52.87	277°2.27 45.15	59°59.24 23.32	179°52.25 5.24	Jupiter 243°27.28 03:09
8	191°25.25	311°30.39 53.58	292°2.72 45.31	75°1.88 23.36	194°54.70 5.22	Saturn 3°29.95 19:06
9	206° 27.72	326°29.59 · · 54.30	307°3.16 · · 45.46	90°4.52 · · 23.39	209°57.15 · · 5.20	
10	221°30.18	341°28.80 55.02	322°3.60 45.62	105°7.16 23.43	224°59.60 5.19	Dec 01 Mon SHA Mer.pass Venus 121°49.07 11:13
11	236° 32.64	356°28.01 55.73	337° 4.04 45.77	120°9.80 23.47	240°2.05 5.17	Mars 101°42.06 12:32
12	251°35.11	11°27.21 \$19°56.44	352°4.49 \$23°45.93	135°12.44 N21°23.50	255°4.50 \$04°5.16	Jupiter 243°31.15 03:05
13 14	266° 37.57 281° 40.04	26°26.42 57.16 41°25.63 57.87	7°4.93 46.08 22°5.37 46.24	150°15.08 23.54 165°17.72 23.57	270°6.95 5.14 285°9.40 5.13	Saturn 3°29.80 19:02
14 15	281 40.04 296° 42.50	56°24.83 · · 58.58	37°5.81 · · 46.39	180°20.37 · · 23.61	300°11.85 · · 5.11	Dec 02 Tue SHA Mer.pass
16	311° 44.96	71°24.03 19°59.29	52°6.25 46.55	195°23.01 23.65	315°14.30 5.09	Dec 02 Tue SHA Mer.pass Venus 120°31.17 11:14
17	326° 47.43	86°23.24 20°0.00	67°6.69 46.70	210°25.65 23.68	330°16.75 5.08	Mars 100°53.63 12:32
18	341°49.89	101°22.44 \$20°0.70	82°7.13 <b>S</b> 23°46.85	225°28.30 N21°23.72	345°19.20 <b>S</b> 04°5.06	Jupiter 243°35.23 03:01
19	356° 52.36	116°21.65 1.41	97°7.58 47.00	240°30.94 23.76	0°21.65 5.04	Saturn 3°29.56 18:59
20	11°54.82	131°20.85 2.12	112°8.02 47.16	255°33.58 23.79	15°24.10 5.03	Horizontal parallax
21	26° 57.29 41° 59.75	146°20.05 · · 2.82	127° 8.46 · · 47.31	270°36.23 · · 23.83	30°26.55 · · 5.01 45°28.99 4.99	Venus: 0.1
22 23	41°59.75 57°2.21	161° 19.25 3.52 176° 18.45 4.23	142°8.90 47.46 157°9.34 47.61	285°38.87 23.87 300°41.52 23.90	45°28.99 4.99 60°31.44 4.98	Mars: 0.1
			-			
Mer.p	oass. 19:12	$\nu$ -0.8′ $d$ 0.7′ m-3.90	$ u 0.4' \; d0.2' \; { m m} 1.30$	$\nu 2.6' \ d0.0' \ \text{m-}2.54$	$ u 2.5' \ d$ -0.0' m0.92	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°51.56	S21°38.74	70°14.03	12.8'	N00°56.55	16.5'	58.7'
1	197°51.34	39.15	84° 45.83	12.8'	01°13.06	16.5'	58.7'
2	212°51.11 227°50.89	39.55	99° 17.58	12.7'	01°29.58	16.5	58.8'
3 4	227°50.89 242°50.66	· · 39.95 40.36	113° 49.29 128° 20.95	12.7' 12.6'	01°46.11 02°2.66	16.5' 16.6'	58.8' 58.9'
5	257°50.44	40.76	142° 52.55	12.5'	02° 19.22	16.6'	58.9'
6	272°50.21	S21°41.16	157° 24.10	12.5'	N02°35.79	16.6'	58.9'
7	287°49.98	41.56	171°55.59	12.4'	$02^{\circ}52.37$	16.6'	59.0'
8	302°49.76	41.96	186° 27.03	12.4'	03°8.95	16.6'	59.0'
9 10	317°49.53 332°49.30	• • 42.36	200° 58.41 215° 29.73	12.3'	03°25.55 03°42.15	16.6'	59.0'
11	347°49.07	42.76 43.16	215 29.73 230° 0.98	12.3' 12.2'	03°58.75	16.6' 16.6'	59.1' 59.1'
12	2°48.84	S21°43.55	244°32.18	12.1'	N04° 15.36	16.6'	59.2'
13	17°48.62	43.95	259°3.31	12.1'	04°31.97	16.6'	59.2'
14	32°48.39	44.34	273°34.37	12.0'	04° 48.57	16.6'	59.2'
15	47°48.16 62°47.93	• • 44.74	288°5.37 302°36.30	11.9'	05°5.18 05°21.78	16.6'	59.3'
16 17	77°47.70	45.13 45.53	302 36.30 317°7.16	11.9' 11.8'	05 21.78 05°38.37	16.6' 16.6'	59.3' 59.3'
18	92°47.47	\$21°45.92	331° 37.95	11.7'	N05°54.96	16.6'	59.4'
19	107°47.24	46.31	346°8.66	11.6'	06°11.54	16.6'	59.4'
20	122°47.01	46.70	0°39.30	11.6'	06°28.10	16.6'	59.5'
21	137°46.78	• • 47.09	15°9.86	11.5'	06°44.66	16.5'	59.5'
22 23	152°46.55 167°46.32	47.48 47.87	29° 40.35 44° 10.76	11.4' 11.3'	07°1.21 07°17.73	16.5' 16.5'	59.5' 59.6'
23			<del></del>			10.5	39.0
	SD = 16.2'	d = 0.4'		SE	O = 16.0'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°46.08	S21°48.26	58°41.08	11.2'	N07°34.24	16.5'	59.6'
1	197°45.85	48.65	73°11.33	11.2'	$07^{\circ}50.74$	16.5'	59.6'
2	212°45.62	49.04	87°41.49	11.1'	08°7.21	16.5'	59.7'
3	227°45.39	• • 49.42	102°11.56	11.0'	08°23.66 08°40.09	16.4	59.7'
4 5	242°45.16 257°44.92	49.81 50.19	116° 41.55 131° 11.45	10.9' 10.8'	08° 40.09 08° 56.49	16.4' 16.4'	59.7' 59.8'
6	272°44.69	S21°50.58	145°41.26	10.7'	N09° 12.86	16.3	59.8'
7	287°44.46	50.96	160° 10.98	10.6'	09°29.20	16.3'	59.8'
8	302°44.22	51.34	174°40.61	10.5'	09°45.52	16.3'	59.9'
9	317°43.99	• • 51.72	189° 10.15	10.4'	10°1.80	16.2'	59.9'
10 11	332°43.75 347°43.52	52.11 52.49	203°39.59 218°8.93	10.3' 10.2'	10° 18.04 10° 34.25	16.2' 16.2'	59.9' 60.0'
12	2°43.29	S21°52.87	232° 38.17	10.2	N10°50.42	16.1	60.0
13	17°43.05	53.24	247°7.32	10.0'	11°6.55	16.1	60.0'
14	32°42.81	53.62	261°36.36	9.9'	11°22.63	16.0'	60.1'
15	47°42.58	• • 54.00	276°5.31	9.8'	11°38.68	16.0'	60.1'
16 17	62°42.34 77°42.11	54.38 54.75	290°34.15 305°2.88	9.7' 9.6'	11°54.67 12°10.62	15.9' 15.9'	60.1' 60.2'
18	92°41.87	54.75 S21°55.13	319° 31.51	9.5	N12°26.51	15.8'	60.2
19	107°41.63	55.50	334°0.04	9.4'	12° 42.35	15.8'	60.2'
20	122°41.40	55.88	348°28.45	9.3'	12°58.14		60.3'
21	137°41.16	• • 56.25	2°56.75	9.2'	13° 13.87	15.7'	60.3'
22 23	152°40.92 167°40.69	56.62 56.99	17°24.95 31°53.03	9.1' 9.0'	13°29.54 13°45.15	15.6' 15.5'	60.3' 60.4'
23			31 55.05			15.5	00.4
	SD = 16.2'	d = 0.4'		SL	D = 16.3'		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°40.45	S21°57.36	46°21.00	8.9'	N14°0.70	15.5'	60.4'
1	197°40.21	57.74	60°48.85	8.7'	14° 16.18	15.4	60.4
2	212°39.97 227°39.73	58.10 •• 58.47	75° 16.59 89° 44.21	8.6'	14°31.60 14°46.94	15.3'	60.5'
3 4	227°39.73 242°39.49	58.47	89°44.21 104°11.72	8.5' 8.4'	14°46.94 15°2.21	15.3' 15.2'	60.5' 60.5'
5	257°39.25	59.21	118°39.10	8.3'	15° 17.41	15.1	60.5
6	272°39.01	S21°59.58	133°6.37	8.1'	N15°32.53	15.0'	60.6'
7	287°38.77	21°59.94	147°33.51	8.0'	15° 47.57	15.0'	60.6'
8 9	302°38.53 317°38.29	22°0.31 · · 0.67	162°0.54 176°27.44	7.9' 7.8'	16°2.53 16°17.40	14.9' 14.8'	60.6' 60.6'
10	317 38.29 332°38.05	1.03	176°27.44 190°54.22	7.8° 7.7'	16° 17.40 16° 32.20	14.8	60.7
11	347°37.81	1.40	205° 20.87	7.5'	16° 46.90	14.6'	60.7'
12	2°37.57	\$22°1.76	219°47.40	7.4'	N17°1.51	14.5'	60.7'
13	17°37.33	2.12	234° 13.80	7.3'	17°16.03	14.4'	60.7'
14	32°37.09	2.48	248° 40.08 263° 6.23	7.1'	17° 30.45 17° 44.78	14.3'	60.8'
15 16	47°36.85 62°36.60	· · 2.84	263° 6.23 277° 32.25	7.0' 6.9'	17° 44.78 17° 59.00	14.2' 14.1'	60.8' 60.8'
17	77°36.36	3.56	291°58.14	6.8'	18° 13.13	14.1	60.8
18	92°36.12	S22°3.92	306° 23.91	6.6'	N18° 27.15	13.9'	60.9'
19	107°35.88	4.27	320° 49.54	6.5'	18°41.06	13.8'	60.9'
20	122°35.63	4.63	335° 15.05	6.4'	18°54.86	13.7'	60.9'
21 22	137°35.39 152°35.15	· · 4.98 5.34	349° 40.42 4° 5.67	6.2' 6.1'	19°8.55 19°22.13	13.6' 13.5'	60.9' 61.0'
23	152 35.15 167°34.90	5.34	4 5.67 18° 30.78	6.0'	19 22.13 19°35.58	13.3'	61.0'
	SD = 16.2'	d = 0.4'			O = 16.5'		
	JD — 10.2	u — 0.4		JL	J — 10.3		

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

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	68-87%	
30	11:26	11:15	11:49	19:57	07:33		
01	11:04	10:53	11:49	20:48	08:22		
02	10:42	10:30	11:49	21:43	09:15		

### December 03, 04, 05 UT (Wed., Thu., Fri.)

h	Aries	Venus	5	Ma	ars	Jup	oiter	Sat	urn		Stars	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	72°4.68		20°4.93	172°9.78	S23°47.76	315°44.16	N21°23.94	75°33.89	S04°4.96			
1	87°7.14	$206^{\circ}16.85$	5.63	$187^{\circ}10.22$	47.91	$330^{\circ}46.81$	23.98	90°36.34	4.94	Alpheratz	357°33.89 353°6.24	29°14.23 -42°10.05
2	102°9.61	221°16.05	6.33	$202^{\circ}10.66$	48.06	345°49.46	24.01	105°38.78	4.93	Ankaa Schedar	349°29.93	56°41.07
3	117° 12.07		• • 7.03	217°11.10	• • 48.21	0°52.10	• • 24.05	120°41.23	• • 4.91	Diphda	348°46.40	-17°50.69
4	132° 14.53	251°14.45	7.73	232°11.53	48.35	15°54.75	24.09	135°43.68 150°46.13	4.89	Achernar	$335^{\circ}19.22$	-57° 6.46
5 6	147° 17.00 162° 19.46	266° 13.65 281° 12.84 S	8.42 20°9.12	247°11.97 262°12.41	48.50 \$23°48.65	30°57.40 46°0.05	24.13 N21°24.16	165° 48.57	4.87 \$04°4.86	Hamal	$327^{\circ}50.09$	23°35.25
7	177°21.93	296°12.04	9.81	277°12.85	48.80	61°2.69	24.20	180°51.02	4.84	Polaris	313°11.44	89°22.54
8	192°24.39	311°11.24	10.51	292°13.29	48.94	76°5.34	24.24	195°53.47	4.82	Acamar	315°10.82	-40°12.08
9	207°26.86	326°10.43 •	• 11.20	$307^{\circ}13.73$	• • 49.09	91°7.99	• • 24.27	$210^{\circ}55.91$	• • 4.80	Menkar Mirfak	314°5.08 308°26.71	4°11.56 49°57.32
10	222°29.32	341°9.63	11.89	322°14.17	49.24	106°10.64	24.31	225°58.36	4.79	Aldebaran	290°38.43	16°33.74
11	237°31.78	356°8.82	12.58	337°14.60	49.38	121°13.29	24.35	241°0.80	4.77	Rigel	281°2.82	-8°10.23
12 13	252°34.25 267°36.71	11°8.02 <b>S</b> 2 26°7.21	20°13.27 13.96	352°15.04 7°15.48	\$23°49.53 49.67	136° 15.94 151° 18.59	N21°24.39 24.42	256°3.25 271°5.69	\$04°4.75 4.73	Capella	$280^{\circ}20.32$	46°1.43
14	282°39.18	41°6.41	14.65	7 15.46 22°15.92	49.81	166°21.24	24.42	286°8.14	4.73	Bellatrix	278°21.76	6°22.44
15	297°41.64		• 15.34	37°16.35	• • 49.96	181°23.89	24.50	301°10.59	4.70	Elnath	278°0.56	28°37.76
16	$312^{\circ}44.10$	71°4.79	16.02	52°16.79	50.10	$196^{\circ}26.54$	24.54	$316^{\circ}13.03$	4.68	Alnilam	275° 36.65 270° 50.96	-1°11.06 7°24.75
17	327° 46.57	86°3.98	16.71	67°17.23	50.24	211°29.19	24.58	331°15.48	4.66	Betelgeuse Canopus	263°51.55	-52°42.38
18	342°49.03		20°17.39	82°17.67	\$23°50.39	226°31.84	N21°24.61	346°17.92	S04°4.64	Sirius	258°25.28	-16°45.00
19	357°51.50	116°2.37	18.07	97°18.10 112°18.54	50.53	241°34.49	24.65	1°20.36	4.62	Adhara	255°4.96	-29°0.29
20 21	12°53.96 27°56.43	131°1.56 146°0.75	18.76 • 19.44	112 18.54 127°18.97	50.67 •• 50.81	256°37.14 271°39.80	24.69 •• 24.73	16°22.81 31°25.25	4.61 •• 4.59	Procyon	$244^{\circ}49.81$	5°9.53
22	42°58.89	160°59.94	20.12	142°19.41	50.95	286°42.45	24.76	46°27.70	4.57	Pollux	243°16.14	27°57.72
23	58°1.35	175°59.12	20.79	157° 19.85	51.09	301°45.10	24.80	61°30.14	4.55	Avior	234° 14.04	-59°35.26
Mari	10:00	$\nu$ -0.8' $d$ 0.7' $_{\rm I}$	m 2 00	$\nu$ 0.4' d0.	1/ m1 20	1/2 6 <sup>1</sup> d0	0′ m-2.55	$\nu 2.4' \ d-0.$	0′ m0 02	Suhail Miaplacidus	222°45.58 221°37.73	-43°31.98 -69°49.08
ivier.p	pass. 19:09	ν-υ.ο αυ.τ Ι	111-3.90	νυ.4 <i>α</i> υ.	1 1111.29	ν2.0 a0.	U III-2.33	ν∠.4 α-U.	0 1110.92	Alphard	221 37.73 217°46.92	-8°46.18
<b>-</b> .	6114	6114	_	6114		6114	_	6114	-	Regulus	207°33.60	11°50.38
Thu 0	<b>GHA</b> 73°3.82	<b>GHA</b> 190°58.31 <b>S</b> 2	<b>Dec</b> 20°21.47	<b>GHA</b> 172°20.28	<b>Dec</b> \$23°51.23	<b>GHA</b> 316°47.76	<b>Dec</b> N21°24.84	<b>GHA</b> 76°32.58	<b>Dec</b> <b>S</b> 04°4.53	Dubhe	$193^{\circ}40.14$	61°36.37
1	88° 6.28	205° 57.50	22.15	172 20.28 187°20.72	51.37	331°50.41	24.88	91°35.03	4.51	Denebola	182°24.29	14°25.56
2	103°8.75	220° 56.69	22.83	202°21.15	51.51	346°53.06	24.92	106°37.47	4.49	Gienah Acrux	175° 42.97 172° 59.60	-17°41.04 -63°14.29
3	$118^{\circ}11.21$	235°55.88 ·	• 23.50	$217^{\circ}21.59$	•• 51.65	1°55.72	• • 24.96	121°39.91	• • 4.48			-03 14.29 -57°15.24
4	133° 13.68	250°55.06	24.17	232°22.02	51.79	16°58.37	24.99	136° 42.36	4.46	Alioth	166° 12.63	55°48.89
5	148° 16.14	265°54.25	24.85	247°22.46	51.92	32°1.03	25.03	151°44.80	4.44	Spica	$158^{\circ}21.75$	-11°17.73
6 7	163° 18.60 178° 21.07	280°53.43 <b>S</b> 2 295°52.62	20°25.52 26.19	262°22.89 277°23.33	\$23°52.06 52.20	47°3.68 62°6.34	N21°25.07 25.11	166° 47.24 181° 49.69	\$04°4.42 4.40	Alkaid	$152^{\circ}51.78$	49°10.83
8	176 21.07 193°23.53	310°51.80	26.19	211 23.33 292°23.76	52.20	77°9.00	25.11	196° 52.13	4.40	Hadar	148°35.49	-60°29.67
9	208° 26.00	325°50.99 ·		307°24.20	• • 52.47	92°11.65	. 25.19	211°54.57	• • 4.36	Menkent		-36°29.70
10	223°28.46	340°50.17	28.20	322°24.63	52.60	$107^{\circ}14.31$	25.22	226°57.01	4.34	Arcturus Rigil Kent.	145°47.52 139°39.88	19°2.78 -60°56.37
11	238° 30.92	355° 49.35	28.86	337°25.06	52.74	122°16.97	25.26	241°59.45	4.32	Kochab	137°20.86	74° 2.70
12	253°33.39		20°29.53	352°25.50	\$23°52.87	137°19.62	N21°25.30	257°1.90	S04°4.30	Zuben'ubi	136°55.52	-16°8.90
13 14	268° 35.85 283° 38.32	25°47.72 40°46.90	30.19 30.86	7°25.93 22°26.36	53.01 53.14	152°22.28 167°24.94	25.34 25.38	272°4.34 287°6.78	4.28 4.26	Alphecca	$126^{\circ}3.48$	26°37.59
15	298° 40.78		· 31.52	37°26.80	53.27	182°27.60	• • 25.42	302°9.22	• • 4.24	Antares	112°15.32	-26°29.32
16	313°43.25	70°45.26	32.18	52°27.23	53.41	197°30.26	25.46	317°11.66	4.22	Atria Sabik	107°9.46 102°2.30	-69°4.40 -15°45.39
17	$328^{\circ}45.71$	85°44.44	32.84	67°27.66	53.54	$212^{\circ}32.91$	25.50	$332^{\circ}14.10$	4.20	Shaula	96°9.80	-37° 7.35
18	343°48.17		20°33.50	82°28.10	\$23°53.67	227°35.57	N21°25.53	347° 16.54	S04°4.18	Rasalhague	95°58.21	12°32.50
19	358°50.64 13°53.10	115°42.80 130°41.98	34.16 34.82	97°28.53 112°28.96	53.80 53.93	242°38.23 257°40.89	25.57 25.61	2°18.98 17°21.42	4.16 4.14	Eltanin	$90^{\circ}42.37$	51°29.17
20 21	28° 55.57		• 35.47	112 28.90 127°29.39	• • 54.07	272°43.55	25.65	32° 23.86	• • 4.12	Kaus Aust.	83°31.93	-34°22.36
22	43°58.03	160°40.34	36.13	142°29.83	54.20	287°46.21	25.69	47°26.30	4.10	Vega	80°33.13 75°47.18	38°48.54 -26°15.90
23	59°0.50	175°39.52	36.78	157°30.26	54.33	302°48.87	25.73	62°28.74	4.08	Nunki Altair	61°59.50	8°56.28
Mer r	pass. 19:05	ν-0.8' d0.7' ı	m-3 90	$\nu$ 0.4' d0.	1′ m1 29	$\nu 2.7' d0$	0′ m-2.55	$\nu 2.4' \ d-0.$	0′ m0 93	Peacock	53°4.95	-56°39.27
										Deneb	$49^{\circ}25.58$	45°22.59
E:	Cnv	CHV	Dec	CUA	Doc	CHV	Doc	GHA	Dec	Enif	33°38.18	9°59.74
Fri 0	<b>GHA</b> 74°2.96	<b>GHA</b> 190°38.69 <b>S</b> 2	<b>Dec</b> 20°37.44	<b>GHA</b> 172°30.69	<b>Dec</b> \$23°54.45	<b>GHA</b> 317°51.54	<b>Dec</b> N21°25.77	<b>GHA</b> 77°31.18	<b>S</b> 04°4.06	Al Na'ir	27°32.09	-46°50.32
1	89°5.42	205° 37.87	38.09	187°31.12	54.58	332°54.20	25.81	92°33.62	4.04	Fomalhaut Scheat	15° 13.70 13° 44.48	-29°29.20 28°13.62
2	104°7.89	220°37.04	38.74	202°31.55	54.71	347°56.86	25.85	107°36.06	4.02	Markab	13° 44.46 13° 29.16	26 13.02 15°20.83
3	119° 10.35		• 39.39	217°31.98	• • 54.84	2°59.52	• • 25.89	122°38.50	• • 4.00			
4	134°12.82	250°35.40	40.04	232°32.41	54.97	18°2.18	25.93	137°40.94	3.98	Dec 03 Wed	SHA 110°12.07	Mer.pass
5	149° 15.28 164° 17.75	265°34.57 280°33.74 <b>S</b> 2	40.69	247°32.84 262°33.28	55.10 \$23°55.22	33°4.85 48°7.51	25.97 N21°26.01	152°43.38 167°45.82	3.96 \$04°3.94	Venus Mars	119° 12.97 100° 5.10	11:15 12:31
6 7	17.75 179° 20.21	280 33.74 <b>5</b> 2 295°32.92	41.98	202 33.28 277°33.71	55.35	48 7.51 63°10.17	26.05	182° 48.25	3.94	Jupiter		02:57
8	194° 22.67	310°32.09	42.63	292°34.14	55.47	78°12.84	26.09	197°50.69	3.89	Saturn	3°29.21	18:55
9	$209^{\circ}25.14$	325°31.26 ·	• 43.27	307°34.57	• • 55.60	$93^{\circ}15.50$	• • 26.13	212°53.13	• • 3.87			
10	224° 27.60	340°30.44	43.92	322°35.00	55.73	108°18.16	26.17	227°55.57	3.85	Dec 04 Thu Venus	<b>SHA</b> 117°54.49	Mer.pass 11:17
11	239°30.07	355°29.61	44.56	337°35.43	55.85	123°20.83	26.20	242°58.01	3.83	Mars	99° 16.46	12:30
12 13	254°32.53 269°35.00	10°28.78 <b>S</b> 2 25°27.95	20°45.20 45.84	352°35.86 7°36.29	\$23°55.97 56.10	138°23.49 153°26.16	N21°26.24 26.28	258°0.44 273°2.88	\$04°3.81 3.79	Jupiter	243°43.94	02:52
14	284° 37.46	40°27.12	45.64	22°36.71	56.22	168°28.83	26.28	273 2.00 288°5.32	3.79	Saturn	3°28.77	18:51
15	299°39.92		• 47.12	37°37.14	56.34	183°31.49	26.36	303°7.76	• • 3.74	Dec 05 Fri	SHA	Mer.pass
16	$314^{\circ}42.39$	70°25.46	47.75	52°37.57	56.47	$198^{\circ}34.16$	26.40	$318^{\circ}10.19$	3.72	Venus		11:18
17	329° 44.85	85°24.63	48.39	67°38.00	56.59	213°36.82	26.44	333°12.63	3.70	Mars	98°27.73	12:30
18	344° 47.32 359° 49.78		20°49.03 49.66	82°38.43 97°38.86	\$23°56.71	228°39.49 243°42.16	N21°26.49 26.53	348° 15.07 3° 17.50	S04°3.68	Jupiter		02:48
19 20	359 49.78 14°52.25	115°22.96 130°22.13	50.29	97 38.86 112°39.29	56.83 56.95	243 42.16 258°44.83	26.53 26.57	3 17.50 18° 19.94	3.66 3.63	Saturn	3°28.22	18:47
21	29°54.71		• 50.92	127°39.72	57.07	273°47.49	26.61	33°22.37	• • 3.61	Horizor	ıtal parallax	
22	44°57.17	$160^{\circ}20.46$	51.56	142°40.14	57.19	$288^{\circ}50.16$	26.65	48°24.81	3.59		Venus:	0.1
23	59° 59.64	175°19.63	52.19	157°40.57	57.31	303°52.83	26.69	63°27.25	3.57		Mars:	0.1
Mer.p	pass. 19:01	ν-0.8′ d0.7′ ı	m-3.90	$\nu$ 0.4′ d0.	1′ m1.28	$\nu$ 2.7′ d0.	0′ m-2.56	$\nu$ 2.4′ d-0.	0′ m0.93			

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°34.66	\$22°6.05	32°55.77	ν 5.9'	N19° 48.92	13.2'	61.0'
1	197°34.41	6.40	47°20.62	5.7'	20°2.14	13.1'	61.0
2	212°34.17	6.75	61°45.34	5.6'	20° 15.23	13.0'	61.0'
3	227°33.92	7.10	76°9.93	5.5'	20°28.20	12.8'	61.0'
4	242°33.68	7.45	90°34.39	5.3'	20°41.03	12.7'	61.1'
5	257°33.43	7.80	104°58.72	5.2'	20°53.74	12.6'	61.1'
6	272°33.19	\$22°8.15	119°22.92	5.1'	$N21^{\circ}6.31$	12.4'	61.1'
7	287°32.94	8.50	133°46.99	4.9'	21°18.75	12.3'	61.1'
8	302°32.70	8.85	148°10.92	4.8'	21°31.04	12.2'	61.1'
9	317°32.45	• • 9.19	162°34.73	4.7'	21°43.19	12.0'	61.1'
10	332°32.20	9.54	176°58.41	4.5'	21°55.21	11.9'	61.2'
11	347°31.95	9.88	191°21.96	4.4'	22°7.07	11.7'	61.2'
12	2°31.71	\$22°10.23	205°45.38	4.3'	N22° 18.78	11.6'	61.2'
13	17°31.46	10.57	220°8.67	4.2'	22°30.35	11.4'	61.2'
14 15	32°31.21 47°30.96	10.91 •• 11.26	234°31.83 248°54.87	4.0' 3.9'	22°41.76 22°53.01	11.3' 11.1'	61.2' 61.2'
16	62°30.72	11.60	263°17.79	3.8'	22 55.01 23°4.11	10.9'	61.2
17	77°30.47	11.00	277°40.58	3.7'	23° 15.05	10.8	61.3
18	92°30.22	S22°12.28	292°3.24	3.5'	N23° 25.82	10.6'	61.3
19	107°29.97	12.62	306°25.78	3.4	23°36.43	10.4	61.3
20	122°29.72	12.96	320°48.21	3.3'	23°46.87	10.4	61.3
21	137°29.47	• • 13.29	335°10.51	3.2'	23°57.14	10.1	61.3
22	152°29.22	13.63	349°32.69	3.1'	24°7.24	9.9'	61.3'
23	167°28.97	13.97	3°54.76	3.0'	24° 17.17	9.7'	61.3'
	SD = 16.2'	d 0 4/					
	$3\nu = 10.2'$	d = 0.4'		5	D = 16.6'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°28.72	<b>S</b> 22°14.30	18°16.71	2.8'	N24° 26.92	9.6'	61.3'
1	197°28.47	14.64	32°38.55	2.7'	24° 36.49	9.4'	61.3'
2	212°28.22	14.97	47°0.28	2.6'	24° 45.88	9.2'	61.3'
3	227°27.97	• • 15.30	61°21.89	2.5'	24°55.08	9.0'	61.3'
4	242°27.72	15.64	75°43.40	2.4'	25°4.11	8.8'	61.3'
5	257°27.47 272°27.21	15.97 \$22°16.30	90°4.80	2.3'	25°12.94	8.6'	61.3'
6	272°27.21 287°26.96	16.63	104°26.10 118°47.29	2.2' 2.1'	N25°21.59 25°30.05	8.5' 8.3'	61.3'
7 8	302°26.71	16.63	118 47.29 133°8.38	2.1	25°30.05	8.1'	61.3' 61.3'
9	317°26.46	10.90	147°29.38	1.9'	25° 46.38	7.9'	61.3
10	332°26.20	17.62	161°50.28	1.8'	25°54.25	7.7'	61.3
11	347°25.95	17.94	176°11.08	1.7'	26°1.93	7.5'	61.3
12	2°25.70	S22°18.27	190°31.80	1.6'	N26°9.41	7.3'	61.3
13	17°25.45	18.60	204°52.43	1.5'	26° 16.68	7.1'	61.3'
14	32°25.19	18.92	219°12.97	1.5'	26° 23.75	6.9'	61.3'
15	47°24.94	· · 19.25	233°33.43	1.4'	26°30.62	6.7'	61.3'
16	62°24.68	19.57	247°53.81	1.3'	26° 37.28	6.5'	61.3'
17	77°24.43	19.89	262°14.11	1.2'	26°43.73	6.2'	61.3'
18	92°24.17	\$22°20.21	276°34.34	1.2'	N26°49.97	6.0'	61.3'
19	107°23.92	20.53	290°54.50	1.1'	26°56.00	5.8'	61.3'
20	122°23.66	20.86	305°14.59	1.0'	27°1.82	5.6'	61.3'
21	137°23.41 152°23.15	· · 21.17 21.49	319°34.61 333°54.57	1.0' 0.9'	27°7.43 27°12.82	5.4' 5.2'	61.3' 61.3'
22 23	152 23.15 167°22.90	21.49	333 54.57 348°14.48	0.9	27 12.82 27°18.00	5.2 5.0'	61.3
23			346 14.46			5.0	01.5
	SD = 16.2'	d = 0.3'		S	D = 16.7'		
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°22.64	522°22.13	2°34.32	0.8'	N27°22.96	4.7'	61.3'
1	197°22.38	22.45	$16^{\circ}54.12$	0.7'	$27^{\circ}27.70$	4.5'	61.3'
2	212°22.13	22.76	31°13.87	0.7'	27°32.23	4.3'	61.3'
3	227°21.87	•• 23.08	45°33.58	0.7'	27°36.53	4.1'	61.3'
4	242°21.61	23.39	59°53.24	0.6'	27°40.61	3.9'	61.3'
5	257°21.36	23.71	74°12.86	0.6'	27° 44.48	3.6'	61.3'
6	272°21.10	\$22°24.02	88°32.46	0.6'	N27°48.12	3.4'	61.2'
7	287°20.84 302°20.58	24.33	102°52.02 117°11.55	0.5'	27°51.54 27°54.73	3.2'	61.2'
8 9	302°20.58 317°20.33	24.64 •• 24.95	117°11.55 131°31.06	0.5' 0.5'	27°54.73 27°57.70	3.0' 2.7'	61.2' 61.2'
10	317 20.33 332°20.07	25.26	131 31.00 145°50.55	0.5	28°0.45	2.7	61.2'
11	347°19.81	25.20	145 50.55 160°10.03	0.5	28°2.97	2.3'	61.2'
12	2°19.55	\$22°25.88	174°29.50	0.5'	N28°5.27	2.1'	61.2
13	17°19.29	26.19	188°48.95	0.5'	28°7.34	1.8'	61.2'
14	32°19.03	26.50	203°8.41	0.5'	28°9.19	1.6'	61.1'
15	47°18.77	• • 26.80	$217^{\circ}27.86$	0.5'	$28^{\circ}10.82$	1.4'	61.1'
16	62°18.51	27.11	231°47.32	0.5'	28° 12.21	1.2'	61.1'
17	77°18.25	27.41	246°6.78	0.5'	28°13.38	0.9'	61.1'
18	92°17.99	\$22°27.72	260°26.26	0.5'	N28° 14.33	0.7'	61.1'
19	107°17.73	28.02	274°45.75	0.5'	28° 15.05	0.5'	61.1'
20	122°17.47	28.32	289°5.26	0.5'	28° 15.55	0.3'	61.0'
21 22	137°17.21 152°16.95	· · 28.62 28.92	303°24.79 317°44.35	0.6' 0.6'	28° 15.82 28° 15.87	0.0' -0.2'	61.0'
22	152°16.95 167°16.68	28.92	317°44.35 332°3.94	0.6'	28° 15.87 28° 15.70	-0.2° -0.4°	61.0' 61.0'
23						-0.4	01.0
	SD = 16.2'	d = 0.3'		S	D = 16.7'		

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

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

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.	Pass.	Age	
Duy	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	13-15	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-100%	
03	10:19	10:07	11:50	22:44	10:13		
04	09:55	09:43	11:50	23:49	11:16		
05	09:31	09:18	11:51	-:-	12:23		

# December 06, 07, 08 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	75°2.10	190°18.79 \$20°52.81	172°41.00 \$23°57.43	318°55.50 N21°26.73	78°29.68 <b>S</b> 04°3.55	Alpheratz 357°33.90 29°14.24
1 2	90°4.57 105°7.03	205°17.96 53.44 220°17.12 54.07	187°41.43 57.55 202°41.85 57.67	333°58.17 26.77 349°0.84 26.81	93°32.12 3.52 108°34.55 3.50	Ankaa 353°6.24 -42°10.06
3	105 7.03 120° 9.50	235°16.29 · · 54.69	217° 42.28 · · 57.78	4°3.51 · · 26.85	123°36.99 · · 3.48	Schedar 349°29.94 56°41.08
4	135° 11.96	250°15.45 55.32	232°42.71 57.90	19°6.18 26.89	138°39.42 3.46	Diphda 348°46.40 -17°50.69
5	$150^{\circ}14.42$	265°14.62 55.94	247°43.14 58.02	34°8.85 26.93	153°41.86 3.43	Achernar 335°19.23 -57°6.47 Hamal 327°50.09 23°35.25
6	165° 16.89	280°13.78 S20°56.56	262°43.56 \$23°58.14	49°11.52 N21°26.97	168°44.29 S04°3.41	Polaris 313°11.52 89°22.56
7 8	180° 19.35 195° 21.82	295°12.94 57.19 310°12.10 57.81	277°43.99 58.25 292°44.42 58.37	64°14.19 27.01 79°16.86 27.05	183°46.72 3.39 198°49.16 3.37	Acamar 315°10.82 -40°12.09
9	210°24.28	325°11.26 · · 58.43	307°44.84 · · 58.48	94°19.53 · · 27.09	213°51.59 · · 3.34	Menkar 314°5.07 4°11.56
10	225° 26.75	340°10.42 59.04	322°45.27 58.60	109°22.21 27.13	228°54.03 3.32	Mirfak 308°26.70 49°57.33 Aldebaran 290°38.41 16°33.74
11	240°29.21	355°9.58 20°59.66	337°45.69 58.71	124°24.88 27.18	243°56.46 3.30	Rigel 281°2.81 -8°10.24
12	255°31.67 270°34.14	10°8.74 <b>S</b> 21°0.28 25°7.90 0.89	352°46.12 \$23°58.82 7°46.55 58.94	139°27.55 N21°27.22 154°30.22 27.26	258°58.89 \$04°3.27 274°1.33 3.25	Capella 280°20.29 46°1.44
13 14	285°36.60	25°7.90 0.89 40°7.06 1.51	7°46.55 58.94 22°46.97 59.05	154°30.22 27.26 169°32.90 27.30	274°1.33 3.25 289°3.76 3.23	Bellatrix 278°21.74 6°22.43
15	300°39.07	55°6.22 · · 2.12	37°47.40 · · 59.16	184°35.57 · · 27.34	304°6.19 · · 3.20	Elnath 278° 0.54 28° 37.76 Alnilam 275° 36.63 -1° 11.07
16	315° 41.53	70°5.38 2.73	52°47.82 59.27	199°38.24 27.38	319°8.62 3.18	Betelgeuse 270°50.94 7°24.74
17	330° 43.99	85°4.54 3.34	67°48.25 59.39	214°40.92 27.42	334°11.06 3.16	Canopus 263°51.53 -52°42.40
18 19	345° 46.46 0° 48.92	100°3.69 <b>S</b> 21°3.95 115°2.85 4.56	82°48.67 \$23°59.50 97°49.10 59.61	229°43.59 N21°27.46 244°46.27 27.51	349°13.49	Sirius 258°25.26 -16°45.01
20	15°51.39	130°2.01 5.17	112°49.52 59.72	259°48.94 27.55	19° 18.35 3.09	Adhara 255°4.94 -29°0.30
21	$30^{\circ}53.85$	145°1.16 · · 5.78	127°49.95 · · 59.83	274°51.62 · · 27.59	34°20.79 · · 3.06	Procyon 244°49.79 5°9.52 Pollux 243°16.10 27°57.72
22	45°56.32	160°0.32 6.38	142°50.37 23°59.94	289°54.30 27.63	49°23.22 3.04	Avior 234°14.01 -59°35.28
23	60°58.78	174°59.47 6.99	157°50.79 24°0.05	304°56.97 27.67	64°25.65 3.01	Suhail 222°45.54 -43°31.99
Mer. <sub>I</sub>	pass. 18:57	$\nu$ -0.8 $'$ $d$ 0.6 $'$ m-3.90	$ u 0.4' \ d 0.1' \ m 1.28$	$ u 2.7' \ d0.0' \ \text{m-}2.57$	$\nu 2.4' \ d\text{-}0.0' \ \text{m}0.93$	Miaplacidus 221°37.68 -69°49.09
						Alphard 217°46.89 -8°46.19
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.57 11°50.37 Dubhe 193°40.09 61°36.36
0	76°1.24	189°58.63 <b>S</b> 21°7.59	172°51.22 \$24°0.16	319°59.65 N21°27.71	79°28.08 \$04°2.99	Denebola 182°24.26 14°25.55
1	91°3.71 106°6.17	204°57.78 8.19 219°56.93 8.79	187°51.64 0.26 202°52.06 0.37	335°2.32 27.75 350°5.00 27.80	94°30.51 2.97 109°32.94 2.94	Gienah 175°42.93 -17°41.05
2	106 6.17 121°8.64	219°56.93 8.79 234°56.09 • 9.39	202°52.06 0.37 217°52.49 · · 0.48	350°5.00 27.80 5°7.68 · · 27.84	109°32.94 2.94 124°35.37 · · 2.92	Acrux 172°59.55 -63°14.29
4	136° 11.10	249°55.24 9.99	232°52.91 0.58	20°10.36 27.88	139° 37.80 2.89	Gacrux 171°51.06 -57°15.24 Alioth 166°12.59 55°48.87
5	151° 13.57	264°54.39 10.59	247°53.33 0.69	35°13.03 27.92	154°40.24 2.87	Spica 158°21.72 -11°17.74
6	166° 16.03	279°53.54 S21°11.19	262°53.76 \$24°0.80	50°15.71 N21°27.96	169° 42.67 S04° 2.84	Alkaid 152°51.75 49°10.81
7 8	181° 18.49 196° 20.96	294°52.69 11.78 309°51.84 12.38	277°54.18 0.90 292°54.60 1.01	65°18.39 28.01 80°21.07 28.05	184° 45.10 2.82 199° 47.53 2.79	Hadar 148°35.44 -60°29.67
9	211°23.42	324°50.99 · · 12.97	307°55.03 · · 1.11	95°23.75 · · 28.09	214°49.96 · · 2.77	Menkent 147°57.04 -36°29.70
10	226° 25.89	339°50.14 13.57	322°55.45 1.22	110°26.43 28.13	229° 52.39 2.75	Arcturus 145°47.50 19°2.76 Rigil Kent. 139°39.83 -60°56.36
11	241°28.35	354°49.29 14.16	337°55.87 1.32	125°29.11 28.17	244°54.81 2.72	Kochab 137°20.84 74°2.68
12	256° 30.82 271° 33.28	9°48.44 S21°14.75 24°47.59 15.34	352°56.29	140°31.79 N21°28.22 155°34.47 28.26	259°57.24 S04°2.70 274°59.67 2.67	Zuben'ubi 136°55.49 -16°8.91
13 14	271 33.28 286°35.74	24°47.59 15.34 39°46.74 15.93	7°56.71 1.53 22°57.14 1.63	155°34.47 28.26 170°37.15 28.30	274°59.67 2.67 290°2.10 2.65	Alphecca 126° 3.46 26° 37.57
15	301°38.21	54°45.88 · · 16.51	37°57.56 · · 1.73	185°39.83 · · 28.34	305°4.53 · · 2.62	Antares 112°15.30 -26°29.32 Atria 107°9.42 -69°4.38
16	316° 40.67	69°45.03 17.10	52°57.98 1.83	200°42.51 28.39	320°6.96 2.60	Sabik 102°2.28 -15°45.39
17	331° 43.14	84°44.18 17.69	67°58.40 1.93	215°45.20 28.43	335°9.39 2.57	Shaula 96° 9.78 -37° 7.34
18 19	346° 45.60 1° 48.07	99°43.32 <b>S</b> 21°18.27 114°42.47 18.85	82°58.82 <b>S</b> 24°2.03 97°59.24 2.13	230°47.88 N21°28.47 245°50.56 28.51	350°11.82 S04°2.54 5°14.24 2.52	Rasalhague 95°58.20 12°32.49
20	16°50.53	129° 41.61 19.44	112°59.66 2.23	260°53.24 28.56	20°16.67 2.49	Eltanin 90°42.37 51°29.15
21	31°52.99	144°40.76 · · 20.02	128°0.08 · · 2.33	275°55.93 · · 28.60	35°19.10 · · 2.47	Kaus Aust. 83°31.91 -34°22.36 Vega 80°33.12 38°48.53
22	46°55.46	159°39.90 20.60	143°0.50 2.43	290°58.61 28.64	50°21.53 2.44	Nunki 75°47.17 -26°15.89
23	61°57.92	174°39.05 21.18	158° 0.93 2.53	306°1.29 28.68	65°23.96 2.42	Altair 61°59.49 8°56.27
Mer. <sub>I</sub>	pass. 18:53	$\nu$ -0.8′ $d$ 0.6′ m-3.90	$ u 0.4' \ d0.1' \ m1.27$	$ u 2.7' \ d0.0' \ \text{m-}2.57$	$\nu$ 2.4′ <i>d</i> -0.0′ m0.94	Peacock 53°4.95 -56°39.26
						Deneb 49°25.59 45°22.58 Enif 33°38.19 9°59.74
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°32.10 -46°50.31
0	77°0.39	189°38.19 S21°21.75	173°1.35 \$24°2.63	321°3.98 N21°28.73	80°26.38 S04°2.39	Fomalhaut 15°13.71 -29°29.20
1 2	92°2.85 107°5.31	204°37.33 22.33 219°36.48 22.91	188°1.77 2.73 203°2.19 2.82	336°6.66 28.77 351°9.35 28.81	95°28.81 2.37 110°31.24 2.34	Scheat 13°44.48 28°13.62
3	107 5.31 122°7.78	234°35.62 · · 23.48	218° 2.61 · · 2.92	6°12.03 · · 28.86	110 31.24 2.34 125°33.66 · · 2.31	Markab 13°29.16 15°20.83
4	$137^{\circ}10.24$	249°34.76 24.05	233°3.02 3.01	21°14.72 28.90	140°36.09 2.29	Dec 06 Sat SHA Mer.pass
5	152° 12.71	264°33.90 24.63	248° 3.44 3.11	36°17.40 28.94	155°38.52 2.26	Venus 115°16.69 11:19
6	167° 15.17	279°33.04 \$21°25.20	263°3.86 \$24°3.21	51°20.09 N21°28.98	170°40.94 \$04°2.23	Mars 97°38.90 12:29 Jupiter 243°53.40 02:44
7 8	182°17.64 197°20.10	294°32.18 25.77 309°31.32 26.34	278° 4.28 3.30 293° 4.70 3.40	66°22.77 29.03 81°25.46 29.07	185° 43.37 2.21 200° 45.80 2.18	Saturn 3°27.58 18:43
9	212° 22.56	324°30.46 · · 26.91	308°5.12 · · 3.49	96°28.15 · · 29.11	215°48.22 · · 2.16	
10	227°25.03	339°29.60 27.47	323°5.54 3.58	111°30.83 29.16	230°50.65 2.13	Dec 07 Sun SHA Mer.pass Venus 113°57.38 11:21
11	242°27.49	354°28.74 28.04	338° 5.96 3.68	126°33.52 29.20	245°53.07 2.10	Mars 96°49.97 12:28
12 13	257°29.96 272°32.42	9°27.88 S21°28.60 24°27.01 29.17	353°6.38	141°36.21 N21°29.24 156°38.90 29.29	260°55.50 S04°2.08 275°57.92 2.05	Jupiter 243°58.40 02:40
14	287° 34.88	39°26.15 29.73	23°7.21 3.95	171°41.58 29.33	291°0.35 2.02	Saturn 3°26.84 18:39
15	302°37.35	54°25.29 · · 30.29	38°7.63 · · 4.04	186°44.27 · · 29.37	306°2.77 · · 2.00	Dec 08 Mon SHA Mer.pass
16	317°39.81	69°24.42 30.85	53°8.05 4.13	201°46.96 29.42	321°5.20 1.97	Venus 112°37.80 11:22
17 18	332° 42.28 347° 44.74	84°23.56 31.41 99°22.69 \$21°31.97	68°8.47 4.23 83°8.88 \$24°4.32	216°49.65 29.46 231°52.34 N21°29.50	336°7.62 1.94 351°10.04 \$04°1.91	Mars 96°0.96 12:28
19	2° 47.21	114°21.83 32.53	98° 9.30 4.40	246°55.03 29.55	6°12.47 1.89	Jupiter 244° 3.59 02:35 Saturn 3° 26.00 18:35
20	17° 49.67	129°20.96 33.08	113° 9.72 4.49	261°57.72 29.59	21°14.89 1.86	
21	32°52.13	144°20.10 · · 33.64	128°10.14 · · 4.58	277°0.41 · · 29.64	36°17.32 · · 1.83	Horizontal parallax
22 23	47° 54.60 62° 57.06	159°19.23 34.19 174°18.37 34.74	143°10.55 4.67 158°10.97 4.76	292°3.10 29.68 307°5.79 29.72	51° 19.74 1.81 66° 22.16 1.78	Venus: 0.1 Mars: 0.1
ا، Wier	pass. 18:49	$\nu$ -0.9' $d$ 0.6' m-3.90	$ u 0.4' \ d0.1' \ m1.27$	$\nu 2.7' \ d0.0' \ \text{m-}2.58$	$\nu$ 2.4′ <i>d</i> -0.0′ m0.94	

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182° 16.42	S22°29.52	346°23.56	0.7'	N28° 15.30	-0.6'	61.0'
1	$197^{\circ}16.16$	29.82	0°43.22	0.7'	28°14.68	-0.8'	60.9'
2	212° 15.90	30.12	15° 2.92	0.7'	28°13.84	-1.1'	60.9'
3	227° 15.64	• • 30.42	29°22.67	0.8'	28°12.77	-1.3'	60.9'
4 5	242°15.37 257°15.11	30.71 31.01	43°42.47 58°2.32	0.9' 0.9'	28°11.49 28°9.99	-1.5' -1.7'	60.9' 60.8'
6	272° 14.85	\$22°31.30	72°22.23	1.0'	N28°8.27	-1.7 -1.9'	60.8
7	287° 14.58	31.60	86°42.19	1.0'	28°6.33	-2.2'	60.8
8	302°14.32	31.89	101°2.22	1.1'	28°4.17	-2.4'	60.8'
9	317° 14.06	• • 32.18	115°22.32	1.2'	28°1.80	-2.6'	60.7'
10	332°13.79	32.48	129°42.48	1.2'	27°59.21	-2.8'	60.7'
11	347° 13.53	32.77	144°2.72	1.3'	27°56.41 N27°53.40	-3.0'	60.7'
12 13	2°13.26 17°13.00	\$22°33.06 33.35	158°23.04 172°43.43	1.4' 1.5'	27°50.18	-3.2' -3.4'	60.7' 60.6'
14	32°12.73	33.64	187°3.91	1.6'	27°46.74	-3.4 -3.6'	60.6
15	47° 12.47	33.92	201°24.47	1.7'	27°43.10	-3.8'	60.6'
16	62°12.20	34.21	215°45.13	1.7'	27°39.26	-4.1'	60.6'
17	77° 11.94	34.50	$230^{\circ}5.87$	1.8'	27°35.20	-4.3'	60.5'
18	92°11.67	S22°34.78	244°26.71	1.9'	N27°30.95	-4.5'	60.5'
19	107° 11.41 122° 11.14	35.07	258°47.65	2.0'	27°26.49	-4.7'	60.5
20 21	122°11.14 137°10.87	35.35 · · 35.64	273°8.69 287°29.83	2.1' 2.2'	27°21.83 27°16.98	-4.9' -5.1'	60.4' 60.4'
22	157 10.67 152° 10.61	35.92	301°51.08	2.4'	27°11.92	-5.1 -5.2'	60.4
23	167°10.34	36.20	316°12.43	2.5'	27°6.68	-5.4	60.3
	SD = 16.2'	d = 0.3'			D = 16.6'		
	JD — 10.2	u — 0.5			D — 10.0		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182° 10.07	\$22°36.48	330°33.90	2.6'	N27°1.23	-5.6'	60.3'
1 2	197°9.80 212°9.54	36.76 37.04	344°55.48 359°17.17	2.7' 2.8'	26°55.60 26°49.78	-5.8' -6.0'	60.3' 60.3'
3	212 9.34 227°9.27	37.32	13°38.98	2.9'	26°43.77	-6.2'	60.2
4	242°9.00	37.60	$28^{\circ}0.91$	3.1'	26° 37.57	-6.4'	60.2'
5	257°8.73	37.87	42°22.96	3.2'	$26^{\circ}31.19$	-6.6'	60.2'
6	272°8.46	\$22°38.15	56°45.14	3.3'	N26°24.62	-6.7'	60.1'
7 8	287°8.20 302°7.93	38.43 38.70	71°7.44 85°29.87	3.4' 3.6'	26°17.88 26°10.96	-6.9' -7.1'	60.1' 60.1'
9	317°7.66	. 38.98	99°52.42	3.7'	26° 3.86	-7.1 -7.3'	60.0'
10	332°7.39	39.25	114°15.11	3.8'	25° 56.59	-7.4'	60.0'
11	347°7.12	39.52	128°37.93	4.0'	25°49.15	-7.6'	59.9'
12	2°6.85	S22°39.79	143°0.88	4.1'	N25°41.54	-7.8'	59.9'
13	17°6.58 32°6.31	40.07	157°23.97	4.2'	25°33.76 25°25.81	-7.9'	59.9'
14 15	47°6.04	40.34 •• 40.61	171°47.19 186°10.55	4.4' 4.5'	25° 25.81 25° 17.70	-8.1' -8.3'	59.8' 59.8'
16	62°5.77	40.87	200°34.05	4.6'	25°9.43	-8.4'	59.8'
17	77°5.50	41.14	214°57.69	4.8'	25°1.01	-8.6'	59.7'
18	92°5.22	S22°41.41	229°21.46	4.9'	N24°52.42	-8.7'	59.7'
19	107°4.95	41.68	243°45.38	5.1'	24°43.68	-8.9'	59.7'
20	122°4.68 137°4.41	41.94 •• 42.21	258° 9.44 272° 33.65	5.2' 5.3'	24°34.79 24°25.75	-9.0' -9.2'	59.6' 59.6'
21 22	157 4.41 152°4.14	42.21	272 33.05 286°57.99	5.5'	24° 25.75	-9.2 -9.3'	59.0 59.5'
23	167°3.87	42.73	301°22.49	5.6'	24°7.22	-9.5'	59.5
	SD = 16.2'	d = 0.3'		5	D = 16.4'		
	<u> </u>						
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	182°3.59	\$22°43.00	315°47.12	5.8'	N23°57.74 23°48.12	-9.6'	59.5'
1 2	197°3.32 212°3.05	43.26 43.52	330°11.90 344°36.83	5.9' 6.1'	23°48.12 23°38.37	-9.8' -9.9'	59.4' 59.4'
3	212 3.03 227° 2.77	• • 43.78	359° 1.90	6.2	23°28.47	-10.0'	59.4'
4	242°2.50	44.04	13°27.12	6.4	23°18.44	-10.2	59.3'
5	257°2.23	44.30	27°52.48	6.5'	23°8.28	-10.3'	59.3'
6	272°1.95	\$22°44.56	42°17.99	6.7'	N22°57.99	-10.4'	59.2'
7	287°1.68	44.81	56°43.65	6.8'	22°47.57	-10.5'	59.2'
8 9	302°1.41 317°1.13	45.07 •• 45.33	71°9.45 85°35.40	6.9' 7.1'	22°37.02 22°26.35	-10.7' -10.8'	59.2' 59.1'
10	332°0.86	45.58	100° 1.50	7.1 7.2'	22° 15.56	-10.6	59.1'
11	347°0.58	45.84	114°27.74	7.4'	22°4.65	-10.9	59.0'
12	2°0.31	S22°46.09	128°54.12	7.5'	N21°53.62	-11.1'	59.0'
13	17°0.03	46.34	143°20.65	7.7'	21°42.48	-11.3'	59.0'
14	31°59.76	46.59	157°47.33	7.8'	21°31.23	-11.4'	58.9'
15 16	46°59.48 61°59.21	· · 46.84 47.09	172°14.15 186°41.12	8.0' 8.1'	21°19.86 21°8.39	-11.5' -11.6'	58.9' 58.8'
16 17	76°58.93	47.09 47.34	201°8.23	8.3	21°8.39 20°56.81	-11.6	58.8'
18	91°58.65	S22°47.59	215°35.48	8.4'	N20°45.13	-11.8'	58.8'
19	106°58.38	47.84	230° 2.87	8.5'	20°33.34	-11.9'	58.7'
20	121°58.10	48.09	244°30.41	8.7'	20°21.46	-12.0'	58.7'
21	136° 57.82 151° 57.55	48.33	258°58.09 273°25.91	8.8'	20°9.47 19°57.39	-12.1'	58.6'
22 23	151°57.55 166°57.27	48.58 48.83	273°25.91 287°53.86	9.0' 9.1'	19°57.39 19°45.22	-12.2' -12.3'	58.6' 58.5'
23	SD = 16.2'	d = 0.3'			D = 16.2'	12.3	30.3
	3D = 10.2	u = 0.3		5	D = 10.2		

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

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

# December 09, 10, 11 UT (Tue., Wed., Thu.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	$77^{\circ}59.53$	189°17.50 <b>S</b> 21°35.30	173°11.39 <b>S</b> 24°4.85	322°8.48 N21°29.77	81°24.59 <b>S</b> 04°1.75	
1	93°1.99	204°16.63 35.85	188°11.80 4.93	337°11.17 29.81	96°27.01 1.72	Alpheratz 357°33.90 29°14.24 Ankaa 353°6.25 -42°10.06
2	108°4.46	219°15.76 36.40	203°12.22 5.02	352°13.87 29.85	111°29.43 1.69	Schedar 349°29.96 56°41.09
3	123°6.92	234°14.89 · · 36.95	218° 12.64 · · 5.11	7°16.56 · · 29.90	126°31.86 · · 1.67	Diphda 348°46.40 -17°50.70
4	138°9.38	249°14.02 37.49	233°13.05 5.19	22°19.25 29.94	141°34.28 1.64	Achernar 335°19.25 -57°6.48
5 6	153° 11.85 168° 14.31	264°13.15 38.04 279°12.29 \$21°38.58	248°13.47 5.28 263°13.88 \$24°5.36	37°21.94 29.99 52°24.64 N21°30.03	156°36.70 1.61 171°39.12 S04°1.58	Hamal 327°50.09 23°35.26
7	183° 16.78	294°11.41 39.13	278°14.30 5.44	67°27.33 30.08	186°41.54 1.56	Polaris 313°12.03 89°22.58
8	198° 19.24	309°10.54 39.67	293°14.71 5.53	82°30.02 30.12	201°43.97 1.53	Acamar 315°10.82 -40°12.10
9	213°21.70	324°9.67 · · 40.21	308°15.13 · · 5.61	97°32.72 · · 30.16	216°46.39 · · 1.50	Menkar 314°5.07 4°11.56
10	228°24.17	339°8.80 40.75	323°15.54 5.69	112° 35.41 30.21	231°48.81 1.47	Mirfak 308°26.70 49°57.34 Aldebaran 290°38.40 16°33.74
11	243°26.63	354°7.93 41.29	338°15.96 5.78	127° 38.11 30.25	246°51.23 1.44	Aldebaran 290°38.40 16°33.74 Rigel 281°2.79 -8°10.25
12	258° 29.10	9°7.06 <b>S</b> 21°41.83	353°16.37 \$24°5.86	142°40.80 N21°30.30	261°53.65 \$04°1.41	Capella 280°20.28 46°1.45
13	273°31.56	24°6.18 42.37	8°16.79 5.94	157°43.50 30.34	276°56.07 1.39	Bellatrix 278°21.72 6°22.43
14	288°34.02	39°5.31 42.91 54°4.44 · · 43.44	23°17.20 6.02	172°46.19 30.39 187°48.89 · · 30.43	291°58.49 1.36 307°0.91 · · 1.33	Elnath 278°0.52 28°37.77
15 16	303°36.49 318°38.95	69°3.56 43.97	38°17.62 · · 6.10 53°18.03 6.18	187°48.89 · · 30.43 202°51.59 30.48	307°0.91 ·· 1.33 322°3.33 1.30	Alnilam 275°36.62 -1°11.07
17	333°41.42	84°2.69 44.51	68°18.45 6.26	217°54.28 30.52	337°5.76 1.27	Betelgeuse 270°50.93 7°24.74
18	348° 43.88	99°1.81 S21°45.04	83°18.86 <b>S</b> 24°6.34	232°56.98 N21°30.56	352°8.18	Canopus 263°51.52 -52°42.42
19	3°46.35	114°0.94 45.57	98°19.28 6.42	247°59.68 30.61	7°10.60 1.21	Sirius 258°25.24 -16°45.02
20	$18^{\circ}48.81$	129°0.06 46.10	113°19.69 6.50	263°2.37 30.65	22°13.02 1.18	Adhara 255°4.92 -29°0.31 Procyon 244°49.76 5°9.51
21	33°51.27	143°59.19 · · 46.63	128°20.10 · · 6.58	278°5.07 · · 30.70	37°15.43 · · 1.16	Pollux 243°16.08 27°57.72
22	48°53.74	158°58.31 47.16	143°20.52 6.65	293°7.77 30.74	52°17.85 1.13	Avior 234°13.98 -59°35.29
23	63°56.20	173°57.43 47.68	158°20.93 6.73	308°10.47 30.79	67°20.27 1.10	Suhail 222°45.52 -43°32.01
Mer.p	pass. 18:45	$\nu$ -0.9 $'$ d0.6 $'$ m-3.90	$ u 0.4' \ d 0.1' \ m 1.26$	$\nu 2.7' \ d0.0' \ \text{m-}2.58$	$\nu$ 2.4′ <i>d</i> -0.0′ m0.94	Miaplacidus 221°37.64 -69°49.10
						Alphard 217°46.86 -8°46.20
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.54 11°50.36
0	78°58.67	188°56.55 \$21°48.21	173°21.34 \$24°6.81	323°13.17 N21°30.83	82°22.69 <b>S</b> 04°1.07	Dubhe 193°40.04 61°36.35
1	94°1.13	203°55.68 48.73	188°21.76 6.88	338°15.86 30.88	97°25.11 1.04	Denebola 182°24.23 14°25.54
2	109°3.59	218°54.80 49.25	203°22.17 6.96	353°18.56 30.92	112°27.53 1.01	Gienah 175°42.91 -17°41.06 Acrux 172°59.50 -63°14.29
3	$124^{\circ}6.06$	233°53.92 · · 49.78	218°22.58 · · 7.04	8°21.26 · · 30.97	127°29.95 · · 0.98	Gacrux 171°51.02 -57°15.25
4	139°8.52	248°53.04 50.30	233°22.99 7.11	23°23.96 31.01	142°32.37 0.95	Alioth 166°12.55 55°48.86
5	154° 10.99	263°52.16 50.82	248°23.41 7.18	38°26.66 31.06	157°34.79 0.92	Spica 158°21.69 -11°17.75
6	169° 13.45	278°51.28 S21°51.33	263°23.82 \$24°7.26	53°29.36 N21°31.10	172°37.20 \$04°0.89	Alkaid 152°51.72 49°10.79
7	184° 15.92	293°50.40 51.85	278°24.23 7.33	68°32.06 31.15	187°39.62 0.86 202°42.04 0.83	Hadar 148°35.41 -60°29.67
8 9	199°18.38 214°20.84	308°49.52 52.37 323°48.64 • 52.88	293°24.64 7.41 308°25.06 · · 7.48	83°34.76 31.19 98°37.47 · · 31.24	202°42.04 0.83 217°44.46 · · 0.80	Menkent 147°57.02 -36°29.71
10	229°23.31	338° 47.76 53.40	323°25.47 7.55	113° 40.17 31.28	232°46.87 0.77	Arcturus 145°47.47 19°2.74
11	244°25.77	353°46.87 53.91	338°25.88 7.62	128° 42.87 31.33	247°49.29 0.74	Rigil Kent. 139°39.80 -60°56.36
12	259°28.24	8°45.99 <b>S</b> 21°54.42	353°26.29 <b>S</b> 24°7.69	143°45.57 N21°31.38	262°51.71 \$04°0.71	Kochab 137°20.80 74°2.66 Zuben'ubi 136°55.47 -16°8.92
13	274°30.70	23°45.11 54.93	8°26.70 7.76	158° 48.27 31.42	277°54.13 0.68	Alphecca 126°3.45 26°37.56
14	289°33.16	38°44.22 55.44	23°27.11 7.83	173°50.98 31.47	292°56.54 0.65	Antares 112° 15.28 -26° 29.32
15	304°35.63	53°43.34 · · 55.95	38°27.52 · · 7.90	188°53.68 · · 31.51	307°58.96 · · 0.62	Atria 107°9.40 -69°4.37
16	319°38.09	68° 42.46 56.46	53°27.94 7.97	203°56.38 31.56	323°1.38 0.59	Sabik 102°2.27 -15°45.40
17	334° 40.56	83°41.57 56.96	68°28.35 8.04	218°59.09 31.60	338° 3.79 0.56	Shaula 96°9.77 -37°7.34
18 19	349° 43.02 4° 45.48	98°40.69 \$21°57.47 113°39.80 57.97	83°28.76	234°1.79 N21°31.65 249°4.50 31.69	353°6.21 S04°0.53 8°8.62 0.50	Rasalhague 95°58.20 12°32.48
20	19° 47.95	128°38.92 58.48	113°29.58 8.25	264°7.20 31.74	23°11.04 0.47	Eltanin 90°42.37 51°29.13
21	34°50.41	143°38.03 · · 58.98	128°29.99 · · 8.31	279°9.90 · · 31.79	38°13.46 · · 0.44	Kaus Aust. 83°31.91 -34°22.35
22	49°52.88	158°37.14 21°59.48	143°30.40 8.38	294° 12.61 31.83	53°15.87 0.41	Vega 80°33.13 38°48.52 Nunki 75°47.17 -26°15.89
23	64°55.34	173°36.26 21°59.98	158°30.81 8.45	309° 15.31 31.88	68°18.29 0.37	Altair 61°59.49 8°56.27
Merr	pass. 18:41	ν-0.9' d0.5' m-3.90	ν0.4' d0.1' m1.25	$\nu 2.7' \ d0.0' \ \text{m-}2.59$	ν2.4' d-0.0' m0.95	Peacock 53°4.95 -56°39.26
						Deneb 49°25.60 45°22.57
<u>-</u> .		GUA -	GU 4		GUA -	Enif 33°38.19 9°59.73
Thu	GHA 70° 57 90	GHA Dec	GHA Dec	<b>GHA Dec</b> 324°18.02 N21°31.92	GHA Dec	Al Na'ir 27°32.11 -46°50.31
0 1	79°57.80 95°0.27	188°35.37 <b>S</b> 22°0.48 203°34.48 0.97	173°31.22 \$24°8.51 188°31.63 8.58	324°18.02 N21°31.92 339°20.73 31.97	83°20.70 <b>S</b> 04°0.34 98°23.12 0.31	Fomalhaut 15°13.71 -29°29.21
2	110°2.73	218° 33.59 1.47	203°32.04 8.64	354°23.43 32.02	113°25.53 0.28	Scheat 13°44.49 28°13.62
3	125°5.20	233°32.70 · · 1.96	218°32.45 · · 8.71	9°26.14 · · 32.06	128°27.94 · · 0.25	Markab 13°29.16 15°20.83
4	140°7.66	248°31.81 2.46	233°32.86 8.77	24°28.85 32.11	143°30.36 0.22	Dec 09 Tue SHA Mer.pass
5	155° 10.13	263°30.92 2.95	248°33.27 8.84	39° 31.55 32.15	158°32.77 0.19	Venus 111°17.97 11:23
6	170° 12.59	278°30.03	263°33.68 <b>S</b> 24°8.90	54°34.26 N21°32.20	173°35.19 \$04°0.16	Mars 95°11.86 12:27
7	185° 15.05	293°29.14 3.93	278°34.08 8.96	69°36.97 32.25	188°37.60 0.12	Jupiter 244°8.96 02:31
8 9	200°17.52	308°28.25 4.42	293°34.49 9.02	84°39.68 32.29 99°42.39 · · 32.34	203°40.02 0.09 218°42.43 · · 0.06	Saturn 3°25.06 18:31
10	215° 19.98 230° 22.45	323°27.36 · · 4.91 338°26.47 5.40	308°34.90 · · 9.09 323°35.31 9.15	99° 42.39 · · 32.34 114° 45.09 32.39	218°42.43 · · 0.06 233°44.84 0.03	Dec 10 Wed SHA Mer.pass
11	245°24.91	353°25.58 5.88	338°35.72 9.21	129° 47.80 32.43	248°47.26 0.00	Venus 109°57.89 11:25
12	260°27.37	8°24.69 S22°6.37	353°36.13 \$24°9.27	144°50.51 N21°32.48	263°49.67 \$03°59.97	Mars 94°22.68 12:26
13	275°29.84	23°23.79 6.85	8°36.54 9.33	159°53.22 32.52	278°52.08 03°59.93	Jupiter 244°14.50 02:27
14	290°32.30	38°22.90 7.33	23°36.94 9.39	174°55.93 32.57	293°54.49 59.90	Saturn 3°24.03 18:28
15	305°34.77	53°22.01 · · 7.81	38°37.35 · · 9.45	189°58.64 · · 32.62	308°56.91 · · 59.87	Dec 11 Thu SHA Mer.pass
16	320°37.23	68°21.11 8.29	53°37.76 9.51	205°1.35 32.66	323°59.32 59.84	Venus 108° 37.56 11:26
17	335°39.69	83°20.22 8.77	68°38.17 9.56	220°4.06 32.71	339°1.73 59.81	Mars 93°33.41 12:26
18 19	350° 42.16 5° 44.62	98°19.33	83°38.57 S24°9.62 98°38.98 9.68	235°6.77 N21°32.76 250°9.48 32.80	354°4.14 \$03°59.77 9°6.55 59.74	Jupiter 244°20.22 02:22
20	5 44.62 20°47.09	113 18.43 9.73 128°17.53 10.20	98 38.98 9.08 113°39.39 9.74	265°12.20 32.85	9 0.55 59.74 24°8.97 59.71	Saturn 3°22.90 18:24
21	35° 49.55	143°16.64 · · 10.68	128°39.80 · · 9.79	280° 14.91 · · 32.90	39°11.38 · · 59.68	Horizontal parallax
22	50° 52.01	158°15.74 11.15	143°40.20 9.85	295° 17.62 32.94	54°13.79 59.64	Venus: 0.1
23	65° 54.48	173°14.85 11.62	158°40.61 9.90	310°20.33 32.99	69°16.20 59.61	Mars: 0.1
Mer r	pass. 18:37	ν-0.9' d0.5' m-3.90	ν0.4' d0.1' m1.25	$\nu 2.7' \ d0.0' \ \text{m-}2.60$	ν2.4' d-0.0' m0.95	

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°56.99	S22°49.07	$302^{\circ}21.96$	9.2'	$N19^{\circ}32.95$	-12.4'	58.5'
1	196°56.71	49.31	316°50.19	9.4'	19°20.60	-12.4'	58.5'
2	211°56.44 226°56.16	49.55 •• 49.80	331°18.57 345°47.07	9.5' 9.6'	19°8.16 18°55.63	-12.5' -12.6'	58.4' 58.4'
4	241°55.88	50.04	0°15.72	9.8'	18°43.01	-12.7'	58.3'
5	256°55.60	50.28	14°44.50	9.9'	$18^{\circ}30.32$	-12.8'	58.3'
6	271°55.32	\$22°50.52	29°13.41	10.0'	N18°17.54	-12.9'	58.3'
7 8	286°55.05 301°54.77	50.76 50.99	43°42.45 58°11.63	10.2' 10.3'	18°4.69 17°51.75	-12.9' -13.0'	58.2' 58.2'
9	316°54.49	51.23	72°40.93	10.4	17°38.75	-13.1'	58.1'
10	331°54.21	51.47	87°10.36	10.6'	$17^{\circ}25.67$	-13.1'	58.1'
11	346°53.93	51.70 <b>S</b> 22°51.94	101°39.93	10.7'	17°12.52 N16°59.30	-13.2'	58.1'
12 13	1°53.65 16°53.37	522 51.94	116°9.62 130°39.43	10.8' 10.9'	16°46.02	-13.3' -13.4'	58.0' 58.0'
14	31°53.09	52.40	145°9.37	11.1'	16°32.66	-13.4	57.9'
15	46°52.81	• • 52.64	159°39.43	11.2'	16°19.25	-13.5'	57.9'
16	61°52.53 76°52.25	52.87	174°9.62 188°39.92	11.3'	16°5.77 15°52.23	-13.5'	57.8'
17 18	91°51.97	53.10 \$22°53.33	203°10.35	11.4' 11.5'	N15°38.63	-13.6' -13.7'	57.8' 57.8'
19	106°51.68	53.56	217°40.89	11.7'	15°24.97	-13.7'	57.7'
20	121°51.40	53.79	232°11.55	11.8'	$15^{\circ}11.26$	-13.8'	57.7'
21	136°51.12	• • 54.01	246°42.32	11.9'	14°57.50	-13.8'	57.6'
22 23	151°50.84 166°50.56	54.24 54.47	261°13.21 275°44.21	12.0' 12.1'	14°43.68 14°29.81	-13.9' -13.9'	57.6' 57.6'
23	SD = 16.2'					13.3	31.0
	5D = 16.2'	d = 0.2'		SI	D = 16.0'		
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°50.28	S22°54.69	290°15.33	12.2'	N14°15.89	-14.0'	57.5'
1 2	196°49.99 211°49.71	54.92 55.14	304°46.55 319°17.88	12.3' 12.4'	14°1.92 13°47.91	-14.0' -14.1'	57.5' 57.4'
3	211°49.71 226°49.43	55.14 •• 55.36	319°17.88 333°49.32	12.4	13°47.91 13°33.85	-14.1' -14.1'	57.4' 57.4'
4	241°49.15	55.59	348°20.87	12.7'	13°19.75	-14.1'	57.4'
5	256°48.86	55.81	2°52.52	12.8'	$13^{\circ}5.61$	-14.2'	57.3'
6	271°48.58	S22°56.03	17°24.28	12.9'	N12°51.42	-14.2'	57.3'
7 8	286°48.30 301°48.01	56.25 56.47	31°56.13 46°28.09	13.0' 13.1'	12°37.20 12°22.94	-14.3' -14.3'	57.2' 57.2'
9	316°47.73	56.69	61°0.14	13.1	12°22.94	-14.3'	57.2'
10	331°47.45	56.90	75°32.29	13.2'	11°54.31	-14.4'	57.1'
11	346°47.16	57.12	90°4.54	13.3'	11°39.94	-14.4'	57.1'
12 13	1°46.88 16°46.59	\$22°57.34 57.55	104°36.89 119°9.32	13.4' 13.5'	N11°25.55 11°11.12	-14.4' -14.5'	57.1' 57.0'
13 14	31°46.31	57.55 57.77	119 9.32 133°41.85	13.6'	10°56.66	-14.5'	57.0'
15	46°46.02	• • 57.98	148°14.47	13.7'	10°42.17	-14.5'	56.9'
16	61°45.74	58.19	162°47.17	13.8'	10°27.65	-14.5'	56.9'
17 18	76°45.45 91°45.17	58.40 \$22°58.61	177°19.97 191°52.85	13.9' 14.0'	10°13.11 N09°58.55	-14.6' -14.6'	56.9' 56.8'
19	106°44.88	58.83	206°25.81	14.0'	09°43.96	-14.6'	56.8'
20	121°44.60	59.03	220°58.86		09°29.35		56.7'
21	136°44.31	• • 59.24	235°31.99	14.2'	09°14.72	-14.7'	56.7'
22 23	151°44.02 166°43.74	59.45 59.66	250°5.20 264°38.49	14.3' 14.4'	09°0.06 08°45.39	-14.7' -14.7'	56.7' 56.6'
23			204 30.49			-14.7	30.0
	SD = 16.2'	d = 0.2'		SI	D = 15.7'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	181°43.45	S22°59.87	279°11.85	14.4'	N08°30.70	-14.7'	56.6'
1	196°43.16	23°0.07	293°45.29	14.5'	08°16.00	-14.7'	56.6'
2	211°42.88 226°42.59	0.28 •• 0.48	308°18.81 322°52.39	14.6' 14.7'	08°1.28 07°46.54	-14.7' -14.7'	56.5' 56.5'
4	241°42.30	0.48	337°26.05	14.7'	07°31.79	-14.7	56.5'
5	256°42.02	0.89	351°59.78	14.8'	07°17.03	-14.8'	56.4'
6	271°41.73	\$23°1.09	6°33.58	14.9'	N07°2.26	-14.8'	56.4'
7 8	286°41.44 301°41.15	1.29 1.49	21°7.44 35°41.37	14.9' 15.0'	06°47.48 06°32.69	-14.8' -14.8'	56.3' 56.3'
9	316°40.86	• 1.69	50°15.37	15.1'	06° 17.89	-14.8'	56.3'
10	331°40.58	1.89	64°49.42	15.1'	$06^{\circ}3.08$	-14.8'	56.2'
11	346°40.29	2.08	79°23.54	15.2'	05°48.27	-14.8'	56.2'
12 13	1°40.00 16°39.71	\$23°2.28 2.48	93°57.72 108°31.95	15.2' 15.3'	N05°33.45 05°18.63	-14.8' -14.8'	56.2' 56.1'
14	31°39.42	2.46	106 31.95 123°6.25	15.3'	05 16.03 05°3.80	-14.8'	56.1'
15	46°39.13	• • 2.87	137°40.59	15.4'	04°48.97	-14.8'	56.1'
16	61°38.84	3.06	152°15.00	15.5'	04°34.14	-14.8'	56.0'
17 18	76°38.55 91°38.26	3.25 \$23°3.45	166°49.45 181°23.96	15.5' 15.6'	04°19.31 N04°4.48	-14.8' -14.8'	56.0' 56.0'
18	91 38.26 106°37.98	3.64	181 23.96 195°58.52	15.6'	03°49.66	-14.8'	55.9'
20	121°37.69	3.83	210°33.12	15.7'	03°34.83	-14.8'	55.9'
21	136°37.40	• • 4.02	225°7.77	15.7'	03°20.01	-14.8'	55.9'
22 23	151°37.11 166°36.81	4.21 4.40	239°42.47 254°17.21	15.7' 15.8'	03°5.19 02°50.37	-14.8' -14.8'	55.8' 55.8'
23	SD = 16.2'	d = 0.2'	257 11.21		D = 15.4'	17.0	33.0
	3υ = 10.2°	u = 0.2		51	J = 15.4°		

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

Lat.		Moonris	e		Moonset	į.
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	18:37	21:21	23:32	14:36	13:30	12:51
<b>N</b> 70°	19:16	21:36	23:35	13:56	13:13	12:44
68°	19:43	21:48	23:38	13:27	12:59	12:38
66°	20:03	21:57	23:41	13:06	12:48	12:33
64°	20:19	22:05	23:43	12:48	12:38	12:29
62°	20:32	22:12	23:45	12:34	12:30	12:25
60°	20:43	22:18	23:47	12:22	12:22	12:22
N 58°	20:53	22:23	23:48	12:11	12:16	12:19
56°	21:01	22:28	23:49	12:02	12:10	12:17
54°	21:08	22:32	23:50	11:54	12:05	12:14
52°	21:15	22:35	23:52	11:46	12:01	12:12
50°	21:21	22:39	23:52	11:40	11:56	12:10
45°	21:34	22:46	23:55	11:25	11:47	12:06
<b>N</b> 40°	21:44	22:52	23:56	11:13	11:40	12:02
35°	21:53	22:57	23:58	11:03	11:33	11:59
30°	22:01	23:02	23:59	10:54	11:27	11:56
20°	22:14	23:09		10:38	11:17	11:52
N 10°	22:26	23:16		10:24	11:08	11:47
0°	22:37	23:23		10:11	10:59	11:43
<b>S</b> 10°	22:48	23:29		09:58	10:51	11:39
20°	22:59	23:36		09:44	10:41	11:35
30°	23:12	23:43		09:27	10:31	11:30
35°	23:20	23:48		09:18	10:24	11:27
40°	23:28	23:53		09:07	10:17	11:23
45°	23:38	23:58		08:54	10:09	11:19
<b>S</b> 50°	23:50		00:05	08:38	09:59	11:15
52°	23:56		80:00	08:30	09:54	11:12
54°	•• ••	00:02	00:12	08:22	09:49	11:10
56°		00:09	00:15	08:13	09:43	11:07
58°	00:11	00:16	00:20	08:02	09:37	11:04
<b>S</b> 60°	00:24	00:25	00:24	07:49	09:29	11:01

		Sun	Moon			
Day	Eqn.of Time		Mer.	Mer.	Pass.	Age
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	19-21
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-59%
09	07:48	07:35	11:52	03:59	16:24	
10	07:21	07:08	11:53	04:48	17:11	
11	06:54	06:40	11:53	05:33	17:54	

# December 12, 13, 14 UT (Fri., Sat., Sun.)

Fig.   CHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
0.00   0.00	Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1							
1 127-138	1	95°59.41		188°41.42 10.01			
14   14   16   16   16   16   17   17   18   18   18   18   18   18	2	$111^{\circ}1.87$	218° 12.15 13.03	203°41.83 10.07	355°28.47 33.13		
1							
171   173   173   175							
87 1987 4-9							
Section   Column							Polaris 313°12.74 89°22.60
19   2011   2012   2013   2014   20							
10 221/21.53 338/4.66 16.74 322/4.56 10.53 130/52.00 33.56 224/271 50.25 21 12 2017/20 338/4.66 10.05 130/52.00 33.56 20/96.22 50							
19	10						
1.5   2.5	11			338°45.48 10.53		249°45.12 59.21	
14   100							
Elout   18   28   28   37   77   32   38   37   78   38   38   38   38   38							Bellatrix 278°21.72 6°22.43
10 221° 9.03 F							
337   388   38   387   388   38   387   389   397   390   10   10   38   387   387   390   10   10   38   387   387   390   10   10   38   387   387   390   10   10   38   387   387   380   380   387   380							
Sept							
10   6*43.76   112*56.88   2082   98*48.72   10.92   255*16.64   33.94   10*43.95   35.94   255*2.00   38.91   255*2.00   21.77   128*9.93   11.01   285*2.00   2.94   2.95*2.00   34.01   2.95*2.00							
Procedure   144-7976   19-98-98   19	19	6°43.76	112°56.83 20.82		251°14.64 33.94	10°4.39 58.94	
99 4809 147-9500 22.11 [28-99.83 1.10] 281-00.08 3403 409.00 887  Mer.pass. 18-330.9' d0.5' m-3.90							
Mor. pass. 18:33							1
Sat   GHA   CHA   Dec							
Sai GHA  GHA  CHA  Dec  GHA  Dec  G	23	66°53.62	172°53.21 22.61	158°50.34 11.10	311°25.52 34.13	70°14.02 58.80	
Second   Color   Col	Mer.	pass. 18:33	$\nu$ -0.9 $'$ d0.5 $'$ m-3.90	$ u 0.4' \ d 0.1' \ m 1.24$	$\nu 2.7' \ d0.0' \ \text{m-}2.60$	$ u 2.4' \ d$ -0.0' m0.95	
Change							
8 81°5608 197°52.31 522°2305 173°5074 524°11.14 30°6°22.25 102°14.18 85°16.25 100°8.83 58.74 100	Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	9
2 112"347 22"49.59							
2 112*10.1 217*50.49 24.33 203*51.5 11.23 356*33.67 34.27 115*21.24 58.70 4 3 127*347 232*49.59 24.37 2318*32.5 11.23 356*33.67 34.27 115*21.24 58.70 56.67 56.67 57*15.25 57*48.68 142*59.49 247*48.69 24.33*52.56 11.32 26*39.12 34.37 145*26.05 58.6.6 58.6	1		202°51.40 23.49				
3 127°347 222°49.59 247′46.68 24.51 238°3.53 51.127 11°30.99 34.52 130°3.54 **56.65   5 157′6.40 202°47.77 233°5.25 11.30 1.32 26′3.91.2 34.7 145′2.60 5 56.65   5 157′6.40 202°47.77 233°5.25 246′52.76 11.30 41°41.46 34.42 100°2.46 5.66 5.66   5 157′6.40 202°47.77 235.50 22°3.64 246′52.76 11.30 41°41.46 34.42 100°2.46 5.66 5.66 5.66 5.66 5.66 5.66 5.66 5	2	$112^{\circ}1.01$	217°50.49 23.93	203°51.55 11.23		115°21.24 58.70	
4 142°594 202'4787 25.55 2481 233°5236 11.32 26'39.12 34.37 148'5205 58.60 58.60 51.55 155°848.55 155°848.60 202'4787 25.55 248'52.76 11.36 14'14.18' 34.42 10'2'8.46 51.50'8.56 55.60 56.60 51.50'8.56 150'8.18'2'1.07'8.60 51.50'8.56 150'8.20'8'3.57 11'87.76 120'8.56 51.50'8'1.00'8'8.40 178'3.08 503'8.56 51.50'8.56 150'8'1.07'8.50'8'8.50'							
5 157°8.40 262°47.77 25.25 248°52.76 11.36 41°41.84 34.42 10°50.86 503°8.86 181°12.167 11°17.76 17°18.06 503°8.86 181°12.167 11°17.76 17°18.06 503°8.86 181°18.12.167 11°17.76 181°18.33 29°2°4.95 26.12 278°53.57 11.44 71°47.28 34.51 10°33.27 58.33 Hadai 181°3.77 040°10.78 11°19.77 181°19.27 25.40 11°20.27 20°20.23 274°4.23 274°4.2 23°54.77 11.55 11°52.72 34.61 220°38.08 58.42 11°20.23 27°4.24 27°4.81 281°4.24 11°20.23 278°4.23 274°4.2 23°54.77 11.55 11°52.72 34.61 220°38.08 58.42 11°4.24 11°20.23 278°5.37 11°4.58 11°54.77 281°4.24 20°4.28 505°5.85 24°11.46 11°58.47 34.67 20°4.28 505°5.85 25°55.60 7°41.41 522°28.28 33°55.58 524°11.64 11°6.89 721°34.75 205°4.29 505°8.35 24°11.49 11°58.17 20°4.28 20°4.77 05°8.35 24°11.49 11°58.17 20°4.28 20°4.77 05°8.35 24°11.49 11°58.17 20°4.28 20°4.77 05°8.35 25°55.20 11°59.20 28.71 287°8.28 287.1 28°55.29 11.59 11°59.06 3.40 03.00°4.77 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.79 05°8.35 24°11.49 11°30.00°4.28 03°4.29 05°4.29 05°4.29 05°4.28 03°4.29 05°4.							
8 202"1-79 307"4-36 50 26.12 278"5-35 7 11.44 71"47.28 34.51 109"33.27 58.53							
202°18.79 307°45.05 232°39.37 11.48 86°50.00 34.56 20°38.06 75.84 Merikent 14°5°50.0 30°2.37 10 232°20.72 337°43.23 27.42 323°54.77 11.55 10°5°5.72 34.61 20°38.06 75.84 Merikent 14°5°50.0 30°2.37 11 24°231.91 352°42.32 27.85 338°55.18 11.60 131°55.17 34.77 250°42.89 58.39 11 24°231.91 352°42.32 27.85 338°55.18 11.60 131°55.17 34.75 250°45.29 503°8.35 12°20°25.55 7°41.41 52°28.28 333°55.58 524°11.64 147°0.89 N21°34.75 250°45.29 503°8.35 N6cchul 130°55.65 136°50.30 130°55.58 22°41.64 147°0.89 N21°34.75 250°45.29 503°8.35 N6cchul 130°55.65 136°80.28 11.72 177°6.34 34.85 250°55.10 58.28 April 130°53.04 52°38.67 2.95.68 11.75 19°9.06 34.90 310°52.51 58.24 14.50 130°53.04 52°38.67 2.95.68 31.175 19°9.06 34.90 310°52.51 58.24 14.50 130°53.04 52°38.67 2.95.68 50.04 11.83 22°21.51 349°9.09 535°57.19 11.79 207°11.78 34.95 325°55.91 58.12 130°33.04 52°38.67 2.95.68 50.04 11.83 22°21.51 349°9.09 110°2.21 51 349°9.09 110°2.21 51 349°9.09 110°2.21 51 349°9.00 110°2.21 51 349°3.09 110°2.21 51 349°3.09 11°							
29 217*18.26 322*44.14 - 26.99 308*54.37 - 11.52 101*52.72 - 34.61 220*38.08							
10 232°20.72 337°43.23 27.85 232°45.77 11.56 116°59.45 34.66 2395°40.48 58.42 Rigil Kent. 139°3-77 40°56.50 120°20°25.55 7°41.41 522°8.28 338°55.18 11.60 131°59.17 3470 250°36.59 503°8.35 20°11.64 147°0.89 N21°34.75 265°45.29 503°8.35 25 524°11.64 147°0.89 N21°34.75 265°45.29 503°8.35 25 524°11.69 16°2.61 34.80 280°9.01 88 22 Alphecca 126°3.43 26°37.54 11.75 190°2.00 4.30 310°2.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 20°3.01 11.00 22°4.53 11.00							
11 247°23.19 352°42.32 27.85 338°55.18 11.00 131°58.17 34.70 250°42.89 58.39 Kochab 13°20.77 74°2.64   12 267°25.55 7°44 14 522°38.25 338°55.58 524°11.64 147°0.89 N21°34.75 250°54.29 503°58.35   13 277°28.11 22°40.50 28.71 8°55.98 11.68 162°3.61 34.80 280°47.70 58.32   14 292°30.88 37°39.58 29.31 32°55.88 11.72 177°6.34 34.80 280°47.70 58.32   15 307°33.04 52°38.67 .29.56 38°55.78 11.72 177°6.34 34.80 310°52.51 58.24   16 322°35.51 6°37°37′6 29.98 53°57.19 11.79 20°71.78 34.99 310°52.51 58.17   17 337°37.97 82°36.85 30.41 68°57.59 11.83 222°14.51 34.99 340°57.32 58.17   18 352°40.43 97°359.49 522°30.88 33°57.99 28°41.36 232°17.23 N21°35.04 355°59.72 503°58.14   10 7°42.90 112°35.02 31.25 98°58.39 11.90 252°19.96 35.90 11°2.12 58.10   12 37°47.83 142°33.20 3.20 128°59.19 11.91 20°72.81 35.14 26°4.33 88.05   12 25°50.90 157°32.28 32.51 133°50.01 12.00 22°25.19 14 41°6.93 38.50   12 22 55°50.91 55°32.28 32.51 133°50.00 12.00 32°25.19 6 41°6.93 38.50   12 25°50.90 157°32.28 32.51 133°50.00 12.00 32°25.19 6 41°6.93 38.50   12 25°50.90 157°32.83 32.51 133°50.00 12.00 32°25.19 6 41°6.93 38.50   12 25°50.90 157°32.83 32.51 133°50.00 12.00 32°25.19 6 41°6.93 38.50   12 25°50.90 157°32.80 32.50 12.50 12.00 32°25.19 6 12.00 12.00 40°25.11 1.00 40°25.11							
12 262°25.65	11	247°23.19					
13 277°28.11 22°40.50 8 2871 8°55.98 11.08 162°3.61 34.80 280°47.70 58.32 Alphecca 126°3.43 26°37.40 14 292°37.40 158.21 15°30°33.04 52°38.67 × 29.56 38°56.78 * 11.75 192°9.06 * 34.90 310°52.51 * 58.24 Atria 107°9.39 - 6.9°4.36 16 32°2.55 16 6°37.76 29.98 53°57.91 11.79 207°11.78 34.95 325°64.91 58.21 17 337°3.79 62°36.85 30.41 68°57.59 11.83 222°14.51 34.99 340°57.32 58.17 18.35 220°3.78 19 19 22°1.78 18.35 22°1.79 18.35 28°1.79 18.35 22°1.79 18.35 28°1.79 18.35 28°1.79 18.35 28°1.79 18.35 22°1.79 18.35 28°1.79 18.35 22°1.79 18.35 28°1.79 18.35 22°1.79 18.35 28°1.79 18.35 22°1.79 18.35 28°1.79 18.35 28°1.79 18.35 28°1.79 18.35 22°1.79 18.35 28°1.79 1	12	262°25.65	7°41.41 <b>S</b> 22°28.28		147°0.89 N21°34.75		
14 292°30.58 37°39.58 29.13 23°50.38 11.72 177'6.34 34.85 295'50.10 58.28 1							
16 322°35.51 67°37.76 29.98 53°57.19 11.79 207°11.78 34.95 325°64.91 58.21   7 337°37.97 82°36.85 30.41 68°57.59 11.83 222°14.51 34.99 340°57.32 58.17   8 352°40.43 97°35.94 \$22°30.83 83°57.99 \$24°11.86 237°17.23 N21°35.04 355°6.97 258.10   2 2°45.36 112°35.02 31.25 98°58.39 11.90 252°19.50 91 112°21.2   2 2°45.36 12°32.8 32.51 143°35.07 11.93 267°22.68 35.14 26°4.53 56.06   8 2°52.50 157°32.8 32.51 143°35.06 12.00 297°28.13 35.24 41°6.93 56.03   8 2°52.50 157°31.37 32.92 159°0.00 12.04 312°30.86 35.29 71°11.74 57.96   8 2°55.29 157°31.37 32.92 159°0.00 12.04 312°30.86 35.29 71°11.74 57.96   8 2°55.22 187°30.45 \$22°33.34 174°0.40 \$24°12.07 327°33.59 N21°35.38 101°16.54 57.85   2 113°0.15 217°28.62 34.16 204°1.20 12.13 342°36.31 35.38 101°16.54 57.85   3 128°2.61 223°27.71 34.59 219°1.00 12.10 342°36.31 35.38 101°16.54 57.85   4 143°5.08 247°26.79 34.99 234°2.00 12.10 22.27 2744.99 35.53 146°23.75 57.71   8 188°12.47 292°2.80 24.04 36.21 297°3.20 12.22 274°4.29 35.58 1   8 203°14.93 307°23.12 36.62 294°3.60 12.13 35.38 101°16.54 57.85   5 158°7.54 262°25.88 36.0 249°2.04 12.23 42°47.22 35.58 16°26.15 57.74   8 203°14.93 307°23.12 36.62 294°3.60 12.32 38°57.99 50.27°3.56 31 16°26.15 57.54   8 203°14.93 307°23.12 36.62 294°3.60 12.32 38°57.99 50.27°3.56 31 16°26.15 57.55   12 26°32.77 1 34.89 30.90 21.20 27°4.96 522°3.80 36.62 294°3.60 12.32 38°57.99 50.27°3.56 31 16°26.15 57.54   8 203°14.93 307°23.12 36.62 294°3.60 12.32 38°57.99 50.27°3.56 31 16°26.15 57.54   8 203°14.93 307°23.12 36.62 294°3.60 12.32 38°25.90 50.27°3.59 50.57.54   8 203°14.93 307°23.12 36.62 294°3.60 12.35 12.90 50.50 50.50 57.66   9 218°17.40 322°2.21 37.03 309°4.00 12.35 12.90 50.50 50.50 57.66   9 218°17.40 322°2.21 37.03 309°4.00 12.35 12.90 50.50 50.50 57.66   9 218°17.40 322°2.21 37.03 309°4.00 12.35 12.90 50.50 57.50 5							
18 332°44.04 3 9°3.94 \$22°36.85 30.41 68°57.59 \$11.83 222°14.51 34.99 340°57.32 58.17 \$18.00°9.76 3.73°7.34 \$19 742.90 112°35.02 31.25 98°58.39 11.90 252°19.96 35.09 11°2.12 58.10 \$12.00 22°45.36 127°34.11 31.67 113°58.79 11.93 26°22.68 35.09 11°2.12 58.10 \$12.00 29°72.61.3 35.14 26°45.3 58.06 \$12.00 29°72.61.3 35.14 26°45.3 58.06 \$12.00 29°72.61.3 35.24 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 56°9.33 57.99 \$10.00 12.04 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.29 \$10.00 12.00 1312°30.86 35.20 \$10.00 12.00 1312°30.86 35.20 \$10.00 12.00 1312°30.86 35.20 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.86 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.30 \$10.00 12.00 1312°30.80 \$10.00 12.00 1312°30.30 \$10.00							
18   352*40.43   97*35.04   522*30.83   83*67.99   \$54*11.86   237*17.23   N21*35.04   355*59.72   \$503*58.14   N3*2*35.04   N3*2*35.							
19 7° 42.90 112° 35.02 31.25 98° 58.39 11.90 252° 19.96 35.09 11° 21.2 58.10 Elatania 99° 42.37 12° 25.11 37° 45.56 140° 25.25 137° 47.83 142° 33.20 32.09 128° 59.19 11.97 282° 25.41 35.19 41° 6.93 58.03 58.03 58.03 58.03 58.03 59.23 17° 32.28 32.51 143° 59.60 12.00 297° 28.13 35.24 56° 9.33 57.99 Nunki 75° 47.17 26° 15.89 Nunki 75° 47.17 26° 15° 15° 15° 15° 15° 15° 15° 15° 15° 15							
22   22   45   56   127   34   11   31   67   113   58   79   11   93   267   22   68   35   14   269   258   3   58   66   21   37   47   83   142   233   20   23   299   128   89   91   91   11   97   282   25   41   35   19   41   69   93   58   63   58   68   23   57   57   72   53   73   22   23   25   50   29   128   59   91   91   11   97   282   25   41   35   19   41   69   93   58   58   68   88   33   13   34   48   50   23   23   57   57   77   17   17   48   57   57   172   31   37   32   29   159   00.0   12.04   312   30.86   35.29   71   11   71   71   11   72   26   15   89   33   13   38   48   50   79   75   75   75   75   75   75   75							
21   37'4'83   142'33.20   ·· 32.09   128'59.19   ·· 11.97   282'25.41   ·· 35.19   285'25.02   157'93.28   32.51   143'59.60   12.00   297'26.13   35.24   56'9.33   57.99   Nunki 75'9.61							
22 52*50.29 15/*32.28 32.91 143*99.00 12.04 312*93.86 35.29 71*91.74 57.96  Mer.pass. 18:29	21		142°33.20 · · 32.09			41°6.93 · · 58.03	
Mer.pass. 18:29   \( \nu \cdot \cd							
Sun   GHA   GHA   Dec   GHA   Solidaria	23	67° 52.75	172°31.37 32.92	159°0.00 12.04	312°30.86 35.29	71°11.74 57.96	
Sun GHA GHA GHA Dec GHA GHA GEA GHA GHA GEA GHA GHA GHA GHA GHA GHA GHA GHA GHA GH	Mer.	pass. 18:29	ν-0.9' d0.4' m-3.90	$\nu$ 0.4′ $d$ 0.0′ $m$ 1.24	$\nu 2.7' \ d0.0' \ \text{m-}2.61$	$\nu$ 2.4′ d-0.0′ m0.96	Peacock 53°4.97 -56°39.25
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12 263°24.79						251°40.56 57.52	
14 293°29.72 37°17.61 39.03 24°6.00 12.49 178°11.78 36.02 296°47.76 57.41 15 308°32.18 52°16.69 ·· 39.42 39°6.40 ·· 12.51 193°14.51 ·· 36.07 311°50.16 ·· 57.37 16 323°34.64 67°15.77 39.82 54°6.80 12.54 208°17.24 36.12 326°52.56 57.33 17 338°37.11 82°14.85 40.22 69°7.20 12.56 223°19.97 36.17 341°54.96 57.29 18 353°39.57 97°13.93 \$22°40.61 84°7.59 \$24°12.59 238°22.70 N21°36.22 356°57.36 \$03°57.26 19 8°42.04 112°13.01 41.00 99°7.99 12.61 253°25.44 36.27 11°59.76 57.22 20 23°44.50 127°12.09 41.39 114°8.39 12.64 268°28.17 36.32 27°2.16 57.18 21 38°46.97 142°11.17 ·· 41.78 129°8.79 ·· 12.66 283°30.90 ·· 36.37 42°4.56 ·· 57.14 22 53°49.43 157°10.24 42.17 144°9.19 12.69 298°33.63 36.42 57°6.96 57.07  Mars: 0.1  Nonet 14 Sun 3°20.34 18:16  Saturn 3°20.34 18:16  Saturn 3°20.34 18:16  Saturn 3°20.34 18:16							I
15 308°32.18 52°16.69 · 39.42 39°6.40 · 12.51 193°14.51 · 36.07 311°50.16 · 57.37   16 323°34.64 67°15.77 39.82 54°6.80 12.54 208°17.24 36.12 326°52.56 57.33   17 338°37.11 82°14.85 40.22 69°7.20 12.56 223°19.97 36.17 341°54.96 57.29   18 353°39.57 97°13.93 \$22°40.61 84°7.59 \$24°12.59 238°22.70 N21°36.22 356°57.36 \$03°57.26   19 8°42.04 112°13.01 41.00 99°7.99 12.61 253°25.44 36.27 11°59.76 57.22   20 23°44.50 127°12.09 41.39 114°8.39 12.64 268°28.17 36.32 27°2.16 57.18   21 38°46.97 142°11.17 · 41.78 129°8.79 · 12.66 283°30.90 · 36.37 42°4.56 · 57.14   22 53°49.43 157°10.24 42.17 144°9.19 12.69 298°33.63 36.42 57°6.96 57.11   23 68°51.89 172°9.32 42.56 159°9.59 12.71 313°36.36 36.47 72°9.36 57.07    Dec 14 Sun SHA Mer.pass Venus 104°35.23 11:31							
16 323° 34.64 67° 15.77 39.82 54° 6.80 12.54 208° 17.24 36.12 326° 52.56 57.33 Venus 104° 35.23 11:31 17 338° 37.11 82° 14.85 40.22 69° 7.20 12.56 223° 19.97 36.17 341° 54.96 57.29 Mars 91° 5.18 12:24 18 353° 39.57 97° 13.93 522° 40.61 84° 7.59 524° 12.59 238° 22.70 N21° 36.22 356° 57.36 503° 57.26 Jupiter 244° 38.37 02:09 19 8° 42.04 112° 13.01 41.00 99° 7.99 12.61 253° 25.44 36.27 11° 59.76 57.22 Saturn 3° 18.92 18:12 138° 46.97 142° 11.17 · 41.78 129° 8.79 · 12.66 283° 30.90 · 36.37 42° 4.56 · 57.14 Mars 91° 5.18 12:24 14.01 144° 11.17 · 41.78 129° 8.79 · 12.66 283° 30.90 · 36.37 42° 4.56 · 57.14 140° 11.17 · 41.78 129° 8.79 · 12.66 283° 30.90 · 36.37 42° 4.56 · 57.14 140° 11.17 · 41.78 129° 8.79 · 12.69 298° 33.63 36.42 57° 6.96 57.11 Venus 0.1 140° 12° 12° 12° 12° 12° 12° 12° 12° 12° 12							
17 338°37.11 82°14.85 40.22 69°7.20 12.56 223°19.97 36.17 341°54.96 57.29 18 353°39.57 97°13.93 \$22°40.61 84°7.59 \$24°12.59 238°22.70 N21°36.22 356°57.36 \$03°57.26 19 8°42.04 112°13.01 41.00 99°7.99 12.61 253°25.44 36.27 11°59.76 57.22 20 23°44.50 127°12.09 41.39 114°8.39 12.64 268°28.17 36.32 27°2.16 57.18 21 38°46.97 142°11.17 · 41.78 129°8.79 · 12.66 283°30.90 · 36.37 42°4.56 · 57.14 22 53°49.43 157°10.24 42.17 144°9.19 12.69 298°33.63 36.42 57°6.96 57.11 23 68°51.89 172°9.32 42.56 159°9.59 12.71 313°36.36 36.47 72°9.36 57.07  Mars 91°5.18 12:24  Jupiter 244°38.37 02:09  Saturn 3°18.92 18:12  Horizontal parallax  Venus: 0.1  Mars: 0.1							
18 353°39.57 97°13.93 \$22°40.61 84°7.59 \$24°12.59 238°22.70 N21°36.22 356°57.36 \$03°57.26							
19 8°42.04 112°13.01 41.00 99°7.99 12.61 253°25.44 36.27 11°59.76 57.22 Saturn 3°18.92 18:12 20 23°44.50 127°12.09 41.39 114°8.39 12.64 268°28.17 36.32 27°2.16 57.18 21 38°46.97 142°11.17 · 41.78 129°8.79 · 12.66 283°30.90 · 36.37 42°4.56 · 57.14 22 53°49.43 157°10.24 42.17 144°9.19 12.69 298°33.63 36.42 57°6.96 57.11 23 68°51.89 172°9.32 42.56 159°9.59 12.71 313°36.36 36.47 72°9.36 57.07 Mars: 0.1							
20 23°44.50 127°12.09 41.39 114°8.39 12.64 268°28.17 36.32 27°2.16 57.18 21 38°46.97 142°11.17 · 41.78 129°8.79 · 12.66 283°30.90 · 36.37 42°4.56 · 57.14 22 53°49.43 157°10.24 42.17 144°9.19 12.69 298°33.63 36.42 57°6.96 57.11 23 68°51.89 172°9.32 42.56 159°9.59 12.71 313°36.36 36.47 72°9.36 57.07  Horizontal parallax Venus: 0.1 Mars: 0.1			112°13.01 41.00			11°59.76 57.22	1
22 53°49.43 157°10.24 42.17 144°9.19 12.69 298°33.63 36.42 57°6.96 57.11 Venus: 0.1 23 68°51.89 172°9.32 42.56 159°9.59 12.71 313°36.36 36.47 72°9.36 57.07 Mars: 0.1							
23 68°51.89 172°9.32 42.56 159°9.59 12.71 313°36.36 36.47 72°9.36 57.07 Mars: 0.1							-
25 00 51.05 172 5.02 42.00 155 5.05 12.71 515 50.00 50.41 72 5.00 51.01							I
Mer.pass. 18:25 $\nu$ -0.9' $d$ 0.4' m-3.90 $\nu$ 0.4' $d$ 0.0' m1.23 $\nu$ 2.7' $d$ 0.0' m-2.61 $\nu$ 2.4' $d$ -0.0' m0.96							11113. 0.1
	Mer.	pass. 18:25	ν-0.9′ d0.4′ m-3.90	ν0.4' d0.0' m1.23	ν2.7' d0.0' m-2.61	ν2.4' d-0.0' m0.96	

h	Su	n	Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°36.52	\$23°4.58	268°52.00	15.8'	N02°35.56	-14.8'	55.8'
1	196°36.23	4.77	283°26.83	15.9'	02°20.76	-14.8'	55.8'
2	211°35.94 226°35.65	4.96 •• 5.14	298°1.69 312°36.60	15.9' 15.9'	02°5.97 01°51.18	-14.8' -14.8'	55.7' 55.7'
4	241°35.36	5.32	327°11.54	16.0'	01°36.40	-14.8'	55.7'
5	256° 35.07	5.51	341°46.52	16.0'	01°21.64	-14.8'	55.6'
6	271°34.78	\$23°5.69	356°21.54	16.0'	N01°6.88	-14.7'	55.6'
7	286°34.49 301°34.19	5.87	10°56.59	16.1'	00°52.13	-14.7'	55.6'
8 9	301°34.19 316°33.90	6.05 · · 6.23	25°31.67 40°6.78	16.1' 16.1'	00°37.40 00°22.68	-14.7' -14.7'	55.5' 55.5'
10	331° 33.61	6.41	54°41.92	16.2'	N00°7.97	-14.7'	55.5'
11	346°33.32	6.59	69°17.09	16.2'	S00°6.72	14.7'	55.5'
12	1°33.03	\$23°6.77	83°52.29	16.2'	S00°21.40	14.7'	55.4'
13 14	16°32.73 31°32.44	6.95 7.12	98°27.51 113°2.76	16.2' 16.3'	00°36.06 00°50.71	14.6' 14.6'	55.4' 55.4'
15	46°32.15	· · 7.30	113 2.76 127°38.03	16.3	00 50.71 01°5.33	14.6	55.3'
16	61°31.85	7.47	142°13.32	16.3'	01°19.94	14.6'	55.3'
17	76°31.56	7.65	$156^{\circ}48.63$	16.3'	$01^{\circ}34.53$	14.6'	55.3'
18	91°31.27	\$23°7.82	171°23.96	16.3'	S01°49.10	14.5'	55.3'
19 20	106°30.97 121°30.68	7.99 8.17	185°59.31 200°34.68	16.4' 16.4'	02°3.65 02°18.18	14.5' 14.5'	55.2' 55.2'
21	136°30.39	• • 8.34	215°10.06	16.4	02°18.18	14.5	55.2'
22	151°30.09	8.51	229°45.46	16.4	02°47.17	14.5'	55.2'
23	166°29.80	8.67	244°20.86	16.4'	$03^{\circ}1.63$	14.4'	55.1'
	SD = 16.2'	d = 0.2'		SI	D = 15.2'		
	CUA				Б.	,	110
Sat 0	<b>GHA</b> 181° 29.50	Dec \$23°8.84	<b>GHA</b> 258° 56.29	u 16.4'	Dec 503°16.07	d 14.4'	HP 55.1'
1	196° 29.21	9.01	273°31.72	16.4	03°30.48	14.4	55.1'
2	211°28.91	9.18	288°7.16	16.4'	03°44.87	14.4'	55.1'
3	226°28.62	• • 9.34	302°42.60	16.5'	03°59.23	14.3'	55.0'
4	241°28.32 256°28.03	9.51	317°18.06 331°53.52	16.5' 16.5'	04°13.56 04°27.87	14.3' 14.3'	55.0' 55.0'
5 6	250 28.03 271°27.73	9.67 \$23° 9.84	331 53.52 346°28.98	16.5'	504°42.15	14.3	55.0'
7	286° 27.44	10.00	1°4.45	16.5'	04°56.40	14.2'	54.9'
8	301°27.14	10.16	15°39.92	16.5'	$05^{\circ}10.62$	14.2'	54.9'
9	316°26.85	• • 10.32	30°15.39	16.5'	05°24.80	14.2'	54.9'
10 11	331°26.55 346°26.26	10.48 10.64	44°50.87 59°26.33	16.5' 16.5'	05°38.96 05°53.09	14.1' 14.1'	54.9' 54.8'
12	1°25.96	\$23°10.80	74° 1.80	16.5	S06°7.18	14.1	54.8'
13	16°25.66	10.96	88°37.26	16.5'	06°21.25	14.0'	54.8'
14	31°25.37	11.12	$103^{\circ}12.72$	16.5'	$06^{\circ}35.27$	14.0'	54.8'
15	46°25.07	• • 11.27	117°48.17	16.4	06°49.27	14.0'	54.8'
16 17	61°24.77 76°24.48	11.43 11.58	132°23.62 146°59.05	16.4' 16.4'	07°3.22 07°17.15	13.9' 13.9'	54.7' 54.7'
18	91°24.18	S23°11.74	161°34.48	16.4	S07°31.03	13.8'	54.7'
19	106°23.88	11.89	$176^{\circ}9.90$	16.4'	07°44.88	13.8'	54.7'
20	121°23.59	12.04	190°45.30		07°58.69	13.8'	54.7'
21 22	136°23.29 151°22.99	· · 12.19 12.34	205°20.69 219°56.07	16.4' 16.4'	08°12.46 08°26.20	13.7' 13.7'	54.6' 54.6'
23	166° 22.69	12.49	234°31.43	16.3'	08°39.89	13.7'	54.6'
	SD = 16.2'	d = 0.2'			D = 15.0'		
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	181°22.40 196°22.10	\$23°12.64 12.79	249°6.78 263°42.11	16.3' 16.3'	\$08°53.55 09°7.16	13.6' 13.6'	54.6' 54.6'
2	211°21.80	12.79	278° 17.42	16.3	09°20.73	13.5	54.5
3	226°21.50	• • 13.09	292°52.71	16.3'	09°34.26	13.5'	54.5'
4	241°21.20	13.23	307°27.98	16.2'	09°47.74	13.4'	54.5'
5 6	256°20.91 271°20.61	13.38 \$23°13.52	322°3.23 336°38.45	16.2' 16.2'	10°1.18 \$10°14.58	13.4' 13.4'	54.5' 54.5'
7	286°20.31	13.66	351°13.66	16.2'	10°27.93	13.4	54.5
8	301°20.01	13.81	5°48.84	16.2'	10°41.23	13.3'	54.4'
9	316° 19.71	• • 13.95	20°23.99	16.1'	10°54.49	13.2'	54.4'
10 11	331° 19.41 346° 19.11	14.09 14.23	34°59.12 49°34.22	16.1' 16.1'	11°7.70 11°20.86	13.2' 13.1'	54.4' 54.4'
12	1° 18.81	14.23 \$23°14.37	49°34.22 64°9.29	16.1	\$11°20.86 \$11°33.98	13.1	54.4'
13	16° 18.51	14.51	78°44.33	16.0'	11°47.04	13.0'	54.4'
14	31° 18.22	14.65	93°19.34	16.0'	12°0.05	13.0'	54.4'
15	46°17.92	• • 14.78	107°54.32	15.9'	12°13.02	12.9'	54.3'
16 17	61°17.62 76°17.32	14.92 15.06	122°29.26 137°4.17	15.9' 15.9'	12°25.93 12°38.79	12.9' 12.8'	54.3' 54.3'
18	91° 17.02	\$23°15.19	151°39.05	15.8'	\$12°51.60	12.8'	54.3'
19	106° 16.72	15.32	166°13.90	15.8'	$13^{\circ}4.35$	12.7'	54.3'
20	121°16.42	15.46	180°48.70	15.8'	13°17.05	12.6'	54.3'
21	136° 16.12 151° 15.81	· · 15.59	195°23.47 209°58.20	15.7'	13°29.69 13°42.28	12.6'	54.3'
22 23	151° 15.81 166° 15.51	15.72 15.85	209°58.20 224°32.90	15.7' 15.7'	13°42.28 13°54.81	12.5' 12.5'	54.2' 54.2'
	SD = 16.2'	d = 0.1'			D = 14.9'		

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

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

	Sun			Moon		
Day	Day Eqn.of Time		Mer.	Mer.Pass.		Age
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	49-30%
12	06:26	06:12	11:54	06:15	18:35	
13	05:58	05:44	11:54	06:56	19:16	
14	05:30	05:15	11:55	07:36	19:57	

### December 15, 16, 17 UT (Mon., Tue., Wed.)

CHA	h	Aries	Venus	Mars	Jupiter	Saturn	Stars
1	Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
1   197							
2 1979 03 297							· ·
1							
1							
Fig.   1.5	4	144°4.21			28°50.03 36.71		· ·
Part	5			249°11.98 12.83	43°52.76 36.76	162°23.75 56.84	
1							
1							
1							
19							
12   264   246   247							Aldebaran 290°38.39 16°33.74
13 297°2630 297°6637 4787 9°1515 1.908 1641466 3716 2776 298°4593 5635 1.008 1971 130 1741 15 307°4512 5640 1540 1540 1540 1540 1540 1540 1540 15							Rigel 281°2.79 -8°10.27
14   246   236   236   236   246   236   246   236   246   236   246   236							
15 300°13.12 51°16.42 46.61 300°15.05 1.01 104°20.12 · 37.6 312°47.72 · 56.45 Ahllum 275°3.61 271.10 10 304°3.05 81°5.06 49.84 60°16.74 1300 20°22.66 37.36 32°5.07 50.61 11 11 309°13.62 107°5.05 107°5.07 97.75 100°22.66 37.36 32°5.07 10.50							
13 358*367.5 06 120 26 48.5 39 27 26 27 27 20 27 25 26 27 28 27 27 27 27 27 27 27 27 27 27 27 27 27	15						
1.0	16	324°33.78	66°53.59 48.98	54°16.34 13.02	209°22.86 37.31	327°50.12 56.41	
18   18   18   18   18   18   18   18	17	339°36.25	81°52.66 49.34	69°16.74 13.04	224°25.59 37.36	342°52.51 56.37	
20 39°4.61.6   101°4.09.6   50.00   120°1.01.3   1.10.6   290°3.81   37.5   279°9.70   58.25   79.95							
20 4 4.5.6.6 1.6.1 98.98 50.06 11.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.							
29   29   29   29   29   29   29   29							
Mer.pass. 18:21							
True   GHA   CHA   Dec   GHA							Avior 234°13.93 -59°35.32
CHA							
Top   Section   Color   Colo	Mer.p	pass. 18:21	$\nu$ -0.9 $'$ $d$ 0.4 $'$ m-3.90	$ u 0.4' \ d0.0' \ m1.23$	$\nu 2.7' \ d0.0' \ \text{m-}2.62$	$ u 2.4' \ d$ -0.0' m0.96	
The GHA GHA CHA Dec GHA DEC GH							·
1 99°590 201°452 3 522°518 81 74′1951 524′1313 4 34′4767 5 71771 88°9.28 503′5610 21 14′5632 5 21′44′30 5 229 204′30.30 1313 43′4767 5 718′118′1467 5 60.02 41′48042 5 229°420 201′40.00 13131 34′4767 5 718′118′1467 5 60.02 41′48042 5 229°420 201′40.00 13131 34′4767 5 718′118′1467 5 60.02 41′48042 5 24°421 200′40.00 13131 34′4768.00 377 7 163′2125 5 5.90 160′75 82 26′41.50 5 355 24°421.00 13131 34′4768.00 377 7 163′2125 5 5.90 160′75 82 26′41.50 5 355 24′421.00 13131 34′4768.00 377 7 163′2125 5 5.90 160′75 82 26′41.50 5 355 24′421.00 13131 36′48768 3 310′40′41.00 1314 34′476.00 14′476.00 14′476.00 14′476.00 14′476.00 14′476.00 14′47.00	Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	
2 114*98 42 216*44.3 52.33 189*19.91 13.14 39*0*0.5 37.77 103*11.67 56.06 3 1070.89 2143.36 52.94 214*0*20.00 13.15 39*0*0.4 77.7 103*11.67 56.06 3 1070.89 2143.36 52.94 214*0*20.00 13.15 39*0*0.4 58.07 5	0	84°53.50		174°19.51 \$24°13.13	329°44.76 N21°37.71	88°9.28 <b>S</b> 03°56.10	
2 114"58.42 216"44.30 52.50 204"20.30 13.15 369"50.24 37.82 118"14.07 56.02 Acrus 172"59.82 632"4.30 145"3.63 5.00 231"43.56 52.94 219"20.70 13.16 14"52.30 37.82 118"14.07 56.02 Acrus 172"59.82 632"4.30 145"3.63 5.00 231"4.30 24"21.00 13.17 24"52.30 37.82 118"14.07 56.02 Acrus 172"59.82 632"4.30 145"3.63 5.00 2							
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The first of the							Alioth 166°12.49 55°48.84
100°11075							· ·
8 205"13.21							
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17 340°35.39 81°30.29 57.78 69°26.23 13.25 22°31.36 38.58 343°49.97 55.41   18 355°37.85 96°29.36 522°88.12 84°26.62 524°13.25 240°34.11 121°38.63 53°55.37   19 10°40.32 111°28.42 58.45 99°27.01 13.26 25°56.85 38.68 13°54.75 55.33   114°26.25 126°27.49 58.79 114°27.41 13.26 25°56.85 38.68 13°54.75 55.33   12 40°45.24 141°26.55 5.59.12 129°27.80 13.26 268°42.34 58.78 43°9.95 3 5.52 5   12 23 70°50.17 171°24.68 59.78 159°28.59 13.26 300°45.08 38.83 59°1.92 55.21   10 50°5.01 717°4.68 59.78 159°28.59 13.26 300°45.08 38.83 59°1.92 55.21   10 50°5.01 717°4.68 59.78 159°28.59 13.26 300°45.08 38.83 59°1.92 55.21   10 50°5.01 717°24.68 59.78 159°28.59 13.26 300°45.08 38.83 59°1.92 55.21   10 50°5.01 717°24.68 59.78 159°28.59 13.26 315°47.8 38.88 59°1.92 55.21   10 50°5.01 717°2.60 59.78 159°28.59 13.26 315°47.8 38.88 59°1.92 55.21   10 50°5.01 717°2.60 59.78 159°28.59 13.26 315°47.8 38.88 59°1.92 55.21   10 50°5.01 717°2.28 0 0.44 186°29.77 13.26 50°56.06 39.04 110°5.01 55.00 85°5.21   10 50°5.01 201°22.80 0.44 186°29.77 13.26 0°56.06 39.04 110°5.00 85°5.02   11 50°5.01 201°22.80 0.44 186°29.77 13.26 0°56.06 39.04 110°5.00 85°5.04   14 146°2.49 246°1.99 1.41 234°30.55 13.26 15°8.81 0.39.09 134°1.38 55.00   16 176°7.42 276°1.81 15 23°2.00 246°31.34 524°13.25 61°7.05 12°30.44 146°1.27 54.96   16 176°7.42 276°1.81 15 23°2.00 246°31.34 524°13.25 61°7.05 121°39.44 140°1.27 1.54 140°1.27 1.54 11.25 11.53 4.82 9°3.30 13.25 91°12.54 39.34 200°25.83 54.79   9 221°14.81 321°15.29 3.02 300°32.52 13.24 106°15.25 39.49 40°24.82 20°54.87   10 236°17.28 336°14.35 3.34 3.66 339°33.30 13.23 15°23.54 12°23.45 12°24.84 54.83   10 236°17.28 336°14.35 3.34 3.66 339°33.30 13.23 13°23.54 12°23.45 12°24.82 20°54.87   10 236°17.28 36°14.35 3.34 36°3.39 53.30 53.30 53.64 20°3.44 54.83   10 236°17.28 336°14.35 3.34 36°3.39 526°3.32 39.81 344°4.73 22 544°5.20 11.34 13.65 339°3.33 31.32 136°2.07 9.35 50 50°3.54 87 9.55 4.65   10 236°17.28 336°14.35 3.34 36°3.39 526°3.32 39.81 344°4.73 22 544°5.20 546°5.30   10 236°17.28 336°14.55 3.34 36°5.35 39°3							
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21	20	25° 42.78				28°57.14 55.29	
22 55°47.71 156°25.61 59.45 144°28.19 13.26 300°45.08 38.83 59°1.92 55.21 Morking 75°4.71.7 2.6°15.89 287.75°1.75°1.72 4.68 59.78 159°28.59 11.3.26 315°47.83 38.88 74°4.31 55.16 Morking 75°4.71.7 2.6°15.89 287.75°1.75°1.72 4.68 59.78 159°28.59 11.3.26 315°47.83 38.88 74°4.31 55.16 Morking 75°4.71.7 2.6°15.89 287.75°1.75°1.75°1.75°1.75°1.75°1.75°1.75°							
Mer.pass. 18:17         ν-0.9' d0.4' m-3.90         ν0.4' d0.0' m1.22         ν2.7' d0.1' m-2.62         ν2.4' d-0.0' m0.97         Actual of 1.92 so 3.93 so 3.93.24         Peacock 53°.498 so 36°39.24         56°39.24 so 3.93 so 3.93.24         20°95.72 so 3.93 so 3.93.24         Dec GHA Does 10°55.0         GHA Does 23°30.11         GHA Does 23°30.12         GHA Does 23							
Wed         GHA         GHA         Dec         GHA <td>23</td> <td>70°50.17</td> <td>171°24.68 59.78</td> <td>159°28.59 13.26</td> <td>315°47.83 38.88</td> <td>74°4.31 55.16</td> <td>Altair 61°59.50 8°56.25</td>	23	70°50.17	171°24.68 59.78	159°28.59 13.26	315°47.83 38.88	74°4.31 55.16	Altair 61°59.50 8°56.25
Character   Char	Mer.p	pass. 18:17	$\nu$ -0.9 $'$ d0.4 $'$ m-3.90	$ u 0.4' \ d0.0' \ m1.22$	$\nu 2.7' \ d0.1' \ \text{m-}2.62$	$ u 2.4' \ d$ -0.0 $' \ \text{m} 0.97$	
Wed   GHA   GHA   Dec   GHA   186°23.74   523°0.11   174°28.08   524°13.26   330°50.57   N21°38.93   89°6.71   S03°55.12   So3°55.12   So3°50.57   N21°38.93   S96°.71   S03°55.12   So3°55.12   So3°50.57   N21°38.93   S96°.71   S03°55.12   So3°55.12   So3°50.57   S03°55.12   So3°50.57   S03°50.57   S03°54.87   S03°5							
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12 266 22.21 6 12.47 523 3.97 354 33.09 524 13.23 151 23.54 N21 39.55 269 35.38 503 54.62 13.21 153 281 24.67 21 11.53 4.28 9 34.09 13.22 166 26.28 39.60 284 37.77 54.58 18:04 15 311 29.60 51 9.64 4.4.90 39 34.87 4.7 13.21 196 31.78 4.53 39.70 314 42.55 4.54 15 326 32.06 66 8.70 5.21 54 35.26 13.20 211 34.53 39.76 329 44.94 54.45 17 341 34.53 81 7.76 5.52 69 35.66 13.20 226 37.28 39.81 344 47.32 54.41 18.356 36.99 96 6.82 523 5.83 84 36.05 524 13.19 241 40.03 N21 39.86 359 49.71 503 54.37 19 11 39.46 111 5.87 6.13 99 36.44 13.18 256 42.78 39.91 14 52.10 54.32 19.00 54.32 12.22 126 44.33 141 3.99 4.67 41.29 37.22 4.13.16 286 48.28 4.001 44 56.87 54.24 19.20 26 44.93 141 3.18 141							
13 281 24.07 21 11.53 4.28 9 34.09 13.22 100 20.28 39.00 284 37.77 54.58 12.00 210 20 26 41.92 126 4.93 6.44 114 36.83 13.17 271 45.53 39.66 290 40.01 44 56.87 54.24 22 56 46.85 156 3.05 7.04 144 37.61 13.15 30 53.00 13.14 316 53.78 40.12 75 1.65 54.15    14 296 27.13 36 10.59 4.59 24 34.48 13.22 181 29.03 39.65 299 40.16 54.54 54.58 54.17 54.58 54.17 54.58 54.17 37.76 5.52 69 35.66 13.20 211 34.53 39.76 329 44.94 54.45 54	12		6°12.47 <b>S</b> 23°3.97	354°33.69 <b>S</b> 24°13.23	151°23.54 N21°39.55	269°35.38 <b>S</b> 03°54.62	
15 311°29.60 51°9.64 · · 4.90 39°34.87 · · 13.21 196°31.78 · · · 39.70 314°42.55 · · 54.49 16 326°32.06 66°8.70 5.21 54°35.26 13.20 211°34.53 39.76 329°44.94 54.45 17 341°34.53 81°7.76 5.52 69°35.66 13.20 226°37.28 39.81 344°47.32 54.41 18 356°36.99 96°6.82 523°5.83 84°36.05 524°13.19 241°40.03 N21°39.86 359°49.71 503°54.37 19 11°39.46 111°5.87 6.13 99°36.44 13.18 256°42.78 39.91 14°52.10 54.32 20 26°41.92 126°4.93 6.44 114°36.83 13.17 271°45.53 39.96 29°54.49 54.28 21 41°44.38 141°3.99 · · 6.74 129°37.22 · · 13.16 286°48.28 · · 40.01 44°56.87 · · 54.24 22 56°46.85 156°3.05 7.04 144°37.61 13.15 301°51.03 40.07 59°59.26 54.19 23 71°49.31 171°2.10 7.35 159°38.00 13.14 316°53.78 40.12 75°1.65 54.15							·
16       326°32.06       66°8.70       5.21       54°35.26       13.20       211°34.53       39.76       329°44.94       54.45       Venus       100°31.10       11:35         17       341°34.53       81°7.76       5.52       69°35.66       13.20       226°37.28       39.81       344°47.32       54.41       Mars       88°36.35       12:22         18       356°36.99       96°6.82       523°5.83       84°36.05       524°13.19       241°40.03       N21°39.86       359°49.71       503°54.37       Jupiter       244°57.94       01:56         19       11°39.46       111°5.87       6.13       99°36.44       13.18       256°42.78       39.91       14°52.10       54.32       Saturn       3°14.07       18:01         20       26°41.92       126°4.93       6.44       114°36.83       13.17       271°45.53       39.96       29°54.49       54.28       54.28       41°44.38       141°3.99       6.74       129°37.22       13.16       286°48.28       40.01       44°56.87       54.24       54.24       54.24       40.01       44°56.87       54.24       54.24       54.24       54.24       54.24       54.24       54.24       54.24       54.24       54.24       54.24 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
17 341°34.53 81°7.76 5.52 69°35.66 13.20 226°37.28 39.81 344°47.32 54.41 Mars 88°36.35 12:22 18 356°36.99 96°6.82 \$23°5.83 84°36.05 \$24°13.19 241°40.03 N21°39.86 359°49.71 \$03°54.37 19 11°39.46 111°5.87 6.13 99°36.44 13.18 256°42.78 39.91 14°52.10 54.32 20 26°41.92 126°4.93 6.44 114°36.83 13.17 271°45.53 39.96 29°54.49 54.28 21 41°44.38 141°3.99 · 6.74 129°37.22 · 13.16 286°48.28 · 40.01 44°56.87 · 54.24 22 56°46.85 156°3.05 7.04 144°37.61 13.15 301°51.03 40.07 59°59.26 54.19 23 71°49.31 171°2.10 7.35 159°38.00 13.14 316°53.78 40.12 75°1.65 54.15 Mars: 0.1							
18 356°36.99 96°6.82 \$23°5.83 84°36.05 \$24°13.19 241°40.03 N21°39.86 359°49.71 \$03°54.37							
19 11°39.46 111°5.87 6.13 99°36.44 13.18 256°42.78 39.91 14°52.10 54.32 Saturn 3°14.07 18:01 20 26°41.92 126°4.93 6.44 114°36.83 13.17 271°45.53 39.96 29°54.49 54.28 21 41°44.38 141°3.99 · 6.74 129°37.22 · 13.16 286°48.28 · 40.01 44°56.87 · 54.24 22 56°46.85 156°3.05 7.04 144°37.61 13.15 301°51.03 40.07 59°59.26 54.19 23 71°49.31 171°2.10 7.35 159°38.00 13.14 316°53.78 40.12 75°1.65 54.15 Mars: 0.1							
20 26°41.92 126°4.93 6.44 114°36.83 13.17 271°45.53 39.96 29°54.49 54.28 21 41°44.38 141°3.99 · 6.74 129°37.22 · 13.16 286°48.28 · 40.01 44°56.87 · 54.24 22 56°46.85 156°3.05 7.04 144°37.61 13.15 301°51.03 40.07 59°59.26 54.19 23 71°49.31 171°2.10 7.35 159°38.00 13.14 316°53.78 40.12 75°1.65 54.15 Mars: 0.1							
22 56°46.85 156°3.05 7.04 144°37.61 13.15 301°51.03 40.07 59°59.26 54.19 Venus: 0.1 23 71°49.31 171°2.10 7.35 159°38.00 13.14 316°53.78 40.12 75°1.65 54.15 Mars: 0.1							
23 71°49.31 171°2.10 7.35 159°38.00 13.14 316°53.78 40.12 75°1.65 54.15 Mars: 0.1							
20 11 13.01 111 2.10 1.00 13.11 320 30.10 10.12 10 1.00 31.10							
Mer.pass. 18:13 $\nu$ -0.9' $d$ 0.3' m-3.90 $\nu$ 0.4' $d$ -0.0' m1.21 $\nu$ 2.7' $d$ 0.1' m-2.63 $\nu$ 2.4' $d$ -0.0' m0.97	23	/1°49.31	1/1°2.10 7.35			/5~1.65 54.15	IVIAIS: U.1
	Mer.p	pass. 18:13	ν-0.9' d0.3' m-3.90	ν0.4' d-0.0' m1.21	ν2.7′ d0.1′ m-2.63	ν2.4' d-0.0' m0.97	

h	Su	n	Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°15.21	S23°15.98	$239^{\circ}7.55$	15.6'	<b>S</b> 14°7.28	12.4'	54.2'
1	196°14.91	16.11	253°42.16	15.6'	14° 19.70	12.4'	54.2'
2	211°14.61 226°14.31	16.24 •• 16.37	268°16.73 282°51.26	15.5' 15.5'	14° 32.05 14° 44.35	12.3' 12.2'	54.2' 54.2'
4	241°14.01	16.49	297°25.74	15.4'	14°56.59	12.2'	54.2'
5	$256^{\circ}13.71$	16.62	$312^{\circ}0.18$	15.4'	$15^{\circ}8.76$	12.1'	54.2'
6	271°13.41	\$23° 16.74	326°34.58	15.3'	\$15°20.88	12.1'	54.1'
7 8	286°13.10 301°12.80	16.87 16.99	341°8.93 355°43.23	15.3' 15.3'	15° 32.93 15° 44.92	12.0' 11.9'	54.1' 54.1'
9	316°12.50	. 17.11	10° 17.49	15.2'	15°56.84	11.9'	54.1'
10	331°12.20	17.23	24°51.69	15.2'	16°8.70	11.8'	54.1'
11 12	346°11.90 1°11.59	17.36 \$23° 17.48	39°25.85 53°59.96	15.1' 15.1'	16°20.49 \$16°32.22	11.7' 11.7'	54.1' 54.1'
13	16°11.29	17.60	68°34.02	15.1	16°43.88	11.6'	54.1'
14	31°10.99	17.71	83°8.03	15.0'	16°55.47	11.5'	54.1'
15	46°10.69	• • 17.83	97°41.98	14.9'	17°7.00	11.5'	54.1'
16 17	61°10.38 76°10.08	17.95 18.06	112°15.89 126°49.74	14.8' 14.8'	17° 18.45 17° 29.84	11.4' 11.3'	54.1' 54.0'
18	91°9.78	\$23°18.18	141°23.53	14.7'	\$17°41.15	11.2'	54.0'
19	106°9.48	18.29	$155^{\circ}57.27$	14.7'	$17^{\circ}52.39$	11.2'	54.0'
20	121°9.17	18.41	170°30.96	14.6'	18°3.56	11.1'	54.0'
21 22	136°8.87 151°8.57	· · 18.52 18.63	185°4.59 199°38.16	14.6' 14.5'	18° 14.65 18° 25.67	11.0' 10.9'	54.0' 54.0'
23	166° 8.26	18.74	214°11.68	14.5'	18° 36.62	10.9	54.0'
	SD = 16.2'	d = 0.1'			0 = 14.8'		
	JD — 10.2			JL	17.0		
Tue	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	181°7.96 196°7.66	\$23° 18.85 18.96	228° 45.14 243° 18.54	14.4' 14.3'	\$18°47.49 18°58.28	10.8' 10.7'	54.0' 54.0'
2	211°7.35	19.07	243 16.54 257°51.88	14.3'	10 50.20 19°9.00	10.7	54.0'
3	226°7.05	• • 19.18	$272^{\circ}25.16$	14.2'	$19^{\circ}19.64$	10.6'	54.0'
4	241°6.75	19.29	286°58.38	14.2'	19°30.20	10.5'	54.0'
5 6	256° 6.44 271° 6.14	19.39 \$23° 19.50	301°31.54 316°4.64	14.1' 14.0'	19°40.68 \$19°51.07	10.4' 10.3'	54.0' 54.0'
7	286°5.83	19.60	330° 37.68	14.0'	20°1.39	10.2'	54.0'
8	301°5.53	19.71	$345^{\circ}10.66$	13.9'	$20^{\circ}11.62$	10.2'	54.0'
9	316°5.22	• • 19.81	359°43.58	13.9'	20°21.78	10.1'	53.9'
10 11	331°4.92 346°4.62	19.91 20.02	14°16.43 28°49.22	13.8' 13.7'	20°31.84 20°41.82	10.0' 9.9'	53.9' 53.9'
12	1°4.31	S23°20.12	43°21.94	13.7'	S20°51.72	9.8'	53.9'
13	16°4.01	20.22	57°54.61	13.6'	21°1.53	9.7'	53.9'
14 15	31°3.70 46°3.40	20.32 •• 20.41	72°27.20 86°59.74	13.5' 13.5'	21°11.25 21°20.89	9.6' 9.5'	53.9' 53.9'
16	61°3.09	20.51	101°32.21	13.4	21°20.69	9.5' 9.5'	53.9'
17	76°2.79	20.61	116°4.61	13.3'	21°39.89	9.4'	53.9'
18	91°2.48	S23°20.70	130°36.95	13.3'	S21°49.25	9.3'	53.9'
19 20	106°2.18 121°1.87	20.80 20.89	145°9.22 159°41.43	13.2'	21°58.52	9.2' 9.1'	53.9' 53.9'
21	136° 1.56	. 20.99	174° 13.57	13.1	22°16.79	9.1	53.9
22	151°1.26	21.08	$188^{\circ}45.64$	13.0'	22°25.78	8.9'	53.9'
23	166°0.95	21.17	203° 17.65	12.9'	22°34.68	8.8'	53.9'
	SD = 16.2'	d = 0.1'		SE	0 = 14.7'		
Wed	GHA	Dec	GHA	ν	Dec	d	НР
0	181°0.65	S23°21.26	217°49.60	12.9'	\$22°43.48	8.7'	53.9'
1	196°0.34	21.35	232°21.47	12.8'	22°52.18	8.6'	53.9'
2	211°0.04 225°59.73	21.44 •• 21.53	246°53.28 261°25.02	12.7' 12.7'	23°0.79 23°9.30	8.5' 8.4'	53.9' 53.9'
3 4	225°59.73 240°59.42	21.62	261° 25.02 275° 56.70	12.7	23° 9.30 23° 17.71	8.4	53.9' 53.9'
5	255°59.12	21.70	290°28.31	12.5'	23°26.02	8.2'	53.9'
6	270°58.81	S23°21.79	304°59.85	12.5'	\$23°34.22	8.1'	53.9'
7 8	285°58.50 300°58.20	21.88 21.96	319°31.32 334°2.73	12.4' 12.3'	23°42.33 23°50.33	8.0' 7.9'	53.9' 53.9'
9	315°57.89	. 22.04	348°34.07	12.3'	23°58.23	7.8'	53.9'
10	330°57.58	22.13	$3^{\circ}5.35$	12.2'	24°6.03	7.7'	53.9'
11	345°57.28	22.21	17°36.56	12.1'	24°13.72	7.6'	53.9'
12 13	0°56.97 15°56.66	\$23°22.29 22.37	32°7.70 46°38.78	12.1' 12.0'	\$24°21.30 24°28.78	7.5' 7.4'	53.9' 53.9'
14	30°56.36	22.45	61°9.79	11.9'	24°36.15	7.3	53.9
15	45°56.05	• • 22.53	75° 40.73	11.9'	24°43.41	7.2'	53.9'
16	60°55.74	22.61	90°11.61	11.8'	24°50.56	7.0'	53.9'
17 18	75°55.44 90°55.13	22.68 \$23°22.76	104° 42.43 119° 13.18	11.8' 11.7'	24°57.60 \$25°4.53	6.9' 6.8'	53.9' 53.9'
19	105°54.82	22.84	133°43.86	11.6'	$25^{\circ}11.35$	6.7'	53.9'
20	120°54.51	22.91	148°14.49	11.6'	25° 18.05	6.6'	53.9'
21 22	135°54.21 150°53.90	· · 22.98 23.06	162° 45.05 177° 15.54	11.5' 11.4'	25°24.64 25°31.12	6.5' 6.4'	53.9' 53.9'
23	165° 53.59	23.13	177 15.54 191°45.97	11.4'	25° 37.48	6.2	53.9'
	SD = 16.2'	d = 0.1'		SF	0 = 14.7'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	22-8%
15	05:01	04:46	11:55	08:18	20:39	
16	04:32	04:17	11:56	09:01	21:24	
17	04:03	03:48	11:56	09:47	22:11	

### December 18, 19, 20 UT (Thu., Fri., Sat.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA I	Dec
0	86°51.78	186°1.16 <b>S</b> 23°7.65	174°38.40 \$24°13.13	331°56.53 N21°40.17	90°4.03 <b>S</b> 03°54.11		°14.23
1	$101^{\circ}54.24$	201°0.21 7.94	189°38.79 13.12	346°59.28 40.22	105°6.42 54.06		°14.23
2	$116^{\circ}56.70$	215°59.27 8.24	204°39.18 13.11	2°2.04 40.27	120°8.81 54.02		°41.10
3	131°59.17	230°58.32 · · 8.54	219°39.57 · · 13.10	17°4.79 · · 40.33	135°11.19 · · 53.98		°50.71
4	147°1.63 162°4.10	245°57.38 8.83	234°39.96 13.08	32°7.54 40.38	150°13.58 53.93		7°6.51
5 6	162 4.10 177°6.56	260°56.43 9.13 275°55.49 \$23°9.42	249°40.35 13.07 264°40.74 \$24°13.06	47°10.29 40.43 62°13.04 N21°40.48	165°15.97 53.89 180°18.35 \$03°53.85		°35.26
7	192°9.03	290°54.54 9.71	279°41.13 13.04	77°15.80 40.53	195°20.74 53.80		°22.63
8	207° 11.49	305°53.60 10.00	294°41.52 13.03	92°18.55 40.59	210°23.12 53.76		°12.14
9	$222^{\circ}13.95$	320°52.65 · · 10.29	309°41.91 · · 13.01	107°21.30 · · 40.64	225°25.51 · · 53.72		°11.54 °57.37
10	$237^{\circ}16.42$	335°51.70 10.58	324°42.30 13.00	122°24.06 40.69	240°27.89 53.67		°33.73
11	252° 18.88	350°50.76 10.87	339°42.69 12.98	137°26.81 40.74	255°30.28 53.63		°10.28
12	267°21.35 282°23.81	5°49.81 \$23°11.15 20°48.86 11.43	354°43.08	152°29.56 N21°40.80 167°32.32 40.85	270°32.66 S03°53.58 285°35.05 53.54		6°1.47
13 14	202 23.01 297°26.28	20°48.86 11.43 35°47.92 11.72	9°43.47 12.95 24°43.86 12.93	167°32.32 40.85 182°35.07 40.90	285°35.05 53.54 300°37.43 53.50		°22.41
15	312°28.74	50°46.97 · · 12.00	39°44.25 · · 12.91	197°37.83 · · 40.95	315°39.82 · · 53.45		°37.77
16	327°31.20	65°46.02 12.28	54°44.64 12.90	212°40.58 41.00	330°42.20 53.41		°11.10
17	342°33.67	80°45.07 12.56	69°45.03 12.88	227°43.34 41.06	345°44.59 53.36		24.72 2°42.47
18	357°36.13	95°44.12 <b>S</b> 23°12.84	84°45.42 <b>S</b> 24°12.86	242°46.09 N21°41.11	0°46.97 \$03°53.32		°45.06
19	12° 38.60	110°43.18 13.11	99°45.81 12.84	257°48.85 41.16	15°49.35 53.27		9°0.36
20 21	27°41.06 42°43.52	125°42.23 13.39 140°41.28 · · 13.66	114°46.20 12.82 129°46.59 · · 12.80	272°51.61 41.21 287°54.36 · · 41.27	30°51.74 53.23 45°54.12 · · 53.19	Procyon 244°49.72	5°9.49
22	57° 45.99	155°40.33 13.94	144°46.98 12.78	302°57.12 41.32	60°56.50 53.14		°57.71
23	72°48.45	170°39.38 14.21	159°47.37 12.76	317°59.87 41.37	75°58.89 53.10	_	°35.34
		$\nu$ -0.9' d0.3' m-3.90	ν0.4' d-0.0' m1.21	ν2.8' d0.1' m-2.63			°32.05
ivier.	pass. 18:10	ν-0.9° α0.3° m-3.90	νυ.4 α-υ.υ m1.21	ν2.8° αυ.1° m-2.03	ν2.4' d-0.0' m0.97		°49.14 °46.23
							°50.33
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		°36.33
0	87°50.92	185°38.43	174°47.76	333°2.63 N21°41.42	91°1.27 \$03°53.05	Denebola 182°24.16 14°	°25.50
1 2	102° 53.38 117° 55.85	200°37.48 14.75 215°36.53 15.02	189°48.15 12.71 204°48.54 12.69	348°5.39 41.48 3°8.15 41.53	106°3.65 53.01 121°6.03 52.96	I	°41.09
3	132°58.31	230°35.58 · · 15.28	219°48.93 · · 12.66	18°10.90 · · 41.58	136°8.42 · · 52.92		°14.30
4	148°0.77	245°34.63 15.55	234°49.32 12.64	33°13.66 41.63	151°10.80 52.87		° 15.25
5	163°3.24	260°33.68 15.81	249°49.71 12.62	48°16.42 41.69	166° 13.18 52.83		°48.82
6	178°5.70	275°32.72 <b>S</b> 23°16.07	264°50.09 \$24°12.59	63°19.18 N21°41.74	181°15.56 \$03°52.78	·	° 10.75
7	193°8.17	290°31.77 16.34	279°50.48 12.57	78°21.94 41.79	196° 17.94 52.74		°29.65
8 9	208° 10.63	305°30.82 16.60	294°50.87 12.54	93°24.69 41.85	211°20.33 52.69		°29.71
10	223° 13.10 238° 15.56	320°29.87 · · 16.86 335°28.92 17.11	309°51.26 · · 12.52 324°51.65 12.49	108°27.45 · · 41.90 123°30.21 41.95	226°22.71 · · 52.64 241°25.09 52.60		.9°2.71
11	253° 18.02	350°27.96 17.37	339°52.04 12.46	138°32.97 42.00	256° 27.47 52.55		°56.34
12	268° 20.49	5°27.01 \$23°17.63	354°52.43 \$24°12.43	153°35.73 N21°42.06	271°29.85 \$03°52.51		'4°2.61 .6°8.93
13	283°22.95	20°26.06 17.88	9°52.81 12.41	168°38.49 42.11	286°32.23 52.46		6°37.51
14	298°25.42	35°25.11 18.14	24°53.20 12.38	183°41.25 42.16	301°34.61 52.42		°29.32
15	313°27.88	50°24.15 · · 18.39	39°53.59 · · 12.35	198°44.01 · · 42.22	316°36.99 · · 52.37		9°4.33
16 17	328° 30.34 343° 32.81	65°23.20 18.64 80°22.25 18.89	54°53.98 12.32 69°54.37 12.29	213°46.77 42.27 228°49.53 42.32	331°39.37 52.32 346°41.75 52.28	Sabik 102°2.24 -15°	°45.40
18	358° 35.27	95°21.29 S23°19.14	84°54.75 S24°12.26	243°52.29 N21°42.38	1°44.13 \$03°52.23	_	7°7.32
19	13°37.74	110°20.34 19.38	99°55.14 12.23	258°55.06 42.43	16°46.51 52.19		°32.45
20	28°40.20	125°19.38 19.63	114°55.53 12.20	273°57.82 42.48	31°48.89 52.14		°29.08 °22.34
21	43°42.67	140°18.43 · · 19.87	129°55.92 · · 12.17	289°0.58 · · 42.53	46°51.27 · · 52.09		° 48.47
22	58°45.13	155°17.47 20.12	144°56.30 12.14	304°3.34 42.59	61°53.65 52.05	_	°15.89
23	73° 47.59	170°16.52 20.36	159°56.69 12.10	319°6.10 42.64	76°56.03 52.00		°56.25
Mer. <sub>I</sub>	pass. 18:06	$\nu$ -1.0′ d0.3′ m-3.90	$\nu$ 0.4′ d-0.0′ m1.20	$\nu 2.8' \ d0.1' \ \text{m-}2.63$	$\nu$ 2.4′ <i>d</i> -0.0′ m0.98		°39.23
							°22.54
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		°59.72
0	88° 50.06	185°15.56 <b>S</b> 23°20.60	174°57.08 <b>S</b> 24°12.07	334°8.87 N21°42.69	91°58.41 \$03°51.95		°50.31 °29.21
1	103°52.52	200°14.61 20.84	189°57.47 12.04	349°11.63 42.75	107°0.79 51.91		°13.61
2	118° 54.99	215°13.65 21.08	204°57.85 12.00	4°14.39 42.80	122°3.16 51.86		°20.82
3 4	133° 57.45 148° 59.92	230°12.70 · · 21.31 245°11.74 21.55	219°58.24 · · 11.97 234°58.63 11.93	19°17.15 · · 42.85 34°19.92 42.91	$137^{\circ}5.54 \cdot \cdot \cdot 51.82$ $152^{\circ}7.92 \cdot 51.77$		er.pass
4 5	148 59.92 164°2.38	245 11.74 21.55 260°10.79 21.78	249°59.02 11.90	49°22.68 42.96	167°10.30 51.72	Venus 99°9.38	11:37
6	179°4.84	275°9.83 \$23°22.02	264°59.40 S24°11.86	64°25.44 N21°43.01	182°12.68 S03°51.67	Mars 87° 46.62	12:21
7	194°7.31	290°8.87 22.25	279°59.79 11.83	79°28.21 43.07	197°15.05 51.63	Jupiter 245°4.76	01:52
8	209°9.77	305°7.92 22.48	295°0.18 11.79	94°30.97 43.12	212° 17.43 51.58	Saturn 3°12.26	17:57
9	224° 12.24	320°6.96 · · 22.71	310°0.56 · · 11.75	109°33.74 · · 43.17	227° 19.81 · · 51.53	Dec 19 Fri SHA Me	er.pass
10 11	239° 14.70 254° 17.16	335°6.00 22.94 350°5.04 23.17	325°0.95 11.71 340°1.34 11.68	124°36.50 43.23 139°39.27 43.28	242°22.19 51.49 257°24.56 51.44	Venus 97° 47.51	11:38
12	269° 19.63	5°4.09 \$23°23.39	355°1.72 S24°11.64	154°42.03 N21°43.33	257°24.56 51.44 272°26.94 \$03°51.39	Mars 86° 56.84	12:20
13	284°22.09	20°3.13 23.62	10°2.11 11.60	169°44.80 43.39	287°29.32 51.34	Jupiter 245°11.71	01:47
14	299°24.56	35°2.17 23.84	25°2.50 11.56	184°47.56 43.44	302°31.69 51.30	Saturn 3°10.35	17:53
15	314°27.02	50°1.21 · · 24.06	40°2.88 ·· 11.52	199°50.33 · · 43.50	317°34.07 · · 51.25		er.pass
16	329°29.49	65°0.25 24.28	55°3.27 11.48	214°53.09 43.55	332°36.45 51.20	Venus 96°25.51	11:40
17	344° 31.95	79°59.30 24.50	70°3.66 11.44 85°4.04 \$24°11.40	229°55.86 43.60	347°38.82 51.15	Mars 86°7.02	12:20
18 19	359°34.41 14°36.88	94°58.34 \$23°24.72 109°57.38 24.94	100°4.43 11.36	244°58.63 N21°43.66 260°1.39 43.71	2°41.20 S03°51.11 17°43.57 51.06	Jupiter 245° 18.81 Saturn 3° 8.35	01:43 17:49
20	29°39.34	124°56.42 25.15	115° 4.81 11.31	275°4.16 43.76	32°45.95 51.01		11:49
21	44°41.81	139°55.46 · · 25.37	130°5.20 · · 11.27	290°6.93 · · 43.82	47°48.33 · · 50.96	Horizontal parallax	
22	59°44.27	154°54.50 25.58	145° 5.59 11.23	305°9.69 43.87	62°50.70 50.91		0.1
23	74°46.74	169°53.54 25.79	160° 5.97 11.18	320°12.46 43.93	77°53.08 50.87	Mars:	0.1
Mer.	pass. 18:02	ν-1.0′ d0.2′ m-3.90	$\nu$ 0.4′ <i>d</i> -0.0′ m1.20	$\nu 2.8' \ d0.1' \ \text{m-}2.64$	ν2.4' d-0.0' m0.98		

h	Su	n	Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.28	S23°23.20	$206^{\circ}16.34$	11.3'	<b>S</b> 25°43.73	6.1'	53.9'
1	195°52.98	23.27	220°46.65	11.2'	25°49.86	6.0'	53.9'
2	210°52.67 225°52.36	23.34 •• 23.41	235°16.90 249°47.08	11.2' 11.1'	25°55.87 26°1.77	5.9' 5.8'	53.9' 53.9'
4	240° 52.05	23.48	264°17.21	11.1'	26°7.54	5.7'	53.9'
5	255°51.74	23.55	278°47.28	11.0'	$26^{\circ}13.20$	5.5'	53.9'
6	270°51.43	S23°23.61	293°17.28	10.9'	\$26°18.73	5.4'	54.0'
7 8	285°51.13 300°50.82	23.68 23.74	307°47.23 322°17.12	10.9' 10.8'	26°24.14 26°29.44	5.3' 5.2'	54.0' 54.0'
9	315°50.51	23.81	336°46.96	10.8	26°34.61	5.0'	54.0'
10	330°50.20	23.87	351°16.74	10.7'	$26^{\circ}39.65$	4.9'	54.0'
11	345°49.89	23.93	5°46.46	10.7'	26°44.57	4.8'	54.0'
12 13	0°49.58 15°49.28	\$23°23.99 24.06	20°16.13 34°45.74	10.6' 10.6'	\$26°49.37 26°54.04	4.7' 4.5'	54.0' 54.0'
14	30°48.97	24.12	49°15.30	10.5	26°58.58	4.4'	54.0'
15	45°48.66	• • 24.18	63°44.81	10.5'	$27^{\circ}3.00$	4.3'	54.0'
16	60°48.35	24.23	78°14.27	10.4'	27°7.29	4.2'	54.0'
17 18	75°48.04 90°47.73	24.29 \$23°24.35	92°43.68 107°13.04	10.4' 10.3'	27°11.46 \$27°15.49	4.0' 3.9'	54.0' 54.0'
19	105°47.42	24.40	107 13.04 121°42.35	10.3	27°19.39	3.8'	54.0'
20	120° 47.11	24.46	136°11.61	10.2'	27°23.17	3.6'	54.0'
21	135°46.80	• • 24.51	150°40.83	10.2'	$27^{\circ}26.81$	3.5'	54.0'
22	150° 46.50	24.57	165°10.00	10.1	27°30.33	3.4'	54.0'
23	165°46.19	24.62	179°39.12	10.1'	$27^{\circ}33.71$ 0 = 14.7'	3.2'	54.0'
	SD = 16.2'	d = 0.1'					
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°45.88	S23°24.67	194°8.21	10.0'	<b>S</b> 27°36.96	3.1'	54.1'
1	195° 45.57	24.72	208°37.25	10.0'	27°40.07	3.0'	54.1'
2	210°45.26 225°44.95	24.77 •• 24.82	223°6.24 237°35.20	10.0' 9.9'	27°43.05 27°45.90	2.8' 2.7'	54.1' 54.1'
4	240°44.64	24.87	252°4.12	9.9'	27°48.62	2.6'	54.1
5	255° 44.33	24.92	266°33.01	9.8'	27°51.20	2.4'	54.1'
6	270°44.02	\$23°24.97	281°1.85	9.8'	S27°53.64	2.3'	54.1'
7	285°43.71	25.01	295°30.66	9.8'	27°55.95	2.2'	54.1'
8 9	300°43.40 315°43.09	25.06 •• 25.10	309°59.44 324°28.18	9.7' 9.7'	27°58.12 28°0.16	2.0' 1.9'	54.1' 54.1'
10	330°42.78	25.15	338°56.89	9.7'	28° 2.06	1.8'	54.1'
11	345°42.47	25.19	353°25.58	9.7'	28° 3.82	1.6'	54.1'
12	0°42.16	\$23°25.23	7°54.23	9.6'	S28° 5.44	1.5'	54.1'
13 14	15°41.85 30°41.54	25.27 25.31	22°22.85 36°51.45	9.6' 9.6'	28° 6.92 28° 8.27	1.3' 1.2'	54.2' 54.2'
15	45°41.23	25.35	51°20.02	9.0 9.5'	28° 9.48	1.1'	54.2'
16	60°40.92	25.39	65°48.57	9.5'	28°10.55	0.9'	54.2'
17	75° 40.61	25.43	80°17.10	9.5'	28°11.48	0.8'	54.2'
18 19	90°40.30 105°39.99	\$23°25.47 25.50	94°45.60 109°14.09	9.5' 9.5'	\$28°12.27 28°12.91	0.6' 0.5'	54.2' 54.2'
20	105 39.99 120°39.68	25.50 25.54	109 14.09 123°42.55	9.5 9.4'	26 12.91 28°13.42	0.5	54.2 54.2'
21	135°39.37	25.57	138°11.00	9.4'	28°13.79	0.2'	54.2'
22	150°39.06	25.61	152°39.44	9.4'	$28^{\circ}14.02$	0.1'	54.2'
23	165°38.75	25.64	167°7.85	9.4'	28°14.11	-0.1'	54.2'
	SD = 16.2'	d = 0.1'		SD	0 = 14.7'		
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	180°38.44	S23°25.67	181°36.26	9.4'	\$28°14.05	-0.2'	54.3'
1 2	195°38.13 210°37.82	25.70 25.73	196° 4.66 210° 33.04	9.4' 9.4'	28°13.86 28°13.52	-0.3' -0.5'	54.3' 54.3'
3	210° 37.82 225° 37.51	25.73	210° 33.04 225° 1.41	9.4° 9.4'	28° 13.52 28° 13.04	-0.5' -0.6'	54.3'
4	240° 37.20	25.79	239°29.78	9.4	28°12.42	-0.8	54.3'
5	255° 36.89	25.82	253°58.15	9.4'	28°11.66	-0.9'	54.3'
6	270°36.57	\$23°25.85	268°26.50	9.4' 9.4'	\$28°10.76	-1.0'	54.3'
7 8	285°36.26 300°35.95	25.88 25.90	282°54.86 297°23.21	9.4' 9.4'	28° 9.71 28° 8.53	-1.2' -1.3'	54.3' 54.3'
9	315° 35.64	25.93	311°51.56	9.4 9.4'	28°7.20	-1.5'	54.4'
10	330°35.33	25.95	$326^{\circ}19.92$	9.4'	28°5.73	-1.6'	54.4'
11	345°35.02	25.97	340°48.27	9.4'	28° 4.12	-1.8'	54.4'
12 13	0°34.71 15°34.40	\$23°26.00 26.02	355°16.63 9°45.00	9.4' 9.4'	\$28°2.36 28°0.47	-1.9' -2.0'	54.4' 54.4'
13 14	30°34.40	26.02	9°45.00 24°13.37	9.4° 9.4°	28° 0.47 27° 58.43	-2.0' -2.2'	54.4° 54.4°
15	45°33.78	• • 26.06	38°41.75	9.4'	27°56.26	-2.3'	54.4'
16	60°33.47	26.08	53°10.13	9.4'	27°53.94	-2.5'	54.4'
17	75°33.15	26.10	67°38.53	9.4'	27°51.48	-2.6'	54.4'
18 19	90°32.84 105°32.53	\$23°26.11 26.13	82° 6.94 96° 35.37	9.4' 9.4'	\$27°48.88 27°46.13	-2.7' -2.9'	54.5' 54.5'
20	120° 32.22	26.15	90 33.37 111°3.81	9.5	27°43.25	-3.0'	54.5
21	135°31.91	• • 26.16	125°32.26	9.5'	27°40.23	-3.2'	54.5'
22	150°31.60	26.18	140° 0.73	9.5'	27°37.07	-3.3'	54.5'
23	165°31.29	26.19	154°29.22	9.5'	27°33.76	-3.4'	54.5'
	SD = 16.2'	d = 0.0'		SD	0 = 14.8'		

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

Lat.		Moonris	е		Moonset	
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
N 72°						
N 70°						
68°						
66°						
64°						
62°	09:17		10.10	11:48	10.55	10.50
60°	08:33	09:55	10:49	12:33	12:57	13:53
N 58°	08:04	09:18	10:11	13:03	13:35	14:30
56°	07:42	08:51	09:45	13:25	14:02	14:57
54°	07:23	08:30	09:24	13:44	14:23	15:17
52°	07:08	08:13	09:06	14:00	14:40	15:35
50° 45°	06:54	07:58	08:51	14:13	14:55	15:50
1	06:27	07:28	08:21	14:41	15:25	16:20
N 40°	06:06	07:04	07:58	15:03	15:49	16:43
35° 30°	05:48	06:45	07:38	15:21	16:08	17:02
20°	05:33 05:07	06:29 06:01	07:22 06:54	15:37 16:04	16:25 16:53	17:19 17:46
N 10°	05:07	05:37	06:34	16:04	10:55	18:10
0°	04:43	05:15	06:07	16:48	17:40	18:32
<b>S</b> 10°	04:04	04:53	05:44	17:10	18:02	18:54
20°	03:42	04:33	05:44	17:10	18:26	19:18
30°	03:16	04:01	04:52	18:00	18:55	19:45
35°	03:01	03:45	04:36	18:16	19:11	20:02
40°	02:44	03:26	04:16	18:34	19:31	20:20
45°	02:24	03:03	03:53	18:57	19:54	20:43
<b>S</b> 50°	01:58	02:34	03:23	19:25	20:24	21:12
52°	01:45	02:20	03:08	19:40	20:39	21:26
54°	01:31	02:03	02:50	19:56	20:57	21:43
56°	01:15	01:44	02:29	20:16	21:18	22:02
58°	00:55	01:19	02:03	20:40	21:44	22:26
<b>S</b> 60°	00:30	00:46	01:25	21:13	22:22	22:59

		Sun			Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age		
	,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	28-0	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	4-0%	
	18	03:33	03:18	11:57	10:36	23:01		
	19	03:04	02:49	11:57	11:27	23:53		
	20	02:34	02:19	11:58	12:20	-:-		

#### December 21, 22, 23 UT (Sun., Mon., Tue.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	89°49.20	184°52.58 \$23°26.01	175°6.36 \$24°11.14	335°15.23 N21°43.98	92°55.45 \$03°50.82	Alpheratz 357°33.94 29°14.23
1	104°51.66	199°51.62 26.22	190°6.74 11.09	350°18.00 44.03	107° 57.83 50.77	Ankaa 353°6.31 -42°10.08
2	119°54.13 134°56.59	214°50.66 26.42 229°49.70 • 26.63	205°7.13 11.05 220°7.52 · · 11.00	5°20.77 44.09 20°23.53 • 44.14	123°0.20 50.72 138°2.57 · · 50.67	Schedar 349°30.03 56°41.10
4	149° 59.06	244°48.74 26.84	235°7.90 10.96	35°26.30 44.19	153°4.95 50.63	Diphda 348°46.44 -17°50.72
5	165°1.52	259°47.78 27.04	250°8.29 10.91	50°29.07 44.25	168°7.32 50.58	Achernar 335°19.33 -57°6.51 Hamal 327°50.11 23°35.26
6	180°3.98	274°46.82 <b>S</b> 23°27.24	265°8.67 <b>S</b> 24°10.86	65°31.84 N21°44.30	183°9.70 \$03°50.53	Hamal 327°50.11 23°35.26 Polaris 313°14.51 89°22.64
7	195°6.45	289°45.86 27.45	280° 9.06 10.82	80°34.61 44.36	198° 12.07 50.48	Acamar 315°10.85 -40°12.14
8 9	210°8.91 225°11.38	304°44.90 27.65 319°43.93 •• 27.85	295° 9.44 10.77 310° 9.83 · · 10.72	95°37.38 44.41 110°40.15 • 44.46	213°14.44 50.43 228°16.82 · · 50.38	Menkar 314°5.07 4°11.54
10	240° 13.84	334°42.97 28.05	325°10.21 10.67	125°42.92 44.52	243°19.19 50.33	Mirfak 308°26.70 49°57.37
11	255° 16.31	349°42.01 28.24	340°10.60 10.62	140°45.69 44.57	258°21.56 50.28	Aldebaran 290°38.38 16°33.73
12	270°18.77	4°41.05 <b>S</b> 23°28.44	355°10.98 <b>S</b> 24°10.57	155°48.46 N21°44.63	273°23.94 \$03°50.24	Rigel 281°2.77 -8°10.29 Capella 280°20.24 46°1.47
13	285°21.23	19°40.09 28.63	10°11.37 10.52	170°51.23 44.68	288°26.31 50.19	Bellatrix 278°21.69 6°22.41
14 15	300°23.70 315°26.16	34°39.12 28.83 49°38.16 · · 29.02	25°11.75 10.47 40°12.14 · · 10.42	185°54.00 44.73 200°56.77 • 44.79	303°28.68 50.14 318°31.06 · · 50.09	Elnath 278°0.48 28°37.77
16	330°28.63	64°37.20 29.21	55°12.52 10.37	215°59.54 44.84	333°33.43 50.04	Alnilam 275°36.59 -1°11.11
17	345°31.09	79°36.24 29.40	70°12.91 10.32	231°2.31 44.90	348° 35.80 49.99	Betelgeuse 270°50.88 7°24.72
18	0°33.56	94°35.27 <b>S</b> 23°29.59	85°13.29 <b>S</b> 24°10.27	246°5.09 N21°44.95	3°38.17 S03°49.94	Canopus 263°51.48 -52°42.49 Sirius 258°25.19 -16°45.08
19	15°36.02	109°34.31 29.78	100°13.68 10.21	261°7.86 45.01	18°40.54 49.89	Adhara 255°4.87 -29°0.38
20	30°38.48	124°33.35 29.96 139°32.38 · · 30.15	115°14.06 10.16	276°10.63 45.06	33°42.92 49.84	Procyon 244°49.70 5°9.48
21 22	45° 40.95 60° 43.41	139°32.38 · · 30.15 154°31.42 30.33	130°14.45 · · 10.11 145°14.83	291°13.40 · · 45.11 306°16.17 45.17	48° 45.29 · · 49.79 63° 47.66 49.74	Pollux 243°16.00 27°57.71
23	75° 45.88	169°30.46 30.51	160°15.22 10.00	321°18.95 45.22	78°50.03 49.69	Avior 234°13.87 -59°35.36
			ν0.4' d-0.0' m1.19	-	ν2.4' d-0.0' m0.98	Suhail 222°45.42 -43°32.07
ivier.p	bass. 17:58	ν-1.0′ d0.2′ m-3.90	νυ.4 α-υ.υ m1.19	ν2.8′ d0.1′ m-2.64	ν2.4 <i>a</i> -0.0 m0.98	Miaplacidus 221°37.47 -69°49.16 Alphard 217°46.77 -8°46.25
	<b></b>					Regulus 207°33.44 11°50.32
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°39.87 61°36.33
0 1	90°48.34 105°50.80	184°29.49 \$23°30.69 199°28.53 30.87	175°15.60	336°21.72 N21°45.28 351°24.49 45.33	93°52.40	Denebola 182°24.13 14°25.49
2	120° 53.27	214°27.57 31.05	205°16.37 9.83	6°27.27 45.39	123°57.14 49.54	Gienah 175°42.80 -17°41.10
3	135°55.73	229°26.60 · · 31.23	220°16.75 · · 9.77	21°30.04 · · 45.44	138°59.51 · · 49.49	Acrux 172°59.32 -63°14.31 Gacrux 171°50.86 -57°15.26
4	150°58.20	244°25.64 31.40	235°17.14 9.72	36°32.81 45.50	154°1.88 49.44	Alioth 166°12.41 55°48.81
5	166°0.66	259°24.67 31.58	250°17.52 9.66	51°35.59 45.55	169°4.25 49.39	Spica 158°21.60 -11°17.79
6	181°3.13	274°23.71 S23°31.75 289°22.74 31.92	265°17.91 S24°9.60 280°18.29 9.54	66°38.36 N21°45.60 81°41.14 45.66	184°6.62 S03°49.34 199°8.99 49.29	Alkaid 152°51.61 49°10.73
7 8	196°5.59 211°8.05	289°22.74 31.92 304°21.78 32.09	280°18.29 9.54 295°18.67 9.48	81°41.14 45.66 96°43.91 45.71	199°8.99 49.29 214°11.36 49.24	Hadar 148°35.25 -60°29.65
9	226° 10.52	319°20.81 · · 32.26	310°19.06 · · 9.42	111°46.69 · · 45.77	229°13.73 · · 49.19	Menkent 147°56.91 -36°29.71
10	241°12.98	334°19.85 32.43	325°19.44 9.36	126°49.46 45.82	244°16.10 49.14	Arcturus 145°47.39 19°2.69 Rigil Kent. 139°39.65 -60°56.34
11	256° 15.45	349°18.88 32.60	340°19.82 9.30	141°52.24 45.88	259° 18.47 49.09	Kochab 137°20.65 74°2.59
12	271° 17.91	4°17.91 \$23°32.76	355°20.21 \$24°9.24	156°55.01 N21°45.93	274°20.84 \$03°49.04	Zuben'ubi 136°55.39 -16°8.94
13 14	286°20.37 301°22.84	19°16.95 32.93 34°15.98 33.09	10°20.59 9.18 25°20.98 9.12	171°57.79 45.99 187°0.56 46.04	289°23.21 48.99 304°25.58 48.94	Alphecca 126°3.38 26°37.50
15	316° 25.30	49°15.02 · · 33.25	40°21.36 · · 9.06	202°3.34 · · 46.10	319°27.95 · · 48.89	Antares 112°15.22 -26°29.32
16	331°27.77	64°14.05 33.41	55°21.74 8.99	217°6.11 46.15	334°30.32 48.84	Atria 107°9.29 -69°4.32 Sabik 102°2.23 -15°45.41
17	$346^{\circ}30.23$	79°13.08 33.57	70°22.13 8.93	232°8.89 46.21	349°32.68 48.79	Sabik 102°2.23 -15°45.41 Shaula 96°9.72 -37°7.32
18	1°32.70	94°12.12 <b>S</b> 23°33.73	85°22.51 <b>S</b> 24°8.87	247°11.67 N21°46.26	4°35.05 <b>S</b> 03°48.73	Rasalhague 95°58.17 12°32.43
19	16°35.16	109°11.15 33.89	100°22.89 8.80	262°14.44 46.31	19° 37.42 48.68	Eltanin 90°42.37 51°29.06
20 21	31°37.62 46°40.09	124°10.18 34.04 139°9.22 · 34.20	115°23.28 8.74 130°23.66 • 8.67	277°17.22 46.37 292°20.00 • 46.42	34°39.79 48.63 49°42.16 • 48.58	Kaus Aust. 83°31.88 -34°22.34
22	61° 42.55	154°8.25 34.35	145°24.04 8.61	307°22.77 46.48	64° 44.52 48.53	Vega 80°33.13 38°48.46
23	76°45.02	169°7.28 34.50	160°24.43 8.54	322°25.55 46.53	79°46.89 48.48	Nunki 75°47.15 -26°15.88 Altair 61°59.50 8°56.24
Merr	pass. 17:54	ν-1.0' d0.2' m-3.90	ν0.4' d-0.1' m1.18	ν2.8' d0.1' m-2.65	ν2.4' d-0.0' m0.98	Peacock 53°4.99 -56°39.22
- IVICI.L	Dass. 17.54	ν-1.0 do.2 iii-3.90			V2.4 U-0.0 1110.98	Deneb 49°25.64 45°22.53
_	6114	5114 B	G114 B	G114 B	G.1.4 B	Enif 33°38.22 9°59.71
Tue 0	<b>GHA</b> 91° 47.48	<b>GHA Dec</b> 184° 6.32 <b>S</b> 23° 34.65	<b>GHA Dec</b> 175°24.81 <b>S</b> 24°8.48	<b>GHA Dec</b> 337°28.33 N21°46.59	<b>GHA Dec</b> 94°49.26 <b>S</b> 03°48.43	Al Na'ir 27°32.16 -46°50.30
1	91 47.48 106°49.95	184 6.32 <b>5</b> 23 34.80	175 24.81 524 8.48 190°25.19 8.41	352°31.11 46.64	109°51.62 48.38	Fomalhaut 15°13.75 -29°29.21
2	121°52.41	214°4.38 34.95	205°25.58 8.34	7°33.89 46.70	124°53.99 48.32	Scheat 13°44.54 28°13.61 Markab 13°29.20 15°20.82
3	$136^{\circ}54.87$	229°3.41 · · 35.10	220°25.96 · · 8.27	22°36.66 · · 46.75	139°56.36 · · 48.27	
4	151°57.34	244°2.45 35.24	235°26.34 8.21	37°39.44 46.81	154°58.72 48.22	Dec 21 Sun SHA Mer.pass
5 6	166°59.80 182°2.27	259°1.48 35.39 274°0.51 \$23°35.53	250°26.72 8.14 265°27.11 \$24°8.07	52°42.22 46.86 67°45.00 N21°46.92	170°1.09 48.17 185°3.46 \$03°48.12	Venus 95°3.38 11:41 Mars 85°17.16 12:19
7	182 2.27 197°4.73	288° 59.54 35.67	280°27.49 8.00	82°47.78 46.97	200° 5.82 48.07	Jupiter 245°26.03 01:39
8	212°7.19	303°58.57 35.81	295°27.87 7.93	97°50.56 47.03	215°8.19 48.01	Saturn 3°6.25 17:45
9	$227^{\circ}9.66$	318°57.61 · · 35.95	310°28.26 · · 7.86	112°53.34 · · 47.08	230°10.55 · · 47.96	Dec 22 Mon SHA Mer.pass
10	242°12.12	333°56.64 36.09	325°28.64 7.79	127°56.12 47.14	245°12.92 47.91	Venus 93°41.15 11:43
11	257°14.59	348°55.67 36.23	340°29.02 7.71	142°58.90 47.19	260°15.29 47.86	Mars 84°27.26 12:19
12 13	272° 17.05 287° 19.52	3°54.70 S23°36.36 18°53.73 36.50	355°29.40 \$24°7.64 10°29.79 7.57	158°1.68 N21°47.25 173°4.46 47.30	275°17.65 \$03°47.80 290°20.02 47.75	Jupiter 245°33.38 01:34
14	302°21.98	33°52.76 36.63	25°30.17 7.50	188°7.24 47.36	305°22.38 47.70	Saturn 3°4.06 17:42
15	317°24.44	48°51.79 · · 36.76	40°30.55 · · 7.42	203°10.02 · · 47.41	320°24.75 · · 47.65	Dec 23 Tue SHA Mer.pass
16	332°26.91	63°50.82 36.89	55°30.93 7.35	218°12.80 47.47	335°27.11 47.60	Venus 92°18.84 11:44
17	347°29.37	78°49.85 37.02	70°31.32 7.28	233°15.58 47.53	350°29.47 47.54	Mars 83°37.33 12:18
18 19	2°31.84 17°34.30	93°48.88	85°31.70 S24°7.20 100°32.08 7.13	248°18.36 N21°47.58 263°21.14 47.64	5°31.84 S03°47.49 20°34.20 47.44	Jupiter 245° 40.85 01:30
20	32°36.76	108 47.92 37.28 123°46.95 37.40	100 32.08 7.13 115°32.46 7.05	278°23.93 47.69	35°36.57 47.38	Saturn 3°1.78 17:38
21	47° 39.23	138°45.98 · · 37.52	130°32.85 · · 6.97	293°26.71 · · 47.75	50°38.93 · · 47.33	Horizontal parallax
22	$62^{\circ}41.69$	153°45.01 37.65	145°33.23 6.90	308°29.49 47.80	65°41.29 47.28	Venus: 0.1
23	77° 44.16	168°44.04 37.77	160°33.61 6.82	323°32.27 47.86	80°43.66 47.23	Mars: 0.1
Mer.p	pass. 17:50	ν-1.0′ d0.1′ m-3.90	ν0.4' d-0.1' m1.18	ν2.8′ d0.1′ m-2.65	ν2.4' d-0.1' m0.99	
					<del></del>	

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.98	S23°26.20	168°57.73	9.5'	S27°30.32	-3.6'	54.5'
1	195°30.67	26.21	183°26.26	9.6'	27°26.74	-3.7'	54.6'
2	210°30.35	26.23	197°54.82	9.6'	27°23.02	-3.9'	54.6'
3	225°30.04	• • 26.24	212°23.39	9.6'	27°19.16	-4.0'	54.6'
4 5	240°29.73 255°29.42	26.24 26.25	226°51.99 241°20.62	9.6' 9.7'	27°15.16 27°11.03	-4.1' -4.3'	54.6' 54.6'
6	270°29.11	S23°26.26	255° 49.28	9.7	\$27°6.75	-4.3 -4.4'	54.6'
7	285°28.80	26.27	270° 17.96	9.7'	27°2.34	-4.5	54.6'
8	300°28.49	26.27	284°46.67	9.7'	26° 57.80	-4.7'	54.6'
9	315°28.17	• • 26.28	299° 15.41	9.8'	$26^{\circ}53.11$	-4.8'	54.7'
10	330°27.86	26.28	313°44.18	9.8'	26°48.29	-5.0'	54.7'
11 12	345°27.55 0°27.24	26.29 \$23°26.29	328° 12.99 342° 41.83	9.8' 9.9'	26°43.34 \$26°38.25	-5.1' -5.2'	54.7' 54.7'
13	15°26.93	26.29	342 41.83 357°10.70	9.9 9.9'	26°33.02	-5.∠ -5.4'	54.7'
14	30°26.62	26.29	11°39.61	9.9'	26° 27.66	-5.5'	54.7'
15	45°26.31	26.29	26°8.55	10.0'	26°22.17	-5.6'	54.7'
16	60°25.99	26.29	40°37.54	10.0'	$26^{\circ}16.54$	-5.8'	54.8'
17	75°25.68	26.29	55°6.56	10.1'	26°10.78	-5.9'	54.8'
18	90°25.37	S23°26.29	69°35.62	10.1'	\$26°4.89	-6.0'	54.8'
19	105°25.06 120°24.75	26.29	84°4.72 98°33.86	10.1'	25°58.87 25°52.72	-6.2'	54.8'
20 21	120°24.75 135°24.44	26.28 •• 26.28	98°33.86 113°3.04	10.2' 10.2'	25°52.72 25°46.44	-6.3' -6.4'	54.8' 54.8'
22	150°24.12	26.27	127° 32.27	10.2	25°40.44	-6.5	54.9'
23	165°23.81	26.27	142°1.54	10.3	25° 33.48	-6.7'	54.9'
	SD = 16.2'	d = 0.0'		SI	0 = 14.9'		
			-				
Mon	GHA	Dec	GHA	$\nu$	Dec	d c o	HP
0 1	180°23.50 195°23.19	\$23°26.26 26.25	156°30.85 171°0.21	10.4' 10.4'	\$25°26.81 25°20.02	-6.8' -6.9'	54.9' 54.9'
2	210°22.88	26.24	185°29.61	10.4	25° 13.09	-0.9 -7.1'	54.9'
3	225°22.57	. 26.24	199°59.06	10.5	25°6.04	-7.2'	54.9'
4	240°22.25	26.23	214°28.56	10.5'	24°58.86	-7.3'	54.9'
5	255°21.94	26.21	228°58.10	10.6'	24°51.56	-7.4'	55.0'
6	270°21.63	\$23°26.20	243°27.69	10.6'	\$24°44.14	-7.5'	55.0'
7 8	285°21.32 300°21.01	26.19 26.18	257°57.33 272°27.02	10.7' 10.7'	24°36.59 24°28.91	-7.7' -7.8'	55.0' 55.0'
9	315°20.70	. 26.16	286° 56.76	10.7	24°21.12	-7.9'	55.0'
10	330°20.38	26.15	301°26.55	10.8	24°13.20	-8.0'	55.0'
11	345°20.07	26.13	315°56.39	10.9'	$24^{\circ}5.16$	-8.2'	55.1'
12	0°19.76	S23°26.11	330°26.28	10.9'	\$23°57.01	-8.3'	55.1'
13	15°19.45	26.10	344°56.22 359°26.21	11.0'	23° 48.73	-8.4'	55.1'
14 15	30°19.14 45°18.83	26.08 •• 26.06	13° 56.26	11.0' 11.1'	23°40.33 23°31.82	-8.5' -8.6'	55.1' 55.1'
16	60°18.52	26.04	28° 26.36	11.2	23°23.19	-8.7'	55.2'
17	75°18.20	26.02	42°56.51	11.2'	23° 14.45	-8.9'	55.2'
18	90°17.89	S23°26.00	57°26.71	11.3'	S23°5.58	-9.0'	55.2'
19	105°17.58	25.97	71°56.96	11.3'	22°56.61	-9.1'	55.2'
20	120°17.27 135°16.96	25.95 •• 25.93	86°27.27 100°57.64	11.4' 11.4'	22°47.52 22°38.32	-9.2' -9.3'	55.2' 55.2'
21 22	150°16.65	25.90	100 57.04 115°28.05	11.5	22°29.00	-9.3 -9.4'	55.2' 55.3'
23	165°16.33	25.88	129°58.52	11.5'	22° 19.58	-9.5'	55.3'
	SD = 16.3'	d = -0.0'		SI	D = 15.0'		
Tue	GHA	Dec	GHA	ν 11.6'	Dec	d 0.6'	HP
0 1	180°16.02 195°15.71	\$23°25.85 25.82	144°29.05 158°59.62	11.6' 11.6'	\$22°10.04 22°0.39	-9.6' -9.8'	55.3' 55.3'
2	210°15.40	25.82 25.79	158 59.02 173°30.25	11.7	22 0.39 21°50.64	-9.8 -9.9'	55.3'
3	225°15.09	25.76	188°0.94	11.7'	21°40.78	-10.0'	55.4'
4	240°14.78	25.73	202°31.68	11.8'	21°30.81	-10.1'	55.4'
5	255°14.46	25.70	217°2.47	11.8'	21°20.73	-10.2'	55.4'
6	270°14.15	\$23°25.67	231°33.32	11.9'	\$21°10.55	-10.3'	55.4'
7 8	285°13.84 300°13.53	25.64 25.61	246°4.22 260°35.17	12.0' 12.0'	21°0.27 20°49.88	-10.4' -10.5'	55.4' 55.4'
9	300°13.53 315°13.22	25.61	260° 35.17 275° 6.18	12.1'	20° 49.88 20° 39.39	-10.5'	55.4° 55.5'
10	330°12.91	25.54	289° 37.24	12.1'	20° 28.80	-10.7	55.5'
11	345°12.60	25.50	304°8.35	12.2'	20°18.10	-10.8'	55.5'
12	0°12.28	S23°25.47	318°39.52	12.2'	S20°7.31	-10.9'	55.5'
13	15°11.97	25.43	333°10.74	12.3'	19°56.41	-11.0'	55.5'
14 15	30°11.66 45°11.35	25.39 •• 25.35	347°42.01 2°13.33	12.3' 12.4'	19°45.42 19°34.34	-11.1' -11.2'	55.6' 55.6'
15 16	45 11.35 60°11.04	25.35	2 13.33 16°44.71	12.4	19 34.34 19°23.15	-11.2 -11.3'	55.6'
17	75°10.73	25.27	31°16.14	12.5'	19°11.87	-11.4	55.6'
18	90°10.42	S23°25.23	45°47.61	12.5'	S19°0.50	-11.5'	55.6'
19	105°10.10	25.19	60°19.14	12.6'	18°49.03	-11.6'	55.7'
20	120°9.79	25.15	74°50.72	12.6'	18° 37.47	-11.7'	55.7'
21 22	135°9.48 150°9.17	· · 25.10 25.06	89°22.35 103°54.03	12.7' 12.7'	18° 25.81 18° 14.07	-11.7' -11.8'	55.7' 55.7'
23	165°8.86	25.00	103 54.03 118° 25.75	12.7	18°2.23	-11.6 -11.9'	55.8'
	SD = 16.3'	d = -0.0'			D = 15.1'		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junise	Juliset	Civil	Naut.
N 72°	08:26	10:58			12:59	15:31
<b>N</b> 70°	08:06	09:55			14:02	15:51
68°	07:50	09:20			14:38	16:07
66°	07:37	08:54	10:35	13:22	15:03	16:20
64°	07:26	08:35	09:53	14:05	15:23	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:08	08:05	09:03	14:55	15:53	16:50
<b>N</b> 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:54	07:43	08:30	15:27	16:15	17:04
54°	06:47	07:34	08:18	15:40	16:24	17:10
52°	06:42	07:25	08:06	15:51	16:32	17:16
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:25	07:02	07:36	16:22	16:56	17:33
<b>N</b> 40°	06:14	06:48	07:19	16:39	17:09	17:43
35°	06:05	06:36	07:05	16:53	17:21	17:53
30°	05:56	06:26	06:52	17:05	17:32	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:50	06:12	17:45	18:08	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
<b>S</b> 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:54	05:18	18:39	19:04	19:33
30°	03:55	04:29	04:56	19:01	19:29	20:02
35°	03:37	04:13	04:43	19:14	19:44	20:21
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:43	03:33	04:10	19:47	20:25	21:15
<b>S</b> 50°	01:57	03:03	03:47	20:10	20:55	22:00
52°	01:29	02:48	03:37	20:21	21:10	22:28
54°	00:42	02:30	03:24	20:33	21:28	23:15
56°	////	02:07	03:10	20:47	21:50	////
58° <b>S</b> 60°	1111	01:37 00:46	02:53 02:33	21:04 21:25	22:20 23:11	//// ////
<b>3</b> 00 °	////	00:40	02:33	21:25	23:11	1111

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

### December 24, 25, 26 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	92°46.62	183°43.07 <b>S</b> 23°37.89		338°35.05 N21°47.91	95°46.02 \$03°47.17	
1	107°49.09	198°42.10 38.01	190°34.37 6.66	353°37.84 47.97	110°48.38 47.12	Alpheratz 357°33.95 29°14.23 Ankaa 353°6.32 -42°10.08
2	122°51.55	213°41.13 38.13	205°34.76 6.59	8°40.62 48.02	125°50.75 47.07	Ankaa 353°6.32 -42°10.08 Schedar 349°30.05 56°41.11
3	137°54.01	228°40.16 · · 38.24		23°43.40 · · 48.08	140°53.11 · · 47.01	Diphda 348°46.44 -17°50.72
4	152°56.48	243°39.19 38.36		38°46.19 48.13	155°55.47 46.96	Achernar 335°19.35 -57°6.52
5 6	167°58.94 183°1.41	258°38.21 38.47 273°37.24 \$23°38.58	250°35.90 6.35 265°36.28 \$24°6.27	53°48.97 48.19 68°51.75 N21°48.24	170°57.83 46.91 186°0.20 \$03°46.85	Hamal 327°50.11 23°35.26
7	198°3.87	288°36.27 38.69		83°54.54 48.30	201°2.56 46.80	Polaris 313°15.47 89°22.66
8	213°6.33	303°35.30 38.81	295°37.05 6.10	98° 57.32 48.36	216° 4.92 46.75	Acamar 315°10.86 -40°12.15
9	228°8.80	318°34.33 · · 38.91	310°37.43 · · 6.02	114°0.10 · · 48.41	231°7.28 · · 46.69	Menkar 314°5.08 4°11.54 Mirfak 308°26.71 49°57.38
10	243°11.26	333°33.36 39.02		129°2.89 48.47	246° 9.64 46.64	Aldebaran 290°38.37 16°33.73
11	258° 13.73	348°32.39 39.13		144°5.67 48.52	261°12.01 46.59	Rigel 281°2.76 -8°10.29
12 13	273° 16.19 288° 18.65	3°31.42 \$23°39.23 18°30.45 39.34	355°38.57	159°8.46 N21°48.58 174°11.24 48.63	276°14.37 S03°46.53 291°16.73 46.48	Capella 280°20.23 46°1.48
14	303°21.12	33°29.48 39.44	25°39.34 5.61	189°14.03 48.69	306°19.09 46.42	Bellatrix 278°21.68 6°22.40
15	318° 23.58	48°28.50 · · 39.54	40°39.72 · · 5.52	204°16.81 · · 48.74	321°21.45 · · 46.37	Elnath 278° 0.47 28° 37.78
16	333°26.05	63°27.53 39.64		219° 19.60 48.80	336°23.81 46.32	Alnilam 275°36.58 -1°11.11 Betelgeuse 270°50.88 7°24.72
17	348°28.51	78°26.56 39.74	70°40.48 5.35	234°22.38 48.86	351°26.17 46.26	Canopus 263°51.48 -52°42.51
18	3°30.98	93°25.59 \$23°39.84	85°40.86 \$24°5.27	249°25.17 N21°48.91	6°28.53 S03°46.21	Sirius 258°25.18 -16°45.09
19 20	18° 33.44 33° 35.90	108°24.62 39.93 123°23.65 40.03		264°27.96 48.97 279°30.74 49.02	21°30.89 46.15 36°33.25 46.10	Adhara 255°4.86 -29°0.39
21	48° 38.37	138°22.67 · · 40.12		294°33.53 · · 49.08	51°35.61 · · 46.04	Procyon 244°49.68 5°9.47
22	63°40.83	153°21.70 40.21	145°42.39 4.92	309° 36.31 49.13	66°37.97 45.99	Pollux 243°15.98 27°57.71
23	78°43.30	168°20.73 40.30		324°39.10 49.19	81°40.33 45.94	Avior 234°13.85 -59°35.38
Merr	pass. 17:46	ν-1.0' d0.1' m-3.90	$\nu$ 0.4' d-0.1' m1.17	ν2.8' d0.1' m-2.65	ν2.4' d-0.1' m0.99	Suhail 222°45.39 -43°32.08 Miaplacidus 221°37.43 -69°49.18
14161.	Juss. 11.40	ν 1.0 do.1 iii-3.90	νο.τ u-υ.1 III1.1/		ν Δ. τ U-U.1 IIIU.33	Alphard 217°46.75 -8°46.26
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°33.42 11°50.32
0	93° 45.76	<b>GHA Dec</b> 183°19.76 \$23°40.39	175°43.15 S24°4.74	<b>GHA Dec</b> 339°41.89 N21°49.25	96°42.69 <b>S</b> 03°45.88	Dubhe 193°39.82 61°36.32
1	108° 48.22	198°18.79 40.48	190°43.53 4.65	354°44.67 49.30	111°45.05 45.83	Denebola 182°24.10 14°25.48 Gienah 175°42.78 -17°41.11
2	123°50.69	213° 17.81 40.57	205°43.91 4.56	9°47.46 49.36	126° 47.41 45.77	Gienah 175°42.78 -17°41.11 Acrux 172°59.27 -63°14.31
3	138° 53.15	228°16.84 · · 40.65	220°44.29 · · 4.47	24°50.25 · · 49.41	141°49.77 · · 45.72	Gacrux 171°50.82 -57°15.27
4	153°55.62	243°15.87 40.74	235°44.67 4.38	39°53.04 49.47	156°52.13 45.66	Alioth 166°12.37 55°48.80
5 6	168° 58.08	258°14.90 40.82	250°45.06 4.29	54°55.82 49.52	171°54.49 45.61	Spica 158°21.57 -11°17.80
7	184°0.54 199°3.01	273°13.92 \$23°40.90 288°12.95 40.99	265°45.44 S24°4.20 280°45.82 4.10	69°58.61 N21°49.58 85°1.40 49.64	186°56.85 \$03°45.55 201°59.20 45.50	Alkaid 152°51.58 49°10.72
8	214°5.47	303°11.98 41.07	295°46.20 4.01	100°4.19 49.69	217°1.56 45.44	Hadar 148° 35.21 -60° 29.66
9	229°7.94	318°11.01 · · 41.14	310°46.58 · · 3.92	115°6.98 · · 49.75	232°3.92 · · 45.39	Menkent 147°56.88 -36°29.72 Arcturus 145°47.37 19°2.68
10	244° 10.40	333°10.03 41.22		130°9.77 49.80	247° 6.28 45.33	Rigil Kent. 139°39.61 -60°56.34
11	259° 12.87	348°9.06 41.30		145°12.55 49.86	262°8.64 45.28	Kochab 137°20.60 74°2.58
12 13	274° 15.33 289° 17.79	3°8.09 S23°41.37 18°7.12 41.44	355°47.72 \$24°3.64 10°48.10 3.54	160°15.34 N21°49.91 175°18.13 49.97	277°10.99 \$03°45.22 292°13.35 45.16	Zuben'ubi 136°55.36 -16°8.95
14	304°20.26	33°6.14 41.52		190°20.92 50.03	307°15.71 45.11	Alphecca 126°3.36 26°37.48
15	$319^{\circ}22.72$	48°5.17 · · 41.59	40°48.86 · · 3.35	205°23.71 · · 50.08	322°18.06 · · 45.05	Antares 112°15.20 -26°29.32 Atria 107°9.26 -69°4.32
16	334° 25.19	63°4.20 41.66	55°49.24 3.25	220° 26.50 50.14	337°20.42 45.00	Sabik 102°2.21 -15°45.41
17	349°27.65	78°3.22 41.72		235°29.29 50.19	352°22.78 44.94	Shaula 96°9.71 -37°7.32
18 19	4°30.11 19°32.58	93°2.25 \$23°41.79 108°1.28 41.86		250°32.08 N21°50.25 265°34.87 50.31	7°25.14 \$03°44.89 22°27.49 44.83	Rasalhague 95°58.16 12°32.42
20	34°35.04	123°0.30 41.92		280° 37.66 50.36	37°29.85 44.77	Eltanin 90°42.36 51°29.04
21	49°37.51	137°59.33 · · 41.98		295°40.45 · · 50.42	52°32.20 · · 44.72	Kaus Aust. 83°31.87 -34°22.34 Vega 80°33.12 38°48.44
22	64°39.97	152°58.36 42.04		310°43.24 50.47	67°34.56 44.66	Nunki 75°47.15 -26°15.89
23	79°42.43	167°57.38 42.11	160°51.91 2.57	325°46.03 50.53	82°36.92 44.61	Altair 61°59.50 8°56.23
Mer.p	oass. 17:42	$\nu$ -1.0′ $d0.1$ ′ m-3.90	$ u 0.4' \ d  0.1' \ \text{m} 1.17$	$\nu 2.8' \ d0.1' \ \text{m-}2.66$	$\nu 2.4' \ d\text{-}0.1' \ \text{m}0.99$	Peacock 53°4.99 -56°39.21
						Deneb 49°25.65 45°22.52
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.22 9°59.71 Al Na'ir 27°32.17 -46°50.30
0	94°44.90	182°56.41		340°48.82 N21°50.59	97°39.27 <b>S</b> 03°44.55	Al Na'ir 27°32.17 -46°50.30 Fomalhaut 15°13.76 -29°29.21
1	109° 47.36	197°55.44 42.22		355°51.62 50.64	112°41.63 44.49	Scheat 13°44.55 28°13.60
2	124° 49.83	212°54.46 42.28		10°54.41 50.70	127° 43.98 44.44	Markab 13°29.21 15°20.81
3 4	139°52.29 154°54.76	227°53.49 · · 42.33 242°52.52 42.39		25°57.20 · · 50.76 40°59.99 50.81	142°46.34 · · 44.38 157°48.69 44.32	Dec 24 Wed SHA Mer.pass
4 5	154 54.76 169°57.22	242 52.52 42.39 257°51.54 42.44		56°2.78 50.87	157 48.09 44.32 172°51.05 44.27	Venus 90° 56.45 11:46
6	184° 59.68	272°50.57 S23°42.49		71°5.57 N21°50.92	187°53.40 S03°44.21	Mars 82°47.37 12:17
7	200°2.15	287°49.59 42.54		86°8.37 50.98	202°55.76 44.15	Jupiter 245°48.43 01:25
8	215°4.61	302°48.62 42.59		101°11.16 51.04	217°58.11 44.10	Saturn 2°59.40 17:34
9	230°7.08	317°47.65 · · 42.64		116°13.95 · · 51.09	233° 0.47 · · 44.04	Dec 25 Thu SHA Mer.pass
10 11	245°9.54 260°12.00	332°46.67 42.69 347°45.70 42.73		131°16.74 51.15 146°19.54 51.20	248° 2.82 43.98 263° 5.17 43.93	Venus 89°34.00 11:47
12	275° 14.47	2°44.72 S23°42.77		161°22.33 N21°51.26	278°7.53 S03°43.87	Mars 81°57.39 12:17
13	290°16.93	17°43.75 42.82		176°25.12 51.32	293° 9.88 43.81	Jupiter 245°56.13 01:21
14	305° 19.40	32°42.78 42.86		191°27.92 51.37	308°12.23 43.76	Saturn 2°56.93 17:30
15 16	320°21.86	47°41.80 · · 42.90		206°30.71 · · 51.43	323°14.59 · · 43.70	Dec 26 Fri SHA Mer.pass
16 17	335°24.32 350°26.79	62°40.83 42.94 77°39.85 42.97		221°33.50 51.49 236°36.30 51.54	338°16.94 43.64 353°19.29 43.58	Venus 88°11.51 11:49
18	5° 29.25	92°38.88 S23°43.01	85°59.13 <b>S</b> 24°0.59	251°39.09 N21°51.60	8°21.65 S03°43.53	Mars 81°7.39 12:16 Jupiter 246°3.93 01:17
19	20°31.72	107°37.91 43.05		266° 41.88 51.65	23°24.00 43.47	Saturn 2°54.37 17:27
20	35°34.18	122°36.93 43.08		281°44.68 51.71	38°26.35 43.41	
21	50°36.64	137°35.96 · · 43.11 152°34.98 43.14		296° 47.47 · · · 51.77 311° 50.27 51.82	53°28.70 · · 43.35 68°31.06 43.30	Horizontal parallax Venus: 0.1
22 23	65°39.11 80°41.57	152°34.98 43.14 167°34.01 43.17		311°50.27 51.82 326°53.06 51.88	68°31.06 43.30 83°33.41 43.24	Mars: 0.1
ivier.	pass. 17:38	ν-1.0′ d0.1′ m-3.90	$\nu$ 0.4′ <i>d</i> -0.1′ m1.16	ν2.8′ d0.1′ m-2.66	ν2.4' d-0.1' m0.99	

۰. <sub>-</sub>	Su	+0.0092 Sec		-011 -		. 555	
h					Moon		
Wed 0	<b>GHA</b> 180° 8.55	Dec \$23°24.97	<b>GHA</b> 132°57.53	u 12.8'	<b>Dec</b> \$17°50.31	d -12.0'	<b>HP</b> 55.8'
1	195° 8.24	24.92	132 37.33 147°29.35	12.0	17°38.30	-12.1'	55.8'
2	210°7.93	24.87	162°1.22	12.9'	17°26.20	-12.2'	55.8'
3	225°7.62	• • 24.82	$176^{\circ}33.14$	13.0'	$17^{\circ}14.01$	-12.3'	55.8'
4	240°7.30	24.77	191°5.10	13.0'	17°1.74	-12.4'	55.9'
5	255°6.99	24.72	205°37.11	13.1'	16°49.39	-12.4'	55.9'
6 7	270° 6.68 285° 6.37	\$23°24.67 24.62	220°9.17 234°41.26	13.1' 13.1'	\$16°36.95 16°24.43	-12.5' -12.6'	55.9' 55.9'
8	300° 6.06	24.57	249°13.41	13.1	16° 11.82	-12.7'	55.9'
9	315° 5.75	• • 24.51	263°45.59	13.2'	15°59.14	-12.8'	56.0'
10	330° 5.44	24.46	278°17.82	13.3'	15°46.38	-12.8'	56.0'
11	345°5.13	24.40	292°50.09	13.3'	15°33.53	-12.9'	56.0'
12 13	0°4.82 15°4.51	\$23°24.35 24.29	307°22.41 321°54.76	13.4' 13.4'	\$15°20.61 15°7.61	-13.0' -13.1'	56.0' 56.1'
14	30° 4.20	24.23	336°27.15	13.4	14°54.54	-13.1'	56.1
15	45°3.88	• • 24.17	350°59.58	13.5'	14°41.39	-13.2'	56.1'
16	60° 3.57	24.12	5°32.05	13.5'	14°28.17	-13.3'	56.1'
17	75°3.26	24.06	20°4.55	13.5'	14°14.87	-13.4'	56.2'
18 19	90°2.95 105°2.64	\$23°23.99 23.93	34°37.10 49°9.68	13.6' 13.6'	\$14°1.50 13°48.06	-13.4' -13.5'	56.2' 56.2'
20	105 2.04 120° 2.33	23.93	63°42.29	13.6'	13°34.54	-13.5'	56.2
21	135°2.02	• • 23.81	78°14.94	13.7'	13°20.96	-13.7'	56.2
22	150° 1.71	23.74	92°47.62	13.7'	13°7.31	-13.7'	56.3'
23	165°1.40	23.68	107°20.33	13.7'	12°53.59	-13.8'	56.3'
	SD = 16.3'	d = -0.0'		SI	D = 15.2'		
<b>-</b> .							
Thu 0	<b>GHA</b> 180° 1.09	Dec \$23°23.61	<b>GHA</b> 121°53.07	u 13.8'	Dec \$12°39.81	d -13.9'	<b>HP</b> 56.3'
1	195° 0.78	23.54	136°25.85	13.8'	12°25.95	-13.9'	56.3'
2	210° 0.47	23.48	150°58.65	13.8'	12°12.04	-14.0'	56.4'
3	$225^{\circ}0.16$	• • 23.41	$165^{\circ}31.48$	13.9'	$11^{\circ}58.06$	-14.0'	56.4'
4	239°59.85	23.34	180°4.35	13.9'	11°44.01	-14.1'	56.4'
5 6	254°59.54 269°59.23	23.27 \$23°23.20	194°37.23 209°10.14	13.9' 13.9'	11°29.91 \$11°15.74	-14.2' -14.2'	56.4' 56.5'
7	284°58.92	23.13	209 10.14 223°43.08	14.0'	11°1.51	-14.2 -14.3'	56.5
8	299°58.61	23.06	238°16.04	14.0'	10°47.22	-14.3'	56.5'
9	314°58.30	• • 22.98	252°49.03	14.0'	10°32.88	-14.4'	56.5'
10	329°57.99	22.91	267°22.03	14.0'	10°18.48	-14.5'	56.6'
11	344°57.68 359°57.37	22.83 \$23°22.76	281°55.06 296°28.10	14.0'	10°4.02 509°49.50	-14.5'	56.6'
12 13	359°57.37 14°57.06	22.68	296 28.10 311°1.17	14.1' 14.1'	09°34.93	-14.6' -14.6'	56.6' 56.6'
14	29°56.75	22.60	325°34.25	14.1'	09°20.31	-14.7'	56.7'
15	44°56.44	· · 22.53	$340^{\circ}7.35$	14.1'	$09^{\circ}5.63$	-14.7'	56.7'
16	59°56.13	22.45	354°40.46	14.1'	08°50.90	-14.8'	56.7'
17 18	74°55.82 89°55.51	22.37 \$23°22.29	9°13.58 23°46.72	14.1' 14.2'	08°36.12 \$08°21.29	-14.8' -14.9'	56.8' 56.8'
19	104°55.20	22.21	23 40.72 38°19.88		08°6.41		56.8'
20	119°54.89	22.12	52°53.04	14.2'	07°51.49	-15.0'	56.8'
21	134°54.58	• • 22.04	67°26.21	14.2'	$07^{\circ}36.51$	-15.0'	56.9'
22	149°54.27	21.96	81°59.39	14.2'	07°21.49	-15.1'	56.9'
23	164°53.97	21.87	96°32.58	14.2'	07°6.43	-15.1'	56.9'
	SD = 16.3'	d = -0.1'		SI	D = 15.4'		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.66	\$23°21.79	111°5.77	14.2'	S06°51.32	-15.2'	56.9'
1	194°53.35	21.70	125°38.97	14.2'	06°36.17	-15.2'	57.0'
2	209°53.04	21.61	140°12.17	14.2'	06°20.97	-15.2'	57.0'
3 4	224°52.73 239°52.42	· · 21.53 21.44	154°45.38 169°18.58	14.2' 14.2'	06°5.74 05°50.46	-15.3' -15.3'	57.0' 57.0'
5	259 52.42 254°52.11	21.35	183°51.79	14.2	05°35.14	-15.3 -15.4'	57.0 57.1'
6	269°51.80	\$23°21.26	198°24.99	14.2'	S05°19.79	-15.4'	57.1
7	284°51.49	21.17	212°58.20	14.2'	05°4.40	-15.4'	57.1'
8	299°51.19	21.07	227°31.40	14.2	04°48.97	-15.5'	57.2'
9 10	314°50.88 329°50.57	· · 20.98 20.89	242°4.59 256°37.78	14.2' 14.2'	04°33.51 04°18.01	-15.5' -15.5'	57.2' 57.2'
10	329 50.57 344°50.26	20.89	250 37.78 271°10.96	14.2'	04 18.01 04°2.48	-15.5' -15.6'	57.2'
12	359°49.95	\$23°20.70	285°44.13	14.2	S03°46.92	-15.6'	57.3
13	14°49.64	20.60	300°17.29	14.1'	03°31.32	-15.6'	57.3'
14	29°49.33	20.51	314°50.44	14.1'	03°15.70	-15.7'	57.3'
15 16	44°49.03 59°48.72	20.41	329°23.57 343°56.70	14.1'	03°0.05 02°44.36	-15.7'	57.4'
16 17	59°48.72 74°48.41	20.31 20.21	343°56.70 358°29.80	14.1' 14.1'	02°44.36 02°28.66	-15.7' -15.7'	57.4' 57.4'
18	89°48.10	\$23°20.11	13°2.90	14.1	502°12.92	-15.8'	57.4
19	104°47.79	20.01	27°35.97	14.1'	01°57.16	-15.8'	57.5'
20	119°47.49	19.91	42°9.02	14.0'	01°41.38	-15.8'	57.5'
21	134°47.18	19.81	56°42.05	14.0'	01°25.57	-15.8'	57.5'
22 23	149°46.87 164°46.56	19.70 19.60	71°15.07 85°48.05	14.0' 14.0'	01°9.74 00°53.89	-15.8' -15.9'	57.6' 57.6'
23						-13.9	37.0
	SD = 16.3'	d = -0.1'		51	D = 15.5'		

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

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

		Sun		Moon			
Day	Eqn.of	Eqn.of Time		Mer.Pass.		Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	4-6	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-31%	
24	00:34	00:19	12:00	15:37	03:14		
25	00:04	00:11	12:00	16:22	04:00		
26	00:25	00:40	12:01	17:06	04:44		

### December 27, 28, 29 UT (Sat., Sun., Mon.)

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Sat	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	95°44.04	182°33.04 <b>S</b> 23°43.20	176°1.41 \$23°59.93	341°55.86 N21°51.94	98°35.76		
1	$110^{\circ}46.50$	197°32.06 43.23	191°1.79 59.82	356°58.65 51.99	113°38.11 43.12	Alpheratz 357°33.97 Ankaa 353°6.34	29°14.22 -42°10.09
2	125°48.96	212°31.09 43.25	206°2.17 59.70	12°1.45 52.05	128° 40.46 43.07	Schedar 349°30.08	56°41.11
3	140°51.43	227°30.11 · · 43.28	221°2.55 · · 59.59	27°4.24 · · 52.11	143°42.82 · · 43.01	Diphda 348°46.46	-17°50.72
4	155° 53.89	242°29.14 43.30 257°28.16 43.32	236°2.93 59.48	42°7.04 52.16	158° 45.17 42.95	Achernar 335°19.38	-57° 6.52
5 6	170° 56.36 185° 58.82	257°28.16 43.32 272°27.19 \$23°43.35	251°3.31 59.37 266°3.69 \$23°59.25	57°9.83 52.22 72°12.63 N21°52.27	173°47.52 42.89 188°49.87 \$03°42.83	Hamal 327°50.13	23°35.26
7	201°1.29	287°26.22 43.36	281°4.07 59.14	87°15.43 52.33	203°52.22 42.78	Polaris 313°16.55	89°22.67
8	216°3.75	302°25.24 43.38	296° 4.45 59.02	102°18.22 52.39	218° 54.57 42.72	Acamar 315°10.88	-40°12.16
9	231°6.21	317°24.27 · · 43.40	311°4.83 · · 58.91	117°21.02 · · 52.44	233°56.92 · · 42.66	Menkar 314° 5.09 Mirfak 308° 26.72	4°11.53 49°57.39
10	246°8.68	332°23.29 43.42	326° 5.21 58.79	132°23.82 52.50	248° 59.27 42.60	Aldebaran 290°38.38	16°33.73
11	261°11.14	347°22.32 43.43	341°5.59 58.67	147°26.61 52.56	264°1.62 42.54	Rigel 281°2.76	-8°10.30
12 13	276° 13.61 291° 16.07	2°21.34 S23°43.44 17°20.37 43.46	356° 5.97 S23° 58.56 11° 6.35 58.44	162°29.41 N21°52.61 177°32.21 52.67	279°3.97 S03°42.48 294°6.32 42.42	Capella 280°20.23	46°1.49
14	306° 18.53	32°19.40 43.47	26°6.73 58.32	192°35.00 52.73	309°8.67 42.37	Bellatrix 278°21.68	6°22.40
15	321°21.00	47°18.42 · · 43.48	41°7.11 · · 58.20	207°37.80 · · 52.78	324°11.02 · · 42.31	Elnath 278° 0.47	28°37.78
16	$336^{\circ}23.46$	62°17.45 43.48	56°7.49 58.09	222°40.60 52.84	339° 13.37 42.25	Alnilam 275°36.58 Betelgeuse 270°50.87	-1°11.12 7°24.71
17	351°25.93	77°16.47 43.49	71°7.87 57.97	237°43.40 52.90	354°15.72 42.19	Canopus 263°51.47	
18	6°28.39	92°15.50 \$23°43.50	86°8.25 <b>S</b> 23°57.85	252°46.19 N21°52.95	9°18.07 S03°42.13	Sirius 258°25.18	-16°45.10
19 20	21°30.85 36°33.32	107°14.52 43.50 122°13.55 43.50	101°8.63 57.73 116°9.01 57.61	267°48.99 53.01 282°51.79 53.06	24°20.42 42.07 39°22.77 42.01	Adhara 255° 4.85	-29°0.40
21	50 33.32 51°35.78	137°12.58 · · 43.50	131° 9.39 · · 57.48	297°54.59 · · 53.12	54° 25.12 · · 41.95	Procyon 244°49.67	5°9.47
22	66°38.25	152°11.60 43.50	146° 9.77 57.36	312°57.39 53.18	69°27.46 41.89	Pollux 243°15.96	27°57.71
23	81°40.71	167°10.63 43.50	161°10.15 57.24	328°0.18 53.23	84°29.81 41.84	Avior 234°13.84 Suhail 222°45.38	-59°35.39
Mori	pass. 17:34	ν-1.0' d0.0' m-3.90	ν0.4' d-0.1' m1.15	ν2.8' d0.1' m-2.66	ν2.4' d-0.1' m1.00	Suhail 222°45.38 Miaplacidus 221°37.40	-43°32.10 -69°49.19
- Ivier.	Dass. 17.34	ν-1.0 d0.0 iii-3.90		ν2.0 d0.1 III-2.00	ν2.4 α-0.1 III1.00	Alphard 217°46.73	-8°46.27
_						Regulus 207°33.40	11°50.31
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Dubhe 193°39.78	61°36.32
0 1	96° 43.17 111° 45.64	182°9.65 \$23°43.50 197°8.68 43.50	176°10.53	343°2.98 N21°53.29 358°5.78 53.35	99°32.16 S03°41.78 114°34.51 41.72	Denebola 182°24.08	14°25.47
2	126° 48.10	212°7.70 43.49	206°11.29 56.87	13°8.58 53.40	129° 36.86 41.66	Gienah 175°42.75	-17°41.12
3	141°50.57	227°6.73 · · 43.49	221°11.67 · · 56.75	28°11.38 · · 53.46	144°39.20 · · 41.60	Acrux 172°59.23	-63°14.32
4	$156^{\circ}53.03$	242°5.76 43.48	236°12.05 56.62	43°14.18 53.52	159° 41.55 41.54	Gacrux 171°50.79 Alioth 166°12.34	-57°15.27 55°48.79
5	171°55.50	257°4.78 43.47	251°12.43 56.50	58°16.98 53.57	174°43.90 41.48	Spica 158°21.55	-11°17.80
6	186° 57.96	272°3.81 \$23°43.46	266°12.81 \$23°56.37	73°19.78 N21°53.63	189°46.25 S03°41.42	Alkaid 152°51.55	49°10.71
7	202°0.42	287°2.83 43.45	281°13.19 56.25	88°22.58 53.69	204°48.59 41.36	Hadar 148°35.17	-60°29.66
8 9	217°2.89 232°5.35	302°1.86 43.44 317°0.88 · · 43.42	296°13.56 56.12 311°13.94 · · 56.00	103°25.38 53.74 118°28.18 · · 53.80	219°50.94 41.30 234°53.29 · · 41.24	Menkent 147° 56.86	-36°29.72
10	247°7.82	331°59.91 43.41	326°14.32 55.87	133°30.98 53.86	249°55.63 41.18	Arcturus 145°47.35	19°2.67
11	262° 10.28	346°58.94 43.39	341°14.70 55.74	148°33.78 53.91	264° 57.98 41.12	Rigil Kent. 139°39.58 Kochab 137°20.55	-60°56.34 74°2.56
12	277° 12.74	1°57.96 <b>S</b> 23°43.38	356°15.08 <b>S</b> 23°55.61	163°36.58 N21°53.97	280°0.33 S03°41.06	Zuben'ubi 136°55.34	-16°8.95
13	292°15.21	16°56.99 43.36	11°15.46 55.49	178°39.38 54.03	295°2.67 41.00	Alphecca 126°3.35	26°37.47
14	307° 17.67	31°56.01 43.34	26°15.84 55.36	193°42.18 54.08	310°5.02 40.94	Antares 112°15.19	-26°29.33
15 16	322°20.14 337°22.60	46°55.04 · · 43.32 61°54.07 43.29	41°16.22 · · 55.23 56°16.60 55.10	208°44.98 · · 54.14 223°47.78 54.20	325°7.36 · · · 40.88 340°9.71	Atria 107° 9.23	-69°4.30
17	352°25.06	76°53.09 43.27	56°16.60 55.10 71°16.98 54.97	223°47.78 54.20 238°50.58 54.25	355°12.06 40.76	Sabik 102°2.20	-15°45.42
18	7°27.53	91°52.12 <b>S</b> 23°43.24	86°17.36 <b>S</b> 23°54.84	253°53.38 N21°54.31	10°14.40 S03°40.70	Shaula 96° 9.70	-37°7.32
19	22°29.99	106°51.14 43.22	101°17.74 54.70	268°56.18 54.37	25° 16.75 40.64	Rasalhague 95°58.15	12°32.41
20	37°32.46	121°50.17 43.19	116°18.12 54.57	283°58.99 54.42	40°19.09 40.58	Eltanin 90°42.36 Kaus Aust. 83°31.87	51°29.03 -34°22.33
21	52°34.92	136°49.20 · · 43.16	131°18.50 · · 54.44	299°1.79 · · 54.48	55°21.44 · · 40.52	Vega 80°33.12	38°48.42
22	67°37.38	151°48.22 43.13	146°18.88 54.31	314°4.59 54.54	70°23.78 40.45	Nunki 75°47.14	
23	82°39.85	166°47.25 43.10	161°19.26 54.18	329°7.39 54.59	85°26.13 40.39	Altair 61°59.50	8°56.22
Mer.	pass. 17:30	ν-1.0′ d-0.0′ m-3.90	ν0.4' d-0.1' m1.15	ν2.8' d0.1' m-2.66	$\nu 2.3' \ d$ -0.1' m1.00	Peacock 53°5.00	-56°39.21
						Deneb 49°25.66	45°22.50 9°59.70
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°38.23 Al Na'ir 27°32.18	
0	97° 42.31	181°46.28 <b>S</b> 23°43.07	176°19.64 \$23°54.04	344°10.19 N21°54.65	100°28.47 <b>S</b> 03°40.33	Fomalhaut 15°13.77	
1	112° 44.78	196° 45.30 43.03	191°20.02 53.91	359°12.99 54.71	115°30.81 40.27	Scheat 13°44.56	28°13.59
2	127° 47.24 142° 49.71	211°44.33 43.00 226°43.36 • 42.96	206°20.39 53.77 221°20.77 · · 53.64	14°15.80 54.76 29°18.60 •• 54.82	130°33.16 40.21 145°35.50 · · 40.15	Markab 13°29.22	15°20.81
4	157° 52.17	241°42.38 42.92	236°21.15 53.50	44°21.40 54.88	160°37.85 40.09	Dec 27 Sat SHA	Mer.pass
5	172°54.63	256°41.41 42.88	251°21.53 53.37	59°24.21 54.93	175°40.19 40.03	Venus 86°49.00	11:51
6	187°57.10	271°40.43 \$23°42.84	266°21.91 <b>S</b> 23°53.23	74°27.01 N21°54.99	190°42.53 <b>S</b> 03°39.97	Mars 80°17.38	12:16
7	202°59.56	286°39.46 42.80	281°22.29 53.09	89°29.81 55.05	205°44.88 39.91	Jupiter 246°11.82	01:12
8	218°2.03	301°38.49 42.76	296°22.67 52.96	104°32.61 55.11	220° 47.22 39.84	Saturn 2°51.72	17:23
9	233°4.49	316° 37.52 · · 42.71	311°23.05 · · 52.82	119°35.42 · · 55.16	235°49.56 · · 39.78	Dec 28 Sun SHA	Mer.pass
10 11	248°6.95 263°9.42	331°36.54 42.67 346°35.57 42.62	326°23.43 52.68 341°23.81 52.54	134°38.22 55.22 149°41.02 55.28	250°51.91 39.72 265°54.25 39.66	Venus 85°26.48	11:52
12	203 9.42 278°11.88	1°34.60 \$23°42.57	356°24.19 \$23°52.40	164°43.83 N21°55.33	280° 56.59 S03° 39.60	Mars 79°27.35	12:15
13	293° 14.35	16°33.62 42.52	11°24.57 52.26	179°46.63 55.39	295°58.93 39.54	Jupiter 246°19.81	01:08
14	308° 16.81	31°32.65 42.47	26°24.95 52.12	194°49.44 55.45	311°1.28 39.47	Saturn 2°48.99	17:19
15	323°19.27	46°31.68 · · 42.42	41°25.33 · · 51.98	209°52.24 · · 55.50	326°3.62 · · 39.41	Dec 29 Mon SHA	Mer.pass
16	338°21.74	61°30.70 42.37	56°25.71 51.84	224°55.04 55.56	341°5.96 39.35	Venus 84°3.96	11:54
17 18	353°24.20 8°26.67	76°29.73 42.31 91°28.76 \$23°42.26	71°26.08 51.70 86°26.46 \$23°51.56	239°57.85 55.62 255°0.65 N21°55.67	356°8.30 39.29 11°10.65 S03°39.23	Mars 78°37.32	12:14
19	23°29.13	106° 27.79 42.20	101°26.84 51.41	270°3.46 55.73	26°12.99 39.16	Jupiter 246°27.88 Saturn 2°46.16	01:03 17:15
20	38° 31.60	121°26.81 42.14	116°27.22 51.27	285°6.26 55.79	41°15.33 39.10		11.13
21	53°34.06	136°25.84 · · 42.08	131°27.60 · · 51.13	300°9.07 · · 55.84	56° 17.67 · · 39.04	Horizontal parallax	
22	68° 36.52	151°24.87 42.02	146°27.98 50.98	315°11.87 55.90	71°20.01 38.98	Venus:	0.1
23	83°38.99	166°23.89 41.96	161°28.36 50.84	330°14.68 55.96	86°22.35 38.92	Mars:	0.1
Mer. <sub>I</sub>	pass. 17:26	$\nu\text{-}1.0'~d\text{-}0.0'~\text{m-}3.90$	u0.4′ <i>d</i> -0.1′ m1.14	$\nu 2.8' \ d0.1' \ \text{m-}2.67$	$\nu 2.3'~\textit{d}0.1'~\textrm{m}1.00$		

h	Su	n			Moon		
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.26	S23°19.49	$100^{\circ}21.01$	13.9'	<b>S</b> 00°38.02	-15.9'	57.6'
1	194°45.95	19.39	114°53.95	13.9'	00°22.13	-15.9'	57.6'
2	209°45.64 224°45.33	19.28 •• 19.17	129°26.86 143°59.74	13.9' 13.8'	S00°6.23 N00°9.69	-15.9' 15.9'	57.7' 57.7'
4	239°45.03	19.07	158° 32.59	13.8'	00° 25.63	16.0'	57.7'
5	254°44.72	18.96	$173^{\circ}5.41$	13.8'	$00^{\circ}41.58$	16.0'	57.8'
6	269°44.41	\$23°18.85	187°38.19	13.7'	N00°57.54	16.0'	57.8'
7 8	284°44.10 299°43.80	18.74 18.62	202° 10.94 216° 43.65	13.7' 13.7'	01°13.52 01°29.51	16.0' 16.0'	57.8' 57.9'
9	314°43.49	. 18.51	231° 16.33	13.6'	01°45.50	16.0'	57.9'
10	329°43.18	18.40	245°48.97	13.6'	02°1.51	16.0'	57.9'
11	344°42.88 359°42.57	18.29 \$23°18.17	260°21.56	13.6'	02°17.52 N02°33.54	16.0'	57.9'
12 13	359 42.57 14°42.26	18.06	274°54.12 289°26.63	13.5' 13.5'	02°49.56	16.0' 16.0'	58.0' 58.0'
14	29°41.96	17.94	303°59.10	13.4'	03°5.59	16.0'	58.0'
15	44°41.65	• • 17.82	318° 31.52	13.4'	03°21.62	16.0'	58.1'
16 17	59°41.34 74°41.04	17.70 17.59	333°3.89 347°36.22	13.3' 13.3'	03°37.65 03°53.68	16.0' 16.0'	58.1' 58.1'
18	89°40.73	523° 17.47	2°8.49	13.2'	N04° 9.71	16.0'	58.2'
19	104°40.43	17.35	16°40.72	13.2'	04°25.73	16.0'	58.2'
20	119°40.12	17.22	31°12.89	13.1'	04°41.76	16.0'	58.2'
21 22	134°39.81 149°39.51	· · 17.10 16.98	45° 45.00 60° 17.06	13.1' 13.0'	04° 57.77 05° 13.78	16.0' 16.0'	58.2' 58.3'
23	149 39.51 164°39.20	16.98	74°49.06	12.9'	05 13.78 05°29.79	16.0'	58.3'
	SD = 16.3'	d = -0.1'			D = 15.7'		
Sun	GHA	Dec	GHA	ν 12.0'	<b>Dec</b> N05° 45.78	d 16.0'	HP
0 1	179°38.90 194°38.59	\$23°16.73 16.61	89°21.00 103°52.88	12.9' 12.8'	N05°45.78 06°1.76	16.0' 16.0'	58.3' 58.4'
2	209°38.29	16.48	118° 24.70	12.8'	06° 17.74	16.0'	58.4
3	224°37.98	•• 16.35	132° 56.45	12.7'	06° 33.70	15.9'	58.4'
4	239°37.68	16.23	147°28.14	12.6'	06°49.64	15.9'	58.5'
5 6	254°37.37 269°37.07	16.10 \$23°15.97	161°59.76 176°31.32	12.6' 12.5'	07°5.57 N07°21.48	15.9' 15.9'	58.5' 58.5'
7	284°36.76	15.84	191°2.80	12.4'	07°37.37	15.9'	58.6'
8	299°36.46	15.71	205°34.22	12.3'	07°53.25	15.9'	58.6'
9	314°36.15 329°35.85	· · 15.57 15.44	220°5.56 234°36.82	12.3' 12.2'	08°9.10 08°24.93	15.8' 15.8'	58.6' 58.6'
10 11	344°35.54	15.44	249°8.02	12.1'	06 24.93 08°40.73	15.8	58.7'
12	359°35.24	\$23° 15.17	263°39.13	12.0'	N08° 56.51	15.8'	58.7'
13	14°34.93	15.04	278° 10.17	12.0'	09°12.26	15.7'	58.7'
14 15	29°34.63 44°34.32	14.90 •• 14.77	292°41.12 307°12.00	11.9' 11.8'	09°27.98 09°43.67	15.7' 15.7'	58.8' 58.8'
16	59°34.02	14.63	301° 12.00 321° 42.79	11.7'	09° 59.33	15.6'	58.8'
17	74°33.72	14.49	$336^{\circ}13.50$	11.6'	$10^{\circ}14.95$	15.6'	58.9'
18	89°33.41	\$23°14.35	350°44.12	11.5'	N10° 30.54	15.6'	58.9'
19 20	104°33.11 119°32.80	14.21 14.07	5° 14.65 19° 45.10	11.4' 11.4'	10°46.10 11°1.61	15.5' 15.5'	58.9' 58.9'
21	134°32.50	• • 13.93	34° 15.46	11.3'	11°17.09	15.4	59.0'
22	149°32.20	13.79	48°45.72	11.2'	$11^{\circ}32.52$	15.4'	59.0'
23	164°31.89	13.65	63°15.90	11.1'	11° 47.91	15.3'	59.0'
	SD = 16.3'	d = -0.1'		SI	D = 15.9'		
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0 1	179°31.59 194°31.29	\$23°13.50 13.36	77° 45.97 92° 15.96	11.0' 10.9'	N12°3.26 12°18.55	15.3' 15.2'	59.1' 59.1'
2	194°31.29 209°30.98	13.36	92° 15.96 106° 45.84	10.9	12° 18.55 12° 33.80	15.2' 15.2'	59.1' 59.1'
3	224°30.68	• • 13.07	121°15.63	10.7'	12°49.00	15.1'	59.2'
4	239°30.38	12.92	135°45.32	10.6'	13°4.15	15.1'	59.2'
5 6	254°30.07 269°29.77	12.77 \$23° 12.62	150° 14.91 164° 44.39	10.5' 10.4'	13° 19.25 N13° 34.29	15.0' 15.0'	59.2' 59.2'
7	209 29.77 284°29.47	12.47	104 44.39 179°13.77	10.4	13° 49.27	14.9'	59.2 59.3'
8	299°29.17	12.32	193°43.05	10.2'	14°4.19	14.9'	59.3'
9	314°28.86	•• 12.17	208° 12.22	10.1'	14° 19.05	14.8'	59.3'
10 11	329°28.56 344°28.26	12.02 11.87	222°41.28 237°10.24	10.0' 9.8'	14°33.85 14°48.59	14.7' 14.7'	59.4' 59.4'
12	359°27.96	\$23°11.71	251°39.08	9.7'	N15°3.26	14.7	59.4
13	14°27.66	11.56	266°7.82	9.6'	15° 17.86	14.5'	59.4'
14	29°27.35 44°27.05	11.40 •• 11.25	280°36.44 295°4.95	9.5'	15°32.39 15°46.85	14.5'	59.5'
15 16	44°27.05 59°26.75	· · 11.25 11.09	295°4.95 309°33.34	9.4' 9.3'	15°46.85 16°1.23	14.4' 14.3'	59.5' 59.5'
17	74°26.45	10.93	324°1.62	9.2'	16° 15.54	14.2	59.5'
18	89°26.15	S23°10.78	338° 29.79	9.0'	N16°29.77	14.2'	59.6'
19	104°25.85	10.62	352°57.83 7°25.76	8.9'	16°43.92 16°57.99	14.1'	59.6'
20 21	119°25.54 134°25.24	10.46 •• 10.30	7°25.76 21°53.56	8.8' 8.7'	16°57.99 17°11.97	14.0' 13.9'	59.6' 59.7'
22	149°24.94	10.13	36°21.25	8.6'	17° 25.87	13.8	59.7'
23	164°24.64	9.97	50°48.82	8.4'	17°39.68	13.7'	59.7'
	SD = 16.3'	d = -0.1'		SI	O = 16.1'		

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

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

		Sun		Moon			
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age	
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	7-9	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	41-63%	
27	00:55	01:10	12:01	17:51	05:29		
28	01:24	01:39	12:02	18:38	06:14		
29	01:54	02:08	12:02	19:29	07:03		

### December 30, 31, 01 UT (Tue., Wed., Thu.)

h	Aries	Ve:	. (1461)	M	ars	loo	piter	S <sub>a</sub> +	urn		Stars	
Tue 0	<b>GHA</b> 98°41.45	<b>GHA</b> 181°22.92	<b>Dec</b> \$23°41.89	<b>GHA</b> 176°28.74	<b>Dec</b> \$23°50.70	<b>GHA</b> 345°17.48	<b>Dec</b> N21° 56.01	<b>GHA</b> 101°24.69	<b>Dec</b> \$03°38.85		SHA	Dec
1	113° 43.92	196°21.95	41.83	191°29.12	50.55	0°20.29	56.07	116° 27.03	38.79	Alpheratz	357°33.98	29°14.22
2	128° 46.38	211°20.98	41.76	206°29.50	50.40	15°23.09	56.13	131°29.37	38.73	Ankaa Schedar	353°6.36 349°30.10	-42°10.09 56°41.10
3	143° 48.84	226°20.01	• • 41.70	221°29.88	• • 50.26	30°25.90	•• 56.19	146°31.71	• • 38.67	Diphda	348°46.47	-17° 50.73
4	158° 51.31	241°19.03	41.63	236°30.26	50.11	45°28.70	56.24	161°34.05	38.60	Achernar	335°19.40	-57°6.53
5 6	173°53.77 188°56.24	256°18.06 271°17.09	41.56 \$23°41.49	251°30.64 266°31.02	49.96 \$23°49.82	60°31.51 75°34.32	56.30 N21°56.36	176°36.39 191°38.73	38.54 \$03°38.48	Hamal	$327^{\circ}50.13$	23°35.26
7	203°58.70	286°16.12	41.41	281°31.40	49.67	90°37.12	56.41	206°41.07	38.41	Polaris	313°17.40	89°22.68
8	219°1.17	301°15.15	41.34	296°31.78	49.52	105°39.93	56.47	221°43.41	38.35	Acamar Menkar	315°10.89 314°5.09	-40°12.17 4°11.53
9	234°3.63	316°14.17	• • 41.26	311°32.15	• • 49.37	120°42.73	• • 56.53	236° 45.75	• • 38.29	Mirfak	308°26.73	49°57.39
10	249°6.09	331°13.20	41.19	326°32.53	49.22	135°45.54	56.58	251°48.09	38.23	Aldebaran	290°38.38	16°33.73
11 12	264°8.56 279°11.02	346°12.23 1°11.26	41.11 \$23°41.03	341°32.91 356°33.29	49.07 \$23°48.92	150°48.35 165°51.15	56.64 N21°56.70	266° 50.43 281° 52.77	38.16 \$03°38.10	Rigel	281°2.76	-8°10.31
13	294° 13.49	16°10.29	40.95	11°33.67	48.77	180°53.96	56.75	296°55.11	38.04	Capella	280°20.22	46°1.50
14	309° 15.95	31°9.32	40.87	26°34.05	48.62	195°56.77	56.81	311° 57.45	37.97	Bellatrix Elnath	278°21.68 278°0.47	6°22.39 28°37.78
15	324° 18.41	46°8.34	• • 40.79	41°34.43	• • 48.47	210°59.58	• • 56.87	326° 59.79	• • 37.91	Alnilam	275°36.58	-1°11.13
16 17	339° 20.88 354° 23.34	61°7.37 76°6.40	40.70 40.62	56°34.81 71°35.19	48.32 48.16	226°2.38 241°5.19	56.92 56.98	342°2.13 357°4.46	37.85 37.78	Betelgeuse	$270^{\circ}50.87$	$7^{\circ}24.70$
18	9° 25.81	91°5.43	\$23°40.53	86°35.57	\$23°48.01	256°8.00	N21° 57.04	12°6.80	\$03°37.72	Canopus	263°51.47	-52°42.54
19	24° 28.27	106°4.46	40.44	101°35.95	47.86	271°10.80	57.10	27°9.14	37.66	Sirius Adhara	258°25.17 255°4.84	-16°45.11 -29°0.42
20	39° 30.74	121°3.49	40.36	116°36.33	47.70	286°13.61	57.15	42°11.48	37.59	Procyon	255 4.84 244°49.66	-29 0.42 5°9.46
21	54° 33.20	136°2.52	• • 40.26	131°36.71	47.55	301°16.42	• • 57.21	57° 13.82	• • 37.53	Pollux	243°15.95	27°57.71
22 23	69° 35.66 84° 38.13	151°1.55 166°0.58	40.17 40.08	146°37.09 161°37.47	47.39 47.24	316°19.23 331°22.04	57.27 57.32	72°16.15 87°18.49	37.46 37.40	Avior	$234^{\circ}13.82$	-59°35.41
							_			Suhail	222°45.35	-43°32.11
Mer.	pass. 17:22	$\nu$ -1.0′ d-0	.1′ m-3.90	$\nu$ 0.4′ d-0	).1′ m1.14	$\nu^{2.8'} d0$	.1′ m-2.67	$\nu^{2.3'} d^{-0}$	.1′ m1.00	Miaplacidus Alphard	221°37.36 217°46.71	-69°49.21 -8°46.28
										Regulus	207°33.38	-6 40.26 11°50.30
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Dubhe	193°39.74	61°36.32
0 1	99° 40.59 114° 43.06	180°59.61 195°58.64	\$23°39.99 39.89	176°37.85 191°38.23	\$23°47.08 46.93	346°24.84 1°27.65	N21°57.38 57.44	102°20.83 117°23.16	\$03°37.34 37.27	Denebola	$182^{\circ}24.06$	$14^{\circ}25.46$
2	129° 45.52	210° 57.67	39.79	206°38.60	46.77	16°30.46	57.44	117 25.10 132°25.50	37.21	Gienah	175°42.73	-17°41.13
3	144°47.98	225°56.70	• • 39.70	221°38.98	• • 46.61	31°33.27	• • 57.55	147° 27.84	• • 37.14	Acrux Gacrux	172°59.18 171°50.75	-63°14.33 -57°15.28
4	159° 50.45	240°55.73	39.60	236°39.36	46.45	46°36.08	57.61	162°30.17	37.08	Alioth	166°12.31	55° 48.78
5	174°52.91	255°54.76	39.50	251°39.74	46.30	61°38.89	57.67	177°32.51	37.02	Spica	158°21.53	-11° 17.81
6 7	189° 55.38 204° 57.84	270°53.79 285°52.82	\$23°39.39 39.29	266°40.12 281°40.50	\$23°46.14 45.98	76°41.70 91°44.50	N21°57.72 57.78	192°34.85 207°37.18	\$03°36.95 36.89	Alkaid	152°51.53	49° 10.70
8	220°0.31	300°51.85	39.19	296°40.88	45.82	106°47.31	57.84	222°39.52	36.82	Hadar	148°35.13	-60°29.65
9	235°2.77	$315^{\circ}50.88$	• • 39.08	311°41.26	• • 45.66	121°50.12	• • 57.89	237°41.86	• • 36.76	Arcturus	147°56.83 145°47.33	-36°29.73 19°2.66
10	250°5.23	330°49.91	38.97	326°41.64	45.50	136°52.93	57.95	252°44.19	36.69	Rigil Kent.	139°39.53	-60°56.34
11 12	265°7.70 280°10.16	345°48.94 0°47.97	38.87 \$23°38.76	341°42.02 356°42.40	45.34 \$23°45.17	151°55.74 166°58.55	58.01	267° 46.53 282° 48.86	36.63 \$03°36.56	Kochab	$137^{\circ}20.50$	$74^{\circ}2.55$
13	295° 12.63	15°47.00	38.65	11°42.78	45.01	182°1.36	N21°58.06 58.12	202 46.00 297°51.20	36.50	Zuben'ubi	136°55.32	-16°8.96
14	310° 15.09	30°46.03	38.53	26°43.16	44.85	197°4.17	58.18	312°53.53	36.44	Alphecca	126°3.33 112°15.17	26°37.46 -26°29.32
15	$325^{\circ}17.56$	45°45.06	• • 38.42	41°43.54	• • 44.69	212°6.98	•• 58.24	327°55.87	• • 36.37	Antares Atria	107°9.20	-20 29.32 -69°4.29
16	340°20.02	60°44.09	38.31	56°43.92	44.52	227°9.79	58.29	342°58.20	36.31	Sabik	102°2.19	-15°45.42
17 18	355°22.48 10°24.95	75°43.12 90°42.15	38.19 \$23°38.07	71°44.30 86°44.68	44.36 \$23°44.20	242°12.60 257°15.41	58.35 N21°58.41	358°0.54 13°2.87	36.24 \$03°36.18	Shaula	$96^{\circ}9.68$	$-37^{\circ}7.31$
19	25° 27.41	105°41.19	37.96	101°45.06	44.03	272°18.22	58.46	28°5.21	36.11	Rasalhague	95°58.14	12°32.40
20	40° 29.88	120°40.22	37.84	116°45.44	43.87	287°21.03	58.52	43°7.54	36.05	Eltanin Kaus Aust.	90°42.35 83°31.86	51°29.01 -34°22.33
21	55° 32.34	135°39.25	• • 37.71	131°45.82	• • 43.70	302°23.84	•• 58.58	58°9.87	• • 35.98	Vega	80°33.12	38° 48.41
22	70° 34.80	150°38.28	37.59	146°46.20	43.53	317°26.65	58.63	73°12.21	35.91	Nunki	75°47.14	-26°15.88
23	85°37.27	165°37.31	37.47	161°46.58	43.37	332°29.46	58.69	88°14.54	35.85	Altair	61°59.50	8°56.21
Mer.	pass. 17:18	$\nu$ -1.0' d-0	.1′ m-3.90	$\nu$ 0.4' d-0	).2′ m1.13	$\nu 2.8' d0$	.1′ m-2.67	$\nu 2.3' \ d-0$	.1′ m1.00	Peacock	53°5.00	-56°39.19 45°22.49
										Deneb Enif	49°25.67 33°38.24	9° 59.69
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Al Na'ir	27°32.19	-46° 50.29
0	100° 39.73	180°36.35			\$23°43.20	347°32.27		103° 16.88	S03°35.78	Fomalhaut	$15^{\circ}13.79$	-29°29.21
1 2	115° 42.20 130° 44.66	195°35.38 210°34.41	37.22 37.09	191°47.34 206°47.72	43.03 42.86	2°35.08 17°37.90	58.81 58.86	118° 19.21 133° 21.54	35.72 35.65	Scheat	13°44.57	28° 13.59
3	145° 47.13	225° 33.44	36.96	221°48.10	• • 42.70	32°40.71	• • 58.92	148° 23.88	• • 35.59	Markab	13°29.23	15°20.80
4	$160^{\circ}49.59$	$240^{\circ}32.47$	36.83	236°48.47	42.53	47°43.52	58.98	$163^{\circ}26.21$	35.52	Dec 30 Tue	SHA	Mer.pass
5	175° 52.05	255°31.51	36.70	251°48.85	42.36	62°46.33	59.03	178°28.54	35.46	Venus	82°41.47	11:55
6 7	190° 54.52 205° 56.98	270°30.54 285°29.57	\$23°36.57 36.44	266°49.23 281°49.61	\$23°42.19 42.02	77°49.14 92°51.95	N21°59.09 59.15	193°30.87 208°33.21	\$03°35.39 35.32	Mars	77°47.29 246°36.03	12:14 00:59
8	220° 59.45	300°28.61	36.30	296°49.99	41.85	92 51.95 107°54.76	59.15	200° 35.21 223° 35.54	35.26	Saturn	2°43.24	17:12
9	236°1.91	315°27.64	• • 36.16	311°50.37	• • 41.68	122°57.58	• • 59.26	238° 37.87	• • 35.19			
10	251°4.38	330°26.67	36.03	326°50.75	41.50	138°0.39	59.32	253°40.20	35.13	Dec 31 Wed Venus	<b>SHA</b> 81°19.01	Mer.pass 11:57
11	266° 6.84	345°25.71	35.89	341°51.13	41.33	153°3.20	59.38	268° 42.54	35.06	Mars	76°57.25	12:13
12 13	281°9.30 296°11.77	0°24.74 15°23.77	\$23°35.75 35.61	356°51.51 11°51.89	\$23°41.16 40.99	168°6.01 183°8.82	N21°59.43 59.49	283°44.87 298°47.20	\$03°34.99 34.93	Jupiter	$246^{\circ}44.25$	00:54
14	311° 14.23	30°22.81	35.46	26°52.27	40.99	198°11.64	59.55	313°49.53	34.86	Saturn	2°40.23	17:08
15	$326^{\circ}16.70$	45°21.84	• • 35.32	41°52.65	• • 40.64	213°14.45	• • 59.60	$328^{\circ}51.86$	• • 34.79	Jan 01 Thu	SHA	Mer.pass
16	341°19.16	60°20.87	35.18	56°53.03	40.46	228°17.26	59.66	343°54.19	34.73	Venus	$79^{\circ}56.61$	11:58
17	356°21.63 11°24.09	75° 19.91	35.03 \$23°34.88	71°53.41 86°53.79	40.29 \$23°40.11	243°20.07 258°22.89	59.72 N21°59.77	358° 56.52	34.66 \$03°34.60	Mars	76°7.22	12:13
18 19	26° 26.55	90 18.94 105°17.98	34.88	101°54.17	39.94	258 22.89 273°25.70	N21 59.77 59.83	13°58.86 29°1.19	\$03°34.60 34.53	Jupiter Saturn	246°52.54 2°37.14	00:50 17:04
20	41°29.02	120° 17.01	34.58	116°54.55	39.76	288°28.51	59.89	44°3.52	34.46			11.04
21	56° 31.48	135° 16.05	• • 34.43	131°54.93	• • 39.59	303°31.32	21°59.95	59°5.85	• • 34.40	Horizo	ntal parallax	0.1
22	71°33.95	150°15.08	34.28	146°55.31	39.41	318°34.14	22°0.00	74°8.18	34.33		Venus: Mars:	0.1 0.1
23	86°36.41	165°14.12	34.13	161°55.69	39.23	333°36.95	0.06	89° 10.51	34.26		iviais.	V.1
Mer.	pass. 17:15	$\nu$ -1.0′ d-0	.1′ m-3.90	$\nu$ 0.4′ d-0	0.2′ m1.12	$\nu 2.8' d0$	.1′ m-2.67	$\nu 2.3' \ d-0$	.1′ m1.01			

h	Su	n			Moon		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.34	S23°9.81	65°16.26	8.3'	$N17^{\circ}53.41$	13.6'	59.7'
1	194°24.04	9.64	79°43.58	8.2'	18°7.03	13.5'	59.8'
2	209°23.74 224°23.44	9.48 •• 9.31	94°10.78 108°37.85	8.1' 7.9'	18°20.57 18°34.01	13.4' 13.3'	59.8' 59.8'
3 4	239°23.14	9.15	108 37.85 123°4.79	7.9 7.8'	18°47.35	13.3	59.8'
5	254° 22.84	8.98	137°31.61	7.7'	19°0.59	13.1'	59.9'
6	269° 22.54	\$23°8.81	151°58.31	7.6'	N19°13.73	13.0'	59.9'
7	284° 22.24	8.64	166°24.87	7.4'	19°26.76	12.9'	59.9'
8	299°21.94	8.47	180°51.31	7.3'	19°39.69	12.8'	59.9'
9 10	314°21.64 329°21.34	· · 8.30 8.13	195°17.62 209°43.80	7.2' 7.1'	19°52.50 20°5.21	12.7' 12.6'	60.0' 60.0'
11	344°21.04	7.96	224°9.85	6.9'	20° 17.80	12.5'	60.0
12	359° 20.74	\$23°7.79	238°35.78	6.8'	N20°30.28	12.4'	60.0'
13	14°20.44	7.61	253°1.57	6.7'	$20^{\circ}42.64$	12.2'	60.1'
14	29°20.14	7.44	267°27.23	6.5'	20°54.88	12.1'	60.1
15 16	44° 19.84 59° 19.55	· · 7.26 7.09	281°52.76 296°18.16	6.4' 6.3'	21°7.00 21°18.99	12.0' 11.9'	60.1' 60.1'
17	74° 19.25	6.91	310°43.43	6.1	21°30.86	11.7'	60.1
18	89° 18.95	\$23°6.73	325°8.57	6.0'	N21°42.60	11.6'	60.2
19	104°18.65	6.56	339°33.58	5.9'	$21^{\circ}54.20$	11.5'	60.2'
20	119° 18.35	6.38	353°58.46	5.7'	22°5.68	11.3'	60.2'
21 22	134° 18.05 149° 17.75	· · 6.20 6.02	8°23.21 22°47.83	5.6' 5.5'	22°17.02 22°28.22	11.2' 11.1'	60.2' 60.3'
23	164° 17.46	5.83	37°12.32	5.4'	22°39.28	10.9'	60.3
	SD = 16.3'	d = -0.2'			D = 16.3'	10.5	
	3D = 10.5	a = -0.2		31	D = 10.3		
Wed	GHA	Dec	GHA	$\nu$	Dec	d 10.0'	HP
0 1	179° 17.16 194° 16.86	\$23° 5.65 5.47	51°36.67 66°0.90	5.2' 5.1'	N22°50.20 23°0.98	10.8' 10.6'	60.3' 60.3'
2	209° 16.56	5.28	80°25.00	5.0'	23°11.61	10.5	60.3
3	224° 16.27	• • 5.10	94°48.97	4.8'	23°22.09	10.3'	60.3
4	239° 15.97	4.91	$109^{\circ}12.82$	4.7'	23°32.43	10.2'	60.4'
5	254° 15.67	4.73	123°36.54	4.6'	23°42.60	10.0'	60.4
6 7	269° 15.37 284° 15.08	\$23° 4.54 4.35	138°0.13 152°23.59	4.5' 4.3'	N23°52.63 24°2.50	9.9' 9.7'	60.4' 60.4'
8	299° 14.78	4.16	166°46.93	4.3 4.2'	24° 12.20	9. <i>1</i> 9.5'	60.4
9	314° 14.48	3.97	181°10.15	4.1'	24°21.75	9.4'	60.5
10	329°14.19	3.78	195°33.25	4.0'	24°31.13	9.2'	60.5'
11	344°13.89	3.59	209°56.22	3.9'	24°40.35	9.1'	60.5'
12	359°13.60 14°13.30	\$23°3.40 3.21	224°19.08 238°41.81	3.7'	N24°49.40 24°58.28	8.9'	60.5'
13 14	29° 13.00	3.21	253°4.43	3.6' 3.5'	24 58.28 25°6.99	8.7' 8.5'	60.5' 60.5'
15	44° 12.71	2.82	267°26.93	3.4'	25°15.53	8.4	60.5
16	59°12.41	2.62	281°49.32	3.3'	$25^{\circ}23.89$	8.2'	60.6'
17	74°12.12	2.43	296°11.60	3.2'	25°32.07	8.0'	60.6'
18 19	89° 11.82 104° 11.53	\$23°2.23 2.03	310°33.76 324°55.82	3.1' 2.9'	N25°40.08 25°47.90	7.8' 7.6'	60.6' 60.6'
20	119° 11.23	1.84	339°17.76	2.8'	25°55.54	7.5'	60.6
21	134° 10.93	. 1.64	353°39.60	2.7'	26°2.99	7.3	60.6'
22	149°10.64	1.44	8°1.34	2.6'	$26^{\circ}10.26$	7.1'	60.6'
23	164°10.35	1.24	22°22.98	2.5'	26°17.33	6.9'	60.6'
	SD = 16.3'	d = -0.2'		SI	D = 16.4'		
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	179° 10.05	\$23°1.03	36°44.52	2.4'	N26°24.22	6.7'	60.7'
1	194°9.76 209°9.46	0.83	51°5.95 65°27.30	2.3'	26°30.92 26°37.42	6.5'	60.7'
2	209°9.46 224°9.17	0.63	65°27.30 79°48.55	2.3' 2.2'	26°37.42 26°43.73	6.3' 6.1'	60.7' 60.7'
4	239°8.87	0.43	94°9.72	2.1'	26°49.84	5.9'	60.7'
5	254°8.58	23°0.02	108°30.79	2.0'	26°55.75	5.7'	60.7'
6	269°8.29	S22°59.81	122°51.78	1.9'	N27°1.46	5.5'	60.7'
7	284°7.99 299°7.70	59.60 50.30	137°12.69 151°33.52	1.8' 1.8'	27°6.97 27°12.27	5.3'	60.7'
8 9	299°7.70 314°7.41	59.39 •• 59.19	151°33.52 165°54.27	1.8	27°12.27 27°17.37	5.1' 4.9'	60.7' 60.7'
10	329°7.11	58.98	180°14.95	1.6'	27°22.27	4.7'	60.7
11	344°6.82	58.77	194°35.55	1.5'	27°26.96	4.5'	60.7'
12	359°6.53	S22°58.55	208°56.09	1.5'	N27°31.44	4.3'	60.7'
13 14	14°6.23 29°5.94	58.34 58.13	223°16.57 237°36.98	1.4' 1.4'	27°35.71 27°39.77	4.1' 3.9'	60.8' 60.8'
14 15	29°5.94 44°5.65	58.13 •• 57.92	251°57.34	1.4	27° 43.63	3.9 3.6'	60.8
16	59°5.36	57.70	266°17.64	1.2'	27°47.26	3.4'	60.8
17	74°5.06	57.49	280°37.88	1.2'	27°50.69	3.2'	60.8'
18	89°4.77	\$22°57.27	294°58.08	1.2'	N27°53.90	3.0'	60.8
19 20	104°4.48 119°4.19	57.05 56.84	309°18.23 323°38.35	1.1' 1.1'	27°56.89 27°59.67	2.8' 2.6'	60.8' 60.8'
20	119°4.19 134°3.90	56.84	323° 38.35 337° 58.42	1.1	27°59.67 28°2.23	2.6	60.8
22	149°3.61	56.40	352°18.46	1.0'	28°4.58	2.1'	60.8
23	164°3.31	56.18	6°38.46	1.0'	28°6.71	1.9'	60.8'
	SD = 16.3'	d = -0.2'		SI	D = 16.5'		

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

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

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
,	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	74-91%
30	02:23	02:37	12:03	20:25	07:56	
31	02:51	03:06	12:03	21:26	08:55	
01	03:20	03:34	12:04	22:32	09:59	